



# The \$1 Trillion Paradox: Why Reforming Research Publishing Should be a Global Priority

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Our research system is a perplexing paradox. Each year, approximately [\\$1 trillion](#) of public funds are spent on research worldwide. Whole careers are spent making incremental improvements to research methods. Hundreds of millions of dollars are spent on a single clinical trial. And yet, the global system for sharing research results is a costly mess. Rooted in antiquated journal structures and marred by market failures, our research systems prioritise profit at the expense of accessibility, equity, and affordability, hindering our ability to fully reap the benefits of research.

A prior CGD [blog](#) argued that research reform is a critical issue for global development and in a subsequent [blog](#) and [policy paper](#), we make the case for G20 engagement. This note further unpacks why research publishing reform should be a global priority using the [Importance-Tractability-Neglectedness \(ITN\) framework](#)—a framework that estimates the value of allocating marginal resources to solving a problem, considering its significance, feasibility for intervention, and the degree to which it has been overlooked—and back-of-the-envelope estimates of the potential costs and benefits. Research and evidence are upstream from almost all kinds of human progress and research publishing reform promises substantial benefits compared with the catalytic investments necessary to achieve it. We have the technological capability, proven alternative publishing models and an established movement to build on. What is needed is analysis and engagement at the policy and political level to enhance national and international leadership and encourage more progressive publishing alternatives.



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## The problem: Current global research publishing systems are ineffective, inefficient, and inequitable

The problems with global research publishing are myriad and more comprehensively described in a [recent CGD policy paper](#). In short, research is most impactful when it is a global public good—able to be accessed, used, and iterated upon by anyone, anywhere. However, despite the immense sharing power of our digitally interconnected age, our current research publishing systems fall woefully short of this ideal. At least **55 percent** and up to **70 percent** of research remains locked behind paywalls that require costly pay-to-read subscriptions. Five for-profit publishing companies—Elsevier, Springer Nature, Wiley Blackwell, Taylor and Francis, and Sage Publications—dominate the market, generating more than **50 percent of revenues** (over **\$7 billion in 2022**) with profit margins up to 38 percent—**higher than big tech companies**.

Recent decades have seen a range of initiatives seeking research publishing reform and “Open Access” publishing. However, so far, the predominant solution has involved transitioning from a pay-to-read to a pay-to-publish model, where researchers or their institutions cover article processing charges to make articles free to access. This approach swaps one set of barriers for another, excluding many researchers and research funders in low- and middle-income countries (LMICs) who cannot pay the exorbitant publishing fees. Meanwhile, this shift continues to line the pockets of publishers, who earn an estimated **\$2 billion from article processing charges each year**. Despite the drawbacks, a prestige economy keeps researchers beholden to these publishers. Researchers must publish in well-recognised journals (almost always owned by one of the big five) to elevate their research and progress their careers.

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## Should addressing the shortcomings of research publishing be a global priority?

The research publishing system is failing, yet fixing it will take work and there are competing demands on our attention and resources. Should reforming global research publishing be a priority? Prioritisation frameworks including economic evaluation approaches like cost-effectiveness analysis, cost-benefit analysis, and their rougher cousin, the back-of-the-envelope calculation (BOTEC), help identify priorities that offer the maximum benefit at the least cost, while the [ITN framework](#) provides additional criteria to prioritise interventions that will have the most marginal benefit. Part of the challenge in answering this question is that research contributes to progress on most, if not all other priorities, and the link between research and impact—while potentially profound—can be difficult to establish. In this article we use the ITN framework with a [cost-consequence](#) summary and simple BOTEC to highlight some considerations. However, this is only a light-touch assessment and deeper analysis to better understand the potential value of reforms would be valuable.

## Importance: Research publishing reform would bring large-scale benefits

First, to assess the importance of research publishing reform we outline a very simple BOTEC that explores the total value of global research investments and what marginal improvements to value could be worth. Because the total size of the research sector is so large and the expected downstream value of this aggregate research even larger, even small increases in value through publishing reforms imply a high willingness to invest to achieve such improvements.

We can broadly consider the return on investments in research publishing reform to be:

$$R = E/c$$

And if we define the value of reforms to be:

$$E = a * b * d * t$$

Where:

**Table 1. Parameters for value of research publishing reform estimation**

NOTATION	PARAMETER	EVIDENCE	OPTIMISTIC ESTIMATE	CONSERVATIVE ESTIMATE
<i>R</i>	Return on investment	Calculated	-	-
<i>E</i>	Expected value of research publishing reforms	Calculated	-	-
<i>c</i>	Cost of achieving research publishing reforms	Assumption-based on current estimated investment of \$411 million (see below) multiplied up to ten times.	\$500 million	\$5 billion
<i>a</i>	Global annual investment in research	An estimated \$1 trillion of public funding is spent globally on research each year, growing at an estimated 6.2 percent per year.	\$1 trillion 6.2 percent growth per year	\$1 trillion 6.2 percent growth per year
<i>b</i>	Value of research compared to investment	An estimated return on investment of research of three to eight times.	8	3
<i>d</i>	Proportional increase in research output value due to research publishing reforms to improve accessibility, equity, and affordability.	Unknown, to explore with scenario analysis. One study has found that free online access to journals was associated with 30 percent greater scientific output. And a large number of studies have found an increase in citations.	15 percent	1 percent
<i>t</i>	Time period considered for accruing benefits		50 years	10 years

If reforms increase research value by 15 percent, that would result in **\$6 trillion–\$16 trillion in value over ten years or between \$139 trillion to \$372 trillion in value over fifty years**. But even if reforms only increase research value by 1 percent it would still result in **\$400 billion to up to \$1 trillion over ten years** or up to **\$9 trillion to \$24 trillion of value over 50 years**. If we assume minimum costs to achieve reform of \$1 billion (roughly double what has been spent to date) up to more conservative estimates of five times this amount, then the return could range from 1800x up to 372,000x.

The most significant uncertainty is the extent to which investments in reform initiatives will improve research impact and over what time period it is reasonable to consider the accrual of these gains. However, we can see that even scenarios pessimistic of sweeping impact (or, equivalently, those that place a significant chance of failure on investments) have a high expected value.

A risk with all efforts to boil costs and benefits down to a single calculation is that we often lose information in the process, particularly that which is challenging to quantify. Cost-consequence analysis (CCA) is an economic evaluation framework which intentionally avoids this and instead seeks to compile relevant evidence (both quantitative and qualitative) into a single balance sheet-style table. The table follows a balance sheet layout and invites the reader to judge whether the aggregate of the positive consequences outweigh the likely costs. This bottom-up approach complements top-down estimation, by identifying specific mechanisms through which benefits are realised. In Table 1, we draw together evidence on the potential costs and consequences of reforms. The categories follow those laid out in our [previous paper](#).

The most often highlighted goal of research publishing reform is improved access to, and therefore impact from, research outputs—as explored by the BOTEC. In addition, we could anticipate improved efficiency and productivity of researchers. Rough estimates suggest potential savings of \$25 billion annually by reducing duplication in research efforts and \$7.7 billion annually through researcher productivity gains. Thirdly, reform could address the critical issue of inequitable publishing opportunities, particularly for researchers in LMICs. These inequities not only undermine research systems and economic development in such countries, they deprive the wider world of the results of their work. Lastly, on consequences, we note that accessible research can increase societal trust in research, the importance of which was underscored by research distrust during the COVID-19 pandemic. On the cost side, while the cost to achieve comprehensive reform is unknown, we find the transition towards an equitable research publishing reform model to have only attracted at least \$411 million in investments to date. However, this should be balanced not only against the significant potential benefits but potential direct cost savings of up to \$6.5 billion each year, by moving away from high-cost Article Processing Charges to lower cost models. At minimum, independent analysis by the Max Planck Institute finds that current resources within the existing publishing system are sufficient to sustain costs following the transition.

**Table 2. Cost-consequence summary of the potential benefits and costs of research publishing reform**

<p><b>Consequences</b></p>	<p><b>Improving research access and impact:</b> There is a well-established and intuitive link between access to research and its impact. The back-of-the-envelope calculations above point towards the potential value of radically reformed global research publishing being in the billions or even trillions of dollars.</p>
	<p><b>Greater efficiency productivity of researchers and research institutions:</b> <a href="#">Ballpark estimates</a> (some years old but more <a href="#">recently defended</a>) suggest that most medical research (up to 85 percent) is wasted and that a significant portion of this (<a href="#">50 percent</a>) relates to studies not considering lessons and results from previous publications, resulting in duplication. At least \$270 billion dollars is spent on biomedical research annually. If research reform could reduce wasted duplication by 5 percent, this would have an equivalent investment value of <b>\$6.7 billion per year</b>. Assuming similar wastage trends for all \$1 trillion R&amp;D research, a 5 percent reduction in duplication would have an equivalent value of <b>\$25 billion per year</b>.</p> <p>More generally, with the current system, many researchers are obligated to use workarounds to seek access to research articles they need. Evidence suggests that research reforms can save researchers an average of <b>45 minutes per week</b> by reducing time spent finding, accessing, and opening articles and enhanced text/data mining capabilities. Applied to over eight million researchers globally, this could save upwards of <b>\$7.7 billion per year</b>.</p>
	<p><b>Equitable ability to publish:</b> The current research publishing landscape creates barriers to equitable publishing. While <a href="#">85 percent of the global population lives in LMICs</a>, LMIC researchers are responsible for only <a href="#">5-percent</a> of research authorship resulting in a lack of author diversity. LMIC researchers face dual access barriers when it comes to research publishing. According to <a href="#">one study</a>, 89 percent of LMIC researchers surveyed cannot afford the high subscription costs to access the research they need, negatively impacting their research and productivity. In addition, LMIC researchers often can't afford the exorbitant publishing fees associated with publishing in 'prestige' journals. This can further disadvantage them given the currently prevailing metrics in global research with negative consequences for their career progression and research funding. This can hinder LMIC researchers from reaching their professional potential, impacting their research output and career progression, and detracting from the potential benefits of research for society.</p>
	<p><b>Increased societal trust in research:</b> As we saw during COVID-19, <a href="#">distrust in science can have devastating consequences</a>. <a href="#">Accessible research can support trust</a> in research and researchers. A study from <a href="#">Pew Research Centre</a> shows that most Americans trust research findings more if their data is openly available.</p>
<p><b>Costs</b></p>	<p><b>Transition investment:</b> Through web searches for research reform funding, building on previous research by GiveWell, we estimate that to date, at least <b>\$411 million (~\$53 million per year)</b> has been spent by philanthropic and public funders on engagement and infrastructure, focused on transitioning to a more equitable research publishing model. This doesn't count private investment in research infrastructure. Note that this is a lower limit estimate for the transition cost.</p>
	<p><b>Recurrent costs:</b> The <a href="#">Max Planck Institute</a> estimates that the current resources within the existing publishing system are sufficient to sustain costs following the transition.</p>
	<p><b>Potential cost savings:</b> If all currently closed access articles (~2.5 million) are transitioned to no/low-charge Open Access articles (median article cost of \$400) rather than paid APCs (\$2860), then this could save in the order of <b>\$6.5 billion</b>, even accounting \$500 million on increased infrastructure spending.</p>

## Tractability: Technological advances and increasing support among researchers makes meaningful change possible

The technology to support the shift to new research publishing models is available and rapidly innovating. New commercial digital publishing models such as F1000 and MDPI have seen success. Similarly, the expansion of preprint servers and the growth of publicly owned platforms like [Scielo](#) have demonstrated the potential of non-commercial models. [Alternative publication and peer-review models that discard traditional journal structures](#) are also emerging. These include platforms like [Unjournal](#) that assess research quality and curate articles in a given field. The emergence of [AI will only hasten the development of new Open Access technologies](#). Yet the prestige economy means that radical changes in digital publishing are not yet revolutionising the sector in the way that the music industry has been transformed by digital platforms like Spotify.

Over the past decade, a range of initiatives seeking publishing reform have sprung up including [COAlition S](#), perhaps the leading voice for Open Access reform, alongside the [OA2020](#) campaign, the [Open Access Network](#), the [Scholarly Publishing and Academic Resources Coalition \(SPARC\)](#) and the [Centre for Open Science](#). These initiatives have contributed in large part to pushing many philanthropic and public funders to implement Open Access mandates, sparking conversations and creating momentum for change. Yet while these initiatives have made important progress, their influence remains predominantly at the institutional level, primarily within Europe and the US, and often with a focus on conventional pay-to-publish solutions at the expense of more economical and innovative alternatives. While such initiatives have been instrumental in creating a groundswell of grassroots change, they remain fragmented and lack significant, sustained engagement at higher national and international political levels that is needed to propel research publishing reform from an issue of institutional importance to international significance.

It is not so much a question of whether change in research publishing is tractable; emerging technologies mean that change is inevitable and already happening, with public funders and initiatives already creating some momentum for research publishing reform. What is needed now and in the future is sufficient political leadership and international coordination to achieve the right kind of change.

## Neglectedness: Too often seen as a niche concern for academics rather than a global system that underwrites economic and societal progress

While numerous research funders, initiatives, and universities advocate for research publishing reform, their efforts often frame research publishing reform as a technical or niche concern, rather than a pressing national or international policy issue. Despite its global relevance and need for international cooperation, discussions of [Open Access in science diplomacy](#) have been sporadic and ad hoc. This is slowly starting to change with India putting research publishing reform on the 2023 G20 agenda, resulting in a [communiqué](#) from the G20 group of Chief Scientific Advisors. Still, there is much more potential for leveraging political support, including the Brazil and South Africa

G20 presidencies, [as we have highlighted](#). To keep research publishing reform prominently on the international policy agenda, further investment in political engagement is needed.

The role of think tanks and policy influencers in shaping effective national and international policies is [well documented](#), yet the discourse around research publishing reform has so far seen limited participation from these entities too. An examination of the global [Open Think Tank Directory](#) shows only 0.1 percent (n=5) mention Open Access, research reform, or Open Science in their organisational descriptions. In contrast, other comparable global issues like universal healthcare are covered by ~13 percent of think tanks (n=513). This lack of policy engagement can make navigating research reform policy more difficult for officials and decisionmakers.

Research publishing reform must be framed as a national and international policy issue. [Catalytic investment in political engagement](#) for research reform has so far been neglected. Setting aside investment in large-scale Open Access journals and platform infrastructure, we estimate around \$53 million is invested per year to fund research reform advocacy, education, and interoperability initiatives, of which an even smaller fraction goes specifically towards political engagement. This is small change compared, for example, to the [\\$1.6 billion granted globally in 2019](#) for human rights advocacy, systems reform, and implementation.

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## Conclusion

Further work to rigorously assess the potential costs and benefits would be welcome to strengthen the evidence base and case for reform amongst the public and policymakers. However, the light-touch assessment sketched out in this note supports the notion that research publishing reform should be a far higher global priority than it currently is. While the potential benefits of reform are complex and hard-to-pin-down, they have the potential to be of global importance, touching all aspects of human progress.

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