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Supporting Strategic Decision-Making with Open Cost Data: Insights from OpenAIRE and PathOS

openCost Conference 2024

Ioanna Grypari
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Introduction

Importance of Market Dynamics

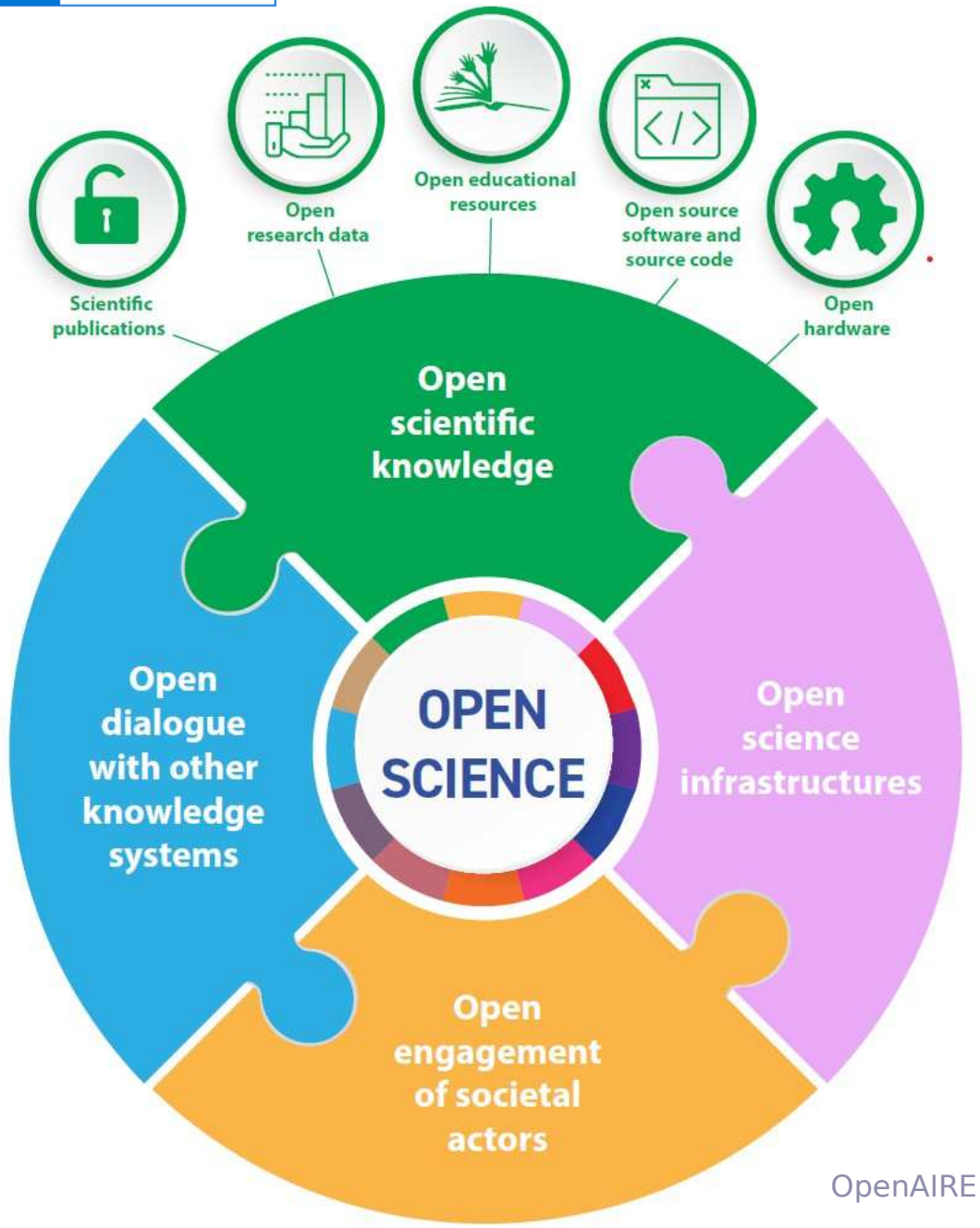
- Understanding how costs influence funding decisions is essential for strategic decision-making in Open Science.

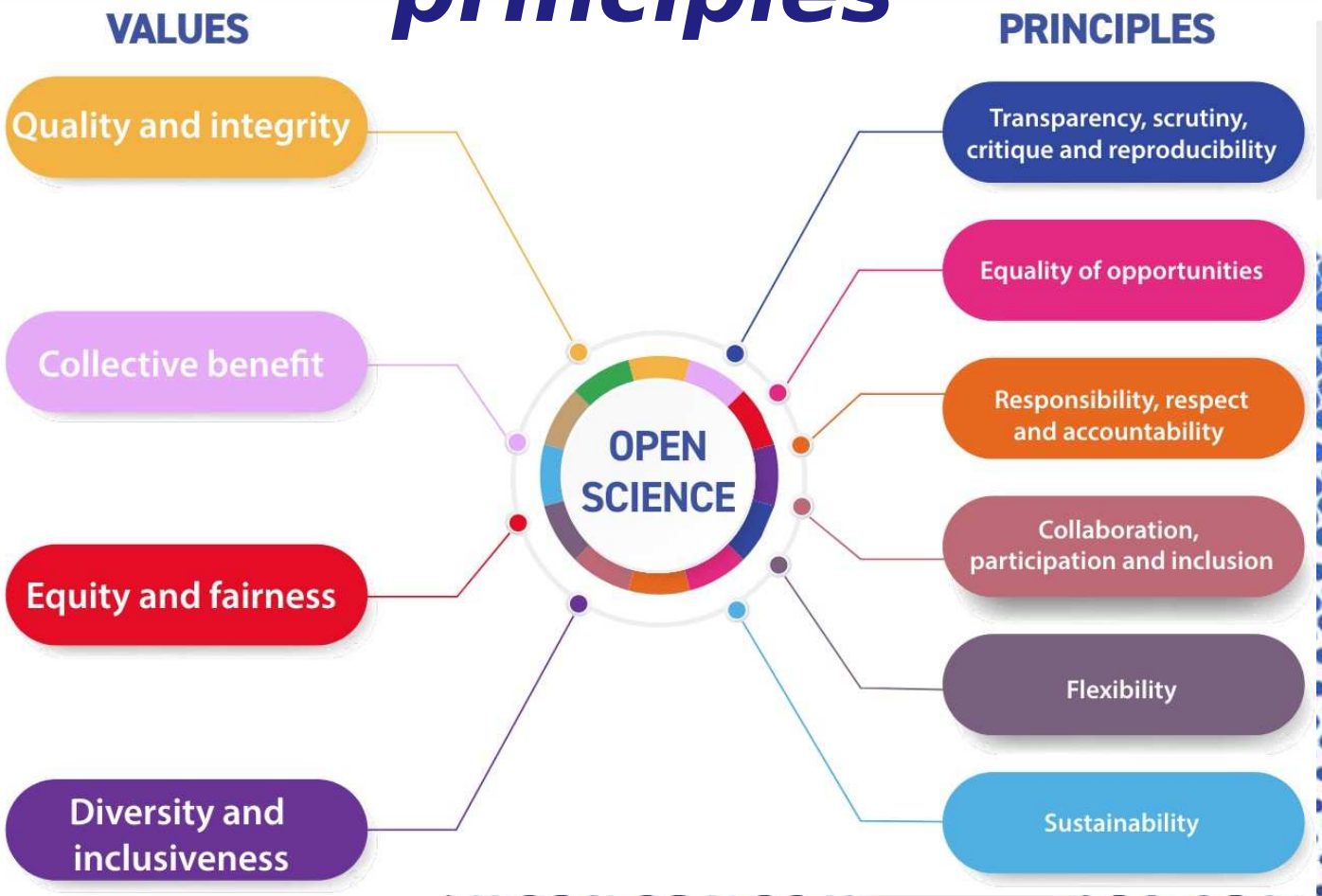
This Talk

- Examine the role of **OpenAIRE** and **PathOS** in providing insights into the economic impact of Open Access publishing.
- Highlight the significance of **APCs** in the Open Science landscape.
- Showcase insights from an APC **extrapolation exercise**.

The Impact of Open Science

Open Science is a diverse bunch of ***practices*** and ***principles***





Images from UNESCO Recommendation, CC-BY-SA

Are our plans working?

Image : Envato Elements

What are the longer-term consequences of not only making things Open, but the ways we are going about it?

Are there unintended consequences and “grimpact”?

PathOS

Open Science Impact Pathways

Programme: Horizon Europe

Call: HORIZON-WIDERA-2021-ERA-01

Type of Action: Research and Innovation

Topic: Modelling & quantifying the impacts of Open Science practice

Grant Agreement No.: 101058728

Duration: Sep 2022 – Aug 2025

Funded by
the European Union

PathOS Primary Objective

*Identify and quantify the **Key Impact Pathways of Open Science across academia, society, and the economy** to enhance understanding and drive informed policy-making.*

Beyond state of the art

- Map the **Causal Pathways** for Open Science, and design and estimate **OS Impact Indicators** for chosen case studies through a **data-driven, AI-assisted** approach.
- Formulate a **Cost-Benefit Analysis framework tailored to Open Science practices** and implement it in selected case studies.

Academic impact: 489 included studies

The academic impact of Open Science: a scoping review

Keywords: academic impact, open science, open access, FAIR data, citizen science, scoping review

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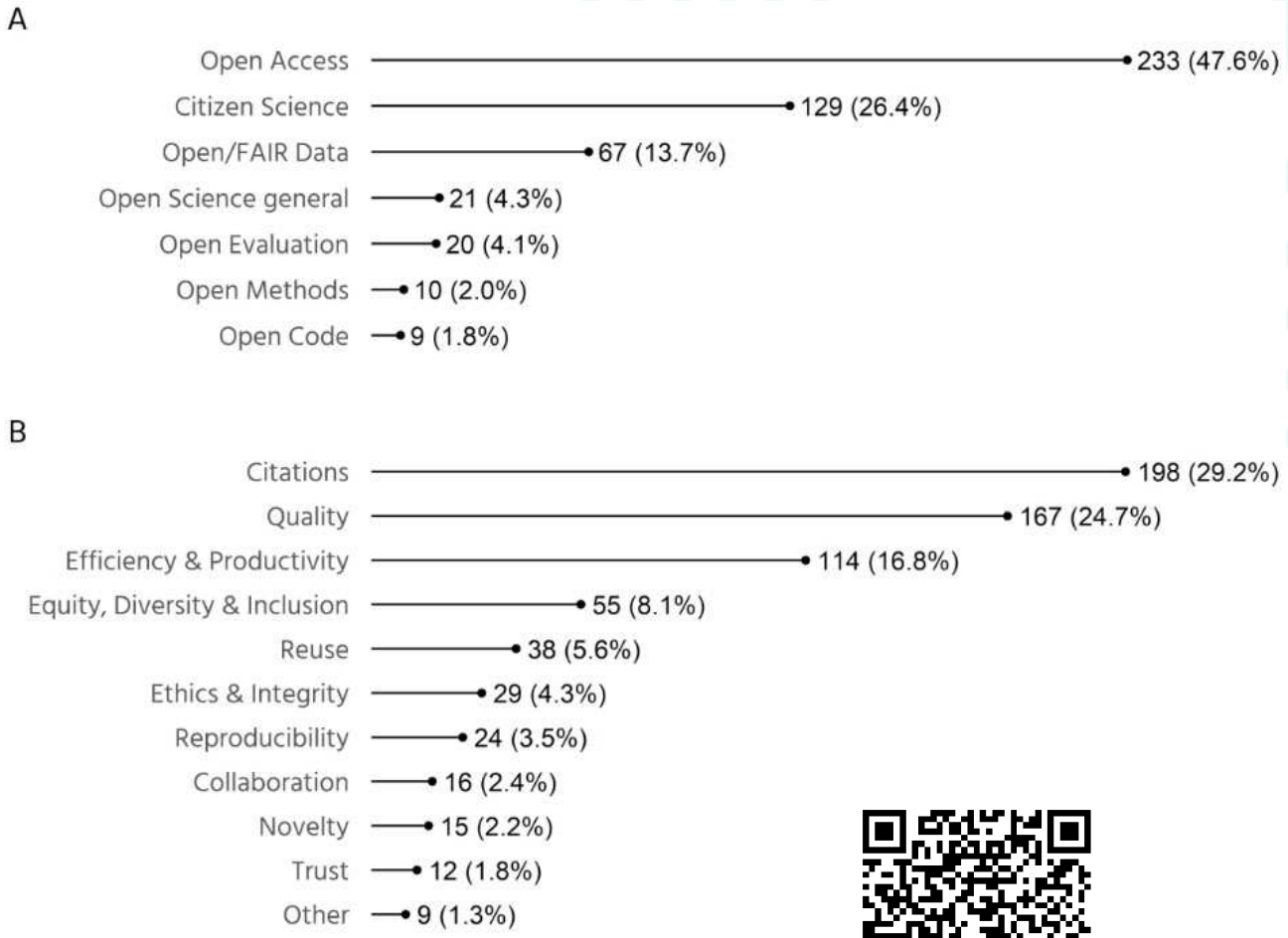
Abstract

Open Science seeks to make research processes and outputs more accessible, transparent, and inclusive, ensuring that scientific findings can be freely shared, scrutinised, and built-upon by researchers and others. To date, there has been no systematic synthesis of the extent to which Open Science reaches these aims. We use the PRISMA scoping review methodology to partially address this gap, scoping evidence on the academic (but not societal or economic) impacts of OS. We identify 489 studies related to all aspects of OS, including Open Access (OA), Open/FAIR Data (OFD), Open Code/Software, Open Evaluation, and Citizen Science (CS). Analysing and synthesising findings, we show that the majority of studies investigated effects of OA, CS, and OFD. Key areas of impact studied are citations, quality, efficiency, equity, reuse, ethics, and reproducibility, with most studies reporting positive or at least mixed impacts. However, we also



Preprint available at https://doi.org/10.31235/osf.io/ptjub

Academic impact: Main findings

- **Citations**
  - Small to moderate increase from OA, Open/FAIR Data, and Open Evaluation
  - Unclear effects from Open Code, no effect from OS badges
- **Quality**
  - Neutral to moderate positive effects from Open Peer Review
  - Conflicting evidence from OA, Citizen Science neutral effect on quality given sufficient training
- **Efficiency & productivity**
  - Positive effects from Citizen Science, OA, and Open Science in general
  - Unclear effect of Open Evaluation
  - Wasted time from predatory publisher emails (OA)
- **Equity, diversity and inclusion**
  - OA leads to more diverse citations and international collaboration
  - Marginalization of those with fewer resources (OA-APC, Open/FAIR Data) or lower status (Open Evaluation)
  - Citizen Science activities focused in the Global North
- **Reuse**
  - Positive effect of Open/FAIR data
- **Reproducibility**
  - Positive effects of preregistrations and registered reports
  - No effects of Open/FAIR Data or Open Methods
- **Novelty**
  - Potentially positive effect of OS practices on rate of true discoveries
- **Ethics & Integrity**
  - Unclear impact of Open Evaluation on integrity of reviews
  - Open/FAIR data has risk of re-identifying participants
- **Trust**
  - Positive effect of OS badges on trust in results by scientists.

Societal impact: 196 included studies

ROYAL SOCIETY OPEN SCIENCE

royalsocietypublishing.org/journal/rsos

Review

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The societal impact of Open Science: a scoping review

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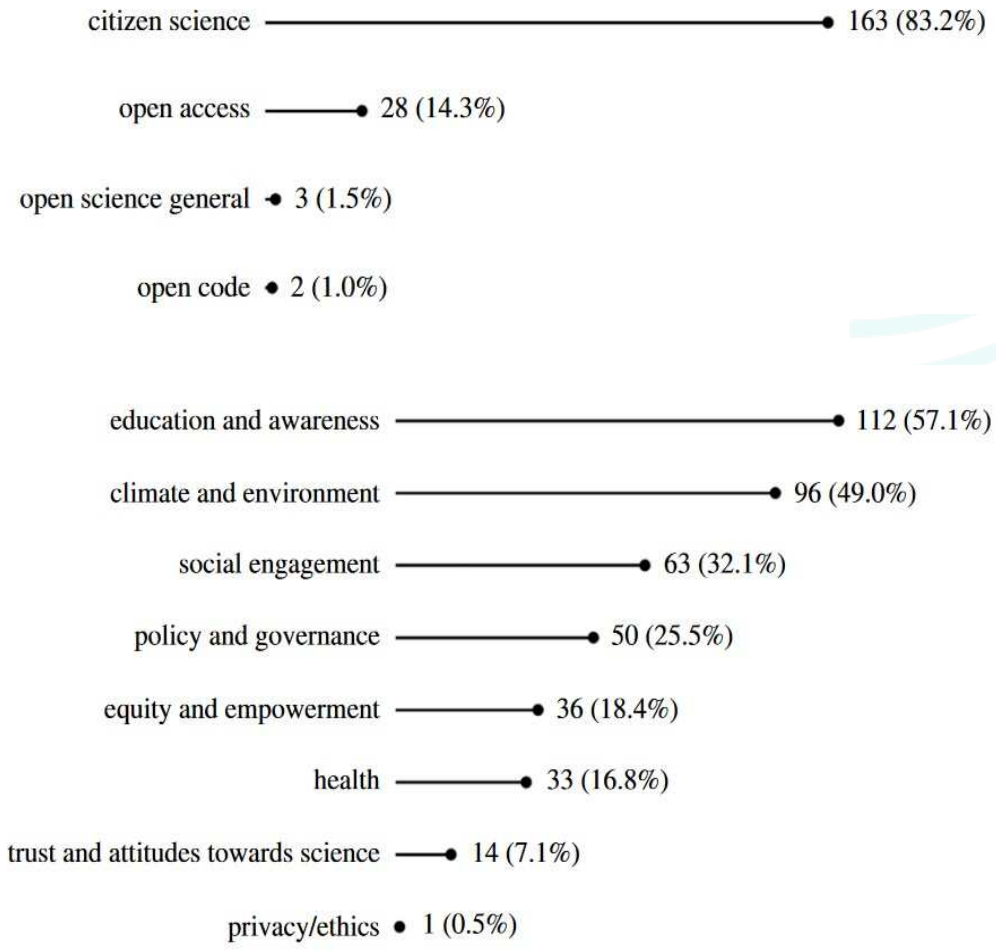
Open Science (OS) aims, in part, to drive greater societal impact of academic research. Government, funder and institutional policies state that it should further democratize research and increase learning and awareness, evidence-based policy-making, the relevance of research to society's problems, and public trust in research. Yet, measuring the societal impact of OS has proven challenging and synthesized evidence of it is lacking. This study fills this gap by systematically scoping the existing evidence of societal impact driven by OS and its various aspects, including Citizen Science (CS), Open Access (OA), Open/FAIR Data (OFD), Open Code/Software and



Economic impact (work in progress)

Literature

- Scarce company data
- Many theoretical papers on expected gains, but few with real evidence
- Most papers on Open Science, Open Access and Open Data, few on Citizen Science, Open Source or Open Code
- Most evidence comes from the medical and biotech sector

Challenges/evidence gaps

- Great difficulties in identifying either business (turnover/profits) or macroeconomic impacts
- A lot more case studies and broader assessments are needed to allow for meta-analyses

Implications

- Significant knowledge gaps - particularly wrt economic implications
- Areas with strong evidence may lack policy support (e.g. Citizen Science)
- Key challenges in measuring causal relationships and a lack of standardized definitions
- Future monitoring relies on Open Data and should focus on impact, employing mixed methods to identify causal pathways.

Monitoring

Monitoring

- Monitoring **uptake** provides insights into participation levels. Monitoring **impact** assesses the effectiveness and outcomes of Open Science.
- Essential to differentiate between **correlation** and **causation**.
- **Financial implications** are critical for decision-making. Accurate **cost assessments** support effective budgeting and resource allocation. Cost changes can **distort the market**.
- **Continuous monitoring** helps identify and mitigate these distortions.
- **Data-driven insights** enable informed policy and funding decisions, enhance transparency and accountability in Open Science investments.

THE **MISSION**

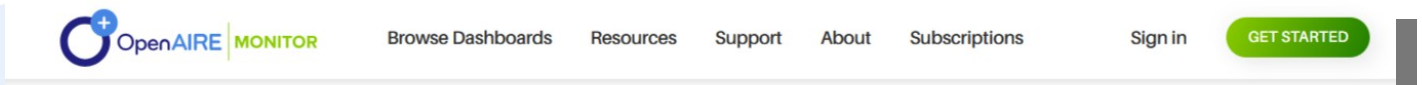
Shift scholarly communication towards **openness** and **transparency**, mobilising R&I actors to co-develop, co-invest and assume co-ownership of an open scholarly communication ecosystem.

WHAT **WE DO**

A **Scholarly Communication e-Infrastructure** that brings together **human capital** and **advanced ICT services.**

1. Aligning policies
2. Operating services
3. Offering training

OpenAIRE Monitor



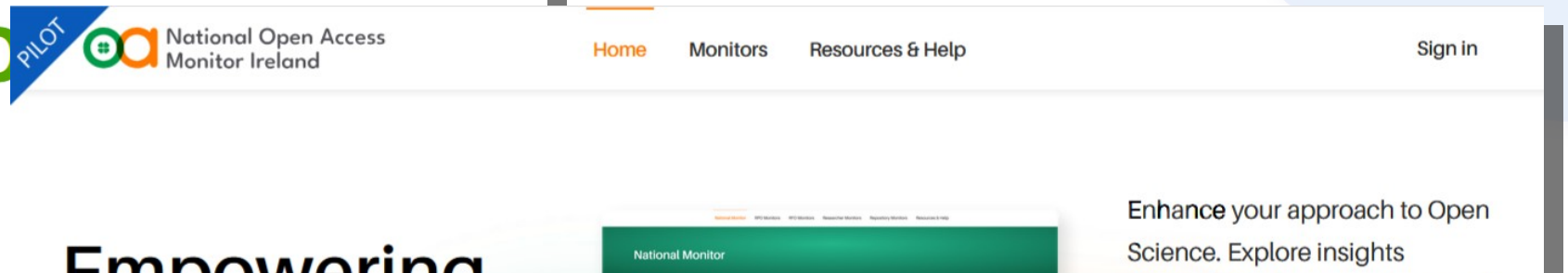
A new era of mo research.

Discover, track and understand trends and impact pathways for your organization.
Make informed decisions.

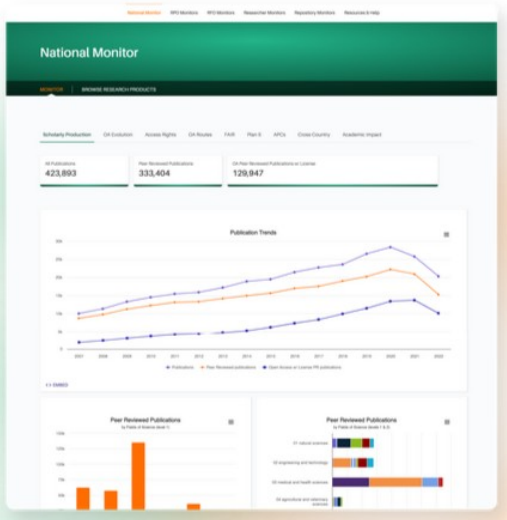
GET STARTED

https://monitor.openaire.eu/

National Open Access Monitor, Ireland



Empowering 100% Open Access in Irish Scholarly Research



Enhance your approach to Open Science. Explore insights thoughtfully designed to support your strategy and contribute to the future of Irish Open Science. In our current pilot phase we are aiming at enhancing data integrity, broadening functionality and embedding the Monitor into the Irish scholarly ecosystem.

TAKE A LOOK

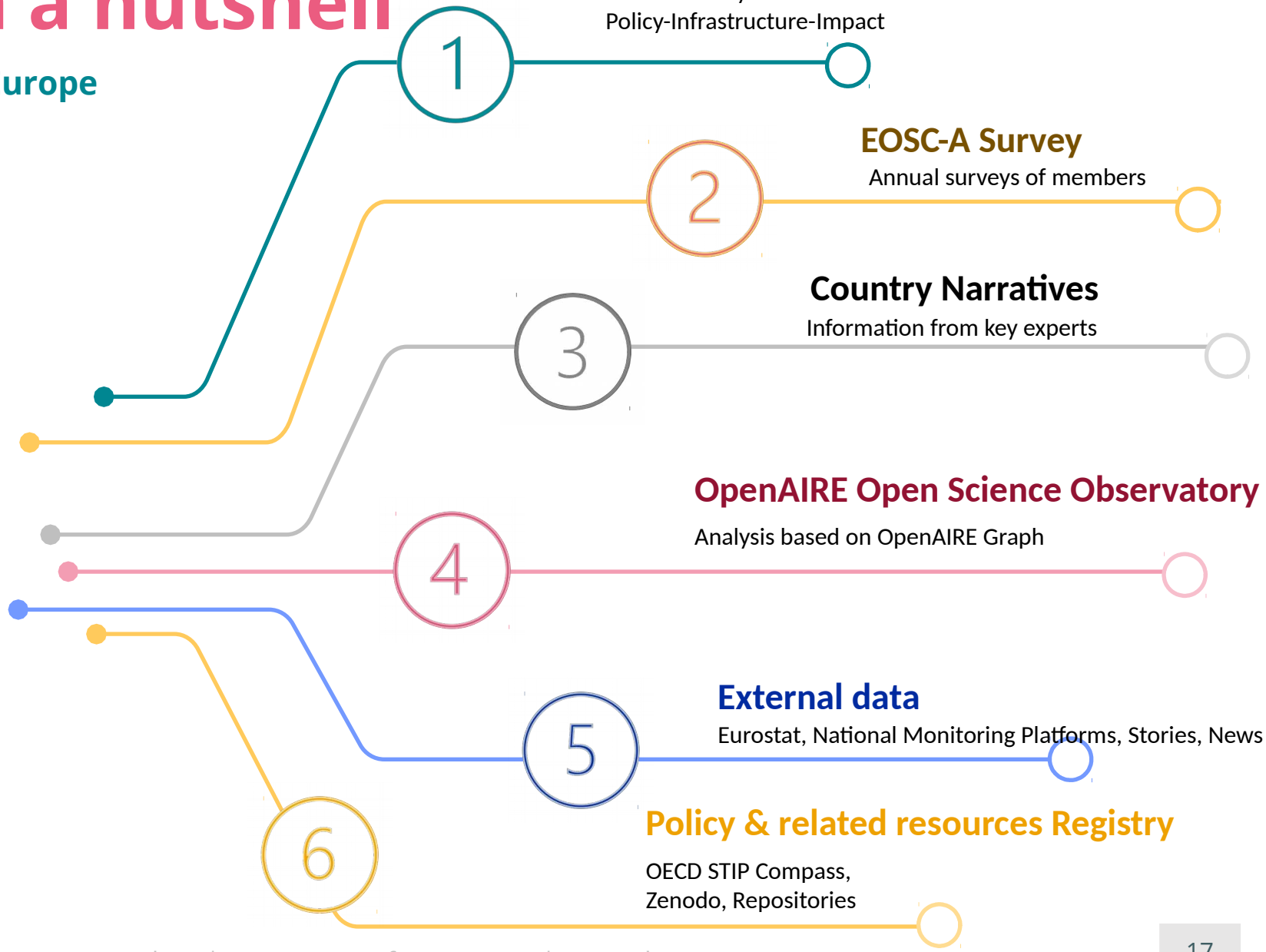
 https://oamonitor.ireland.openaire.eu/

EOSC Track in a nutshell

360º view of Open Science in Europe

European Open Science Observatory

Policy Intelligence Tool



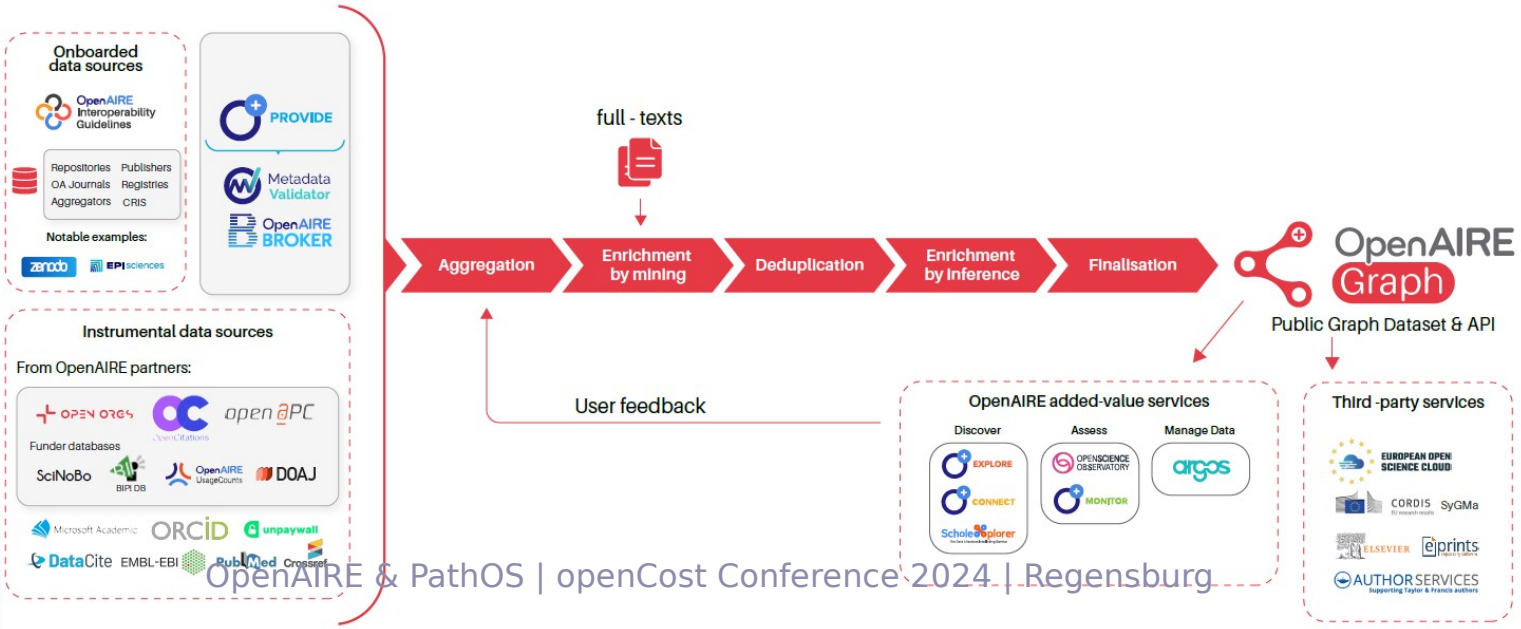
eosc track

Funded by the European Union

Data Backbone: The OpenAIRE Graph

graph.openaire.eu

- A **Scientific Knowledge Graph** with **timely** and **comprehensive** coverage of research outputs (**140K** data sources, **280M** research outputs, **monthly** updates)
- **Precision, Depth & Processing**
- **Robustness, Openness & Transparency**

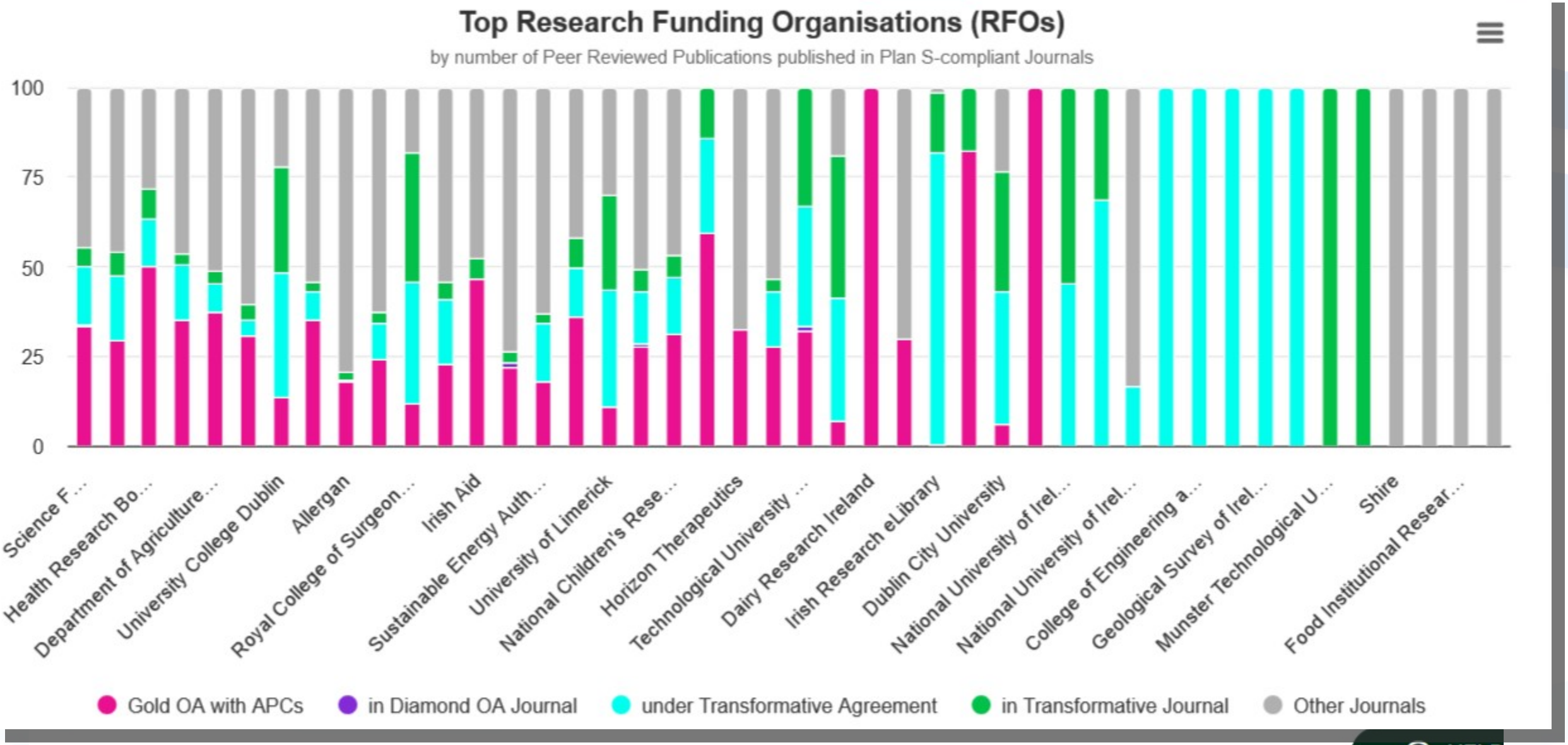


APCs

- In the OpenAIRE Graph: **OpenAPC**
- **Bruns and Taubert (2021):** Over 50% of APC payments for participating universities are missing from current datasets - average payments for non-covered APCs are higher than those reported
- **Schönfelder (2020):** Impact of missing data on accurately assessing APCs – recommendation for improved data collection practices across institutions to enhance transparency.
- **Budzinski et al. (2020):** Market power of publishers significantly affects APC pricing - higher market concentration among publishers correlates with increased APC levels.

Indicators


RESEARCH OUTPUT
• Publications, Datasets, Software, Other Research Products
• Interdisciplinarity/ Fields of Science
OPEN SCIENCE
• FAIRness
• Access Rights, Open Access Routes
• Journal Business Models
• Article Processing Charges (APCs)
• Plan S
COLLABORATIONS
• Via Project Participations
• Via Co-authorship, Co-creation
IMPACT
• Reach & Frequency (downloads, citations)
• SUSTAINABLE DEVELOPMENT GOALS
FUNDING
• Grants/Projects
INDICATOR THEMES



HELP

Top RPOs | Top RFOs | Top Publishers | Top Journals

PathOS

Pathways, Indicators, and Evaluation

- **Impact Pathways:** Impact pathways are crucial for understanding how OS strategies translate into practical applications and their subsequent effects on the society.
  - Tracing complex, interconnected pathways that influence diverse effects (feedback loops).
- **OS Impact Indicators:** Measures to assess strategy compliance and efficacy.
  - Suggesting indicators that capture the multifaceted nature of Open Science including developing robust methodologies.
- **Cost-Benefit Analysis (CBA):** Informing the allocation of resources and strategy prioritization.
  - Consistently comparing costs and benefits, including non-market effects, using suitable metrics
- **Operationalization in Case Studies:** Testing strategies in real-world scenarios to assess practical impacts.
  - Adapting evaluation tools to different disciplinary and contextual nuances.

Key Outputs

https://pathos-project.eu/

01 Frameworks

- OS Impact Pathways
- Cost-Benefit Analysis for OS

02 Handbook of OS Indicators

- Indicator "Recipes"
- Tools and datasets

03 Literature Insights & Registry

- Lit Review on OS impacts
- Online registry of OS stories

04 Case Study Deep Dives

- OS impact assessments, Causality focus
- Cost-Benefit evaluations *(select case studies)*

05 Training & Engagement

- Engagement programme
- Training for policy-makers & research administrators

06 Recommendations

- Guidelines and best practices
- Project-derived insights

APC EXTRAPOLATION

A Simple APC Extrapolation Exercise

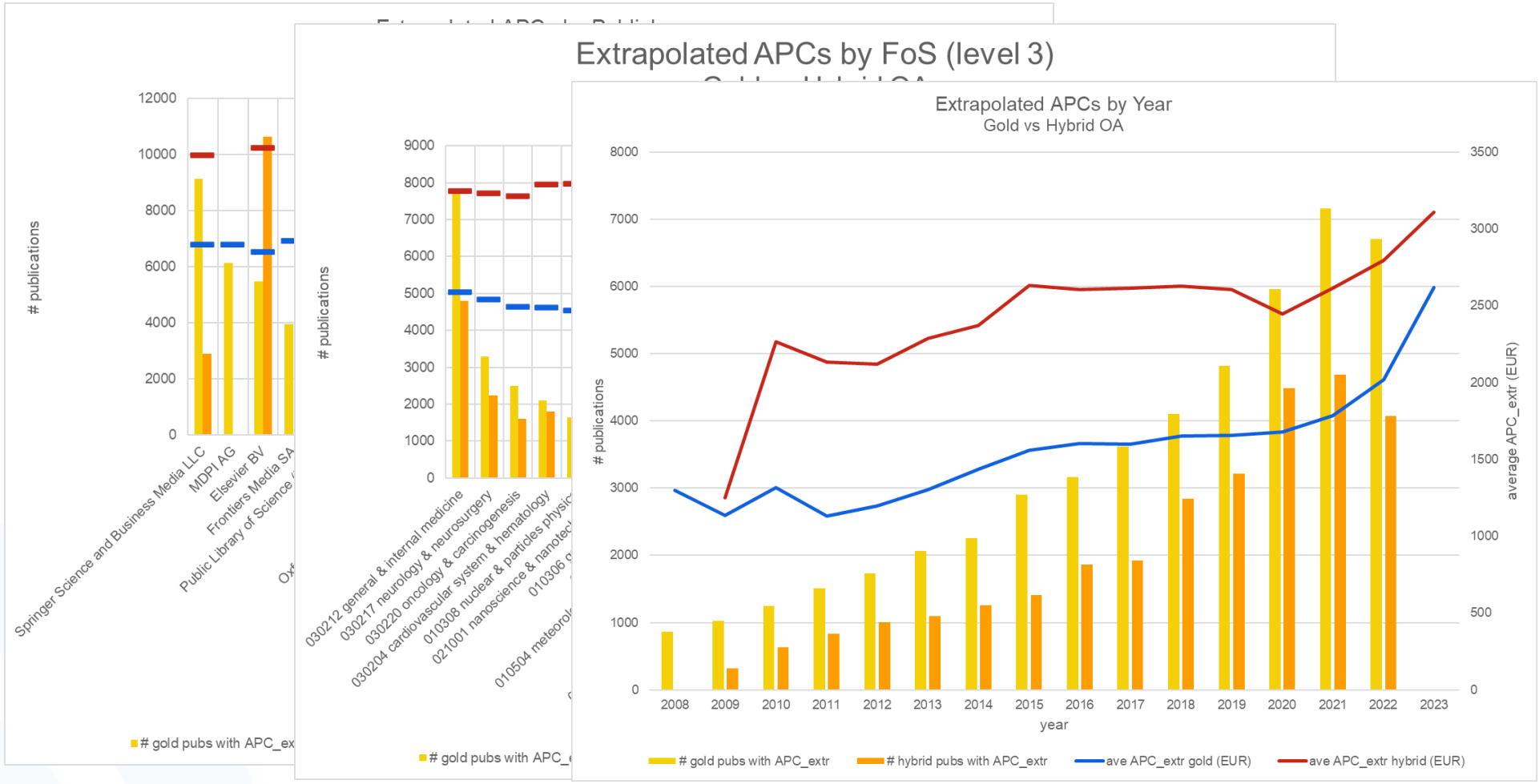
Based on **Schönfelder (2020),** analyzing APC pricing using data from OpenAPC.

1. **Quintile of the SNIP score** (CWTS, 2024): We used the SNIP for each journal and year of publication, then separated the distribution of SNIP scores for Irish peer-reviewed publications into quintiles .
2. Publication route: **Gold or Hybrid OA**.
3. **Year of publication**

Coverage and Averages after Extrapolation

Peer-Reviewed Publications	Gold OA	Hybrid OA	Gold & Hybrid OA
Incurred an APC	74,277	42,403	116,680
Have an APC from OpenAPC	1,100 (1.48%)	553 (1.3%)	1653 (1.42%)
Average APC from OpenAPC	EUR 1769,44	EUR 2694.97	EUR 2105.79
Have an APC after Extrapolation Exercise	50,161 (67,5%)	29,838 (70,37%)	79,999 (68.56%)
Average Extrapolated APC	EUR 1617,55	EUR 2527.71	EUR 1948,31

A Simple APC Extrapolation Exercise



A Simple APC Extrapolation Exercise

- **Effectiveness of Extrapolation**
  - Expands the dataset significantly, offering a more comprehensive view of the APC landscape.
- **Essential to recognize potential inaccuracies**
  - Validity of underlying assumptions is critical.
  - Representative grouping is necessary for meaningful results.

- **Addressing Data Gaps**
  - Many areas exhibit insufficient APC reporting, leading to incomplete insights.
  - Collaboration can enhance data quality and comprehensiveness.
  - Increased contributions lead to more reliable extrapolation.

Conclusion

Conclusion

- **Monitoring Impact:** Essential for informed decision-making.
- **Limited Evidence:** There is insufficient data on the economic impact and overall outcomes of Open Science.
- **Available Resources:** Frameworks from PathOS and data from the OpenAIRE Graph can help navigate these complexities. Tech and infrastructure is available.
- **Data Gaps:** Current data is inadequate for a comprehensive analysis of APCs and market dynamics.
- **APC Extrapolation:** The variability observed after extrapolation needs validation to ensure accuracy.
- **Collaboration Needs:** Prioritizing APC cost-sharing across disciplines, countries, and publishers is essential.
- **Focus on Causality:** Understanding causal relationships is crucial for effective analysis.

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Thank you!

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