Perceived constraints and missed opportunities? Exploring the tensions between adopting open science and innovating democracy

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Abstract
In this article, we studied the application of four commonly-discussed open science practices (OSP) (pre-registration, data sharing, replication and open access publishing) within the subfield of democratic innovations, by analysing published and peer-reviewed papers in the field (N=6384). A minority of articles have used one or more OSPs. Replication and pre-registration accounted for less than 1% of research articles. Full data availability of research materials (data, code for replication, etc.) was only found in approximately 3.5% of our sample; though this practice has increased over the last 10 years reaching close to 8% in the year 2020. At the same time, we find an increase in the application of open publishing over time, reaching almost 50% of the publications in recent years. We conclude by arguing that OSPs can enhance the validity and rigour of research and can consequently contribute to improving the practice of democratic innovations and their policy effects. We also recognize potential perceived constraints of OSP on creative discovery within the field and discuss whether open research conflicts with aspects of exploratory discovery, by shedding light on some misperceptions.

Keywords: open science, preregistration, data sharing, democratic innovations, replication

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Introduction

There is an ongoing vibrant debate within different research communities about the merits and challenges of adopting Open Science Practices (hereinafter OSP) in scholarly research. Such practices include providing detailed, transparent, and open information about analytic and interpretive choices the researcher makes; the pre-registration of hypotheses and analyses plans; and sharing data with the scholarly community and lay citizens. Open science calls for transparency at all stages of the research process and unbiased consideration of all kinds of research findings, both those that provide evidence to confirm and disconfirm theories.

In a parallel movement, democratic innovations has become a large and growing subfield in political science. Democratic innovations is an interdisciplinary field, dedicated to understanding the reform of democracy through “institutions that have been specifically designed to increase and deepen citizen participation in the political decision-making process” (Smith 2009,1). The field is marked by appreciation for methodological innovation and plurality. Democratic Innovation research has brought together political philosophers, political scientists, sociologists, and practitioners who use diverse research methods to produce knowledge about the effectiveness of institutionalized and non-institutionalized forms of democratic experiment. Work in this field has generated significant policy impact. An increasing number of governments work with scholars to implement high-profile citizens’ assemblies, participatory budgeting, innovative plebiscites, and other deliberative and participatory democratic programmes. For example the European Union (EU) has recently launched an EU-level initiative encompassing a series of citizen-led discussions (citizens’ panels) on important policy issues facing European societies (e.g. climate change, health, economy) allowing diverse contributors to together shape the common European future (see https://futureu.europa.eu/). Given the societal relevance and crucial implications for rapidly adopted forms of policy making, the rigour and trustworthiness of the science of democratic innovations is of paramount importance. Spada and Ryan (2017) have recently found that the overwhelming majority of democratic innovation studies published in top journals in political science focused on best practices, with very few studying processes which authors themselves identify as failures, alluding to the existence of a potential publication bias within the field. Publication bias is one of the most common forms of questionable research practices (QRP) (John, Loewenstein and Prelec 2012; Ioannidis, et al. 2014) and means that only statistically significant and/or positive, exciting/novel results get published, with non-significant (null), or negative findings (for supporters of favoured theories) remaining unpublished, leading to “an overrepresentation of both significant findings and inflated effect sizes” (Dienlin et al. 2021, 6) and generating an inaccurate body of evidence (Cooper, DeNeve and Charlton 1997; Fanelli 2012; Miguel et al. 2014). Publication bias can have detrimental effects on research advancements within democratic innovations, with important implications for policy-making and democratic experimentation, for example, by exaggerating effectiveness of some democratic innovations for policymaking and democratically shaping public opinion.

OSP have been proposed as a way of preventing publication bias (Chambers 2019) and other QRP, such as adapting narratives to present the exploratory hypotheses derived from unexpected results as hypotheses tested (HARKing), and p-hacking, where analysis strategies are adapted to privilege significant or neater findings (see John, Loewenstein and Prelec 2012). It is hoped that OSPs can restore public trust in science (Anvari and Lakens 2018). While OSPs have been examined within other disciplines, and fields, such as psychology, education, ecology and communication (John et al 2012; Bakker et al. 2021; Fraser et al. 2018), we do not know whether such practices have been applied within democratic innovations. Therefore, we set out to explore the prevalence of OSP within democratic innovations. By doing so, we study the following three pre-registered research questions: (RQ1): What is the prevalence of open science practices (OSP) within the democratic innovation field? (RQ2): What are the predictors of the adoption of OS practices? And (RQ3): Has the adoption of such practices changed over time?
In this article, we provide a first-ever assessment of the application of OSPs in peer-reviewed published scholarship within the field of democratic innovations encompassing publications between the years of 1970 to 2021 (N=6384). Our results indicate that the only prevalent OSP is the publication of results in open-access journals (31% of journal articles), whose application has been increasing steadily since 2018, currently reaching in the most recent year 48% of journal articles. Other OSPs like pre-registration of studies or replication of other works are barely applied. We found less than 1% of publications that employed any of these practices in our population. Finally, data sharing is still far from being the norm in the field, with only about 3.6% of the publications over the 50-year period having adhered to what are ever more widely recognised as good data-sharing practices.

The paper is organised as follows: We begin by discussing the concept of open science practices and its potential for rigorous and transparent research within social sciences, before presenting our research questions. We further discuss the methods leading our empirical review study. Next, we present the main findings of our review. We conclude by discussing the value and challenges of OSPs for the study of democratic innovations. First, we argue that OSP can enhance the validity and rigour of research and can consequently contribute to improving the practice of democratic innovations and their policy effects. Second, we discuss challenges for adopting open-science practices. We recognize potential perceived constraints of OSP on creative discovery within the field and discuss whether open research conflicts with aspects of exploratory discovery, by shedding light on some misperceptions. We conclude by discussing how democratic innovations scholars can contribute to designing institutions for open science.

**Open Science Practices**

Open science is a movement whose aim is to make all stages of a research and knowledge production process transparent and accessible and draws its foundations from key tenets within research ethics and robustness of scientific method. Many best practices in ethical scientific process rely on open sharing, including testing validity claims through replication, and allowing for effective peer review, as well as reducing barriers of access to publicly funded work and avoidance of duplication of scarce research resources (Chambers 2019; Nosek, Ebersole, DeHaven and Mellor 2018).

Inclusivity is core to the open science movement. The open access aspect of the movement has sought to make scholarly research, especially where publicly funded, accessible to all as a public good. Scholarly publishing, with its need to protect reputation and standards (and in many cases profits) has often been slow to take advantage of technological advancement. Traditional means of access to academic publications via subscription to physical copies of journals has been supplanted by the advent of the world-wide web. Yet a variety of more or less reasonable concerns means that anachronisms of older practices are stubbornly held on to.

Open Science though stretches far beyond inclusive access to the ‘final product’ of peer-reviewed research articles. The move towards the semantic web also allows for improved storage, linking, and retrieval of research materials and provides greater opportunities for sharing, connecting, and validating scientific knowledge. The broader open science movement has been spurred on by familiar concerns with publication bias (Gerber et al 2001), and continued concerns with a variety of undesirable incentives and norms which might help explain the ‘replication crises’ (Pashler & Wagenmakers 2012). More infamously genuine efforts to replicate studies have themselves eventually led to notorious discoveries of research fraud and fabrication of data such in the cases of Diedrik Staepel (Bhattacharjee 2013) or Michael LaCour (Broockman, Kalla and Aronow 2015).

The use of open science practices has been on the rise in the social sciences in recent years, but uptake has varied, and aspects of the open science movement have been variously promoted and critiqued (c.f. Jacobs et al 2021, Rinke and Wuttke 2021, Christensen et al 2020, Ansell & Samuels 2016). Requirements for open science practices have been adopted by key gatekeepers and standard-bearers for social scientific
work, including funding councils (and governments) e.g. through Plan S, professional membership associations, and editors of leading peer-reviewed journals. In a survey of scholars working in economics, political science, psychology and sociology, Christensen et al. find increases in the use of at least one open science practice, particularly since 2017 (2020). They find that the rate of adoption differs both by field and methodology, and intriguingly found that perceptions of change generally lagged behind reported change in use of open science practices. Changing norms can likely be explained by access to information and training on open science as well as requirements imposed by gatekeepers. Nevertheless, different ‘schools of thought’ or perhaps ‘myths’ around open science seem pervasive and have led to calls for a more integrated concept aimed at advancing the credibility of political science (Rinke and Wuttke 2021: 281).

Four Commonly-discussed OSPs

There are four core OSPs, commonly-discussed within social sciences: (Bakker et al. 2021; Christensen et al. 2021; Dienlin et al. 2021; Miguel et al 2014): sharing of replication materials, preregistration of studies, open-access publishing and replication.

Data and Materials Sharing

Sharing the replication materials entails posting the data and the steps that generate the reported analyses and tests in publicly-available repositories. Open data and other replication materials help other researchers to reproduce the findings of published articles, learn from the research for future studies, understand the research design, instruments and results better, uncover intentionally or unintentionally misreported results, and as such assess the validity, verifiability and rigour of the study. Data sharing can also help other researchers to study relationships or themes the original author(s) did not think of studying. Data sharing hence can facilitate transparency and rigour of research findings. It can also be directly beneficial for researchers. For example, Christensen and colleagues (2019) have recently found that availability of data increases the number of citations of journal articles, by systematically reviewing articles published in two leading journals in political science (AJPS) and economics (AER). More recently, improved norms around citing and otherwise directly rewarding or recognising the researchers and technicians who produce data, code, and analysis packages have improved the incentives for data sharing.

Several journals within political science have already adopted data sharing policies requiring the researchers to upload their replication materials online, even though there is a large variation in the strength and enforcement of data policies by journals. One ‘flagship’ journal in political science, *American Journal of Political Science’s* policy states that “the corresponding author of a manuscript that is accepted for publication […] must provide materials that are sufficient to enable interested researchers to verify all of the analytic results that are reported in the text and supporting materials”, “before submitting the final draft of the accepted manuscript”[^5]. Other journals have taken a more flexible approach to data access and sharing.

Preregistration and pre-analysis plan

Preregistering a study means that researchers determine and register the research questions, hypotheses, research design and analytical strategy before collecting the data. A more comprehensive preregistration plan also includes a summary of the study, exact measures of variables, power calculations, etc. Upon registering the study with all this information it receives a time-stamp, and is publicly discoverable. The objective of such a practice is to hamper intended and unintended questionable research practices (e.g. reduce p-hacking and HARKing) and distinguish between exploratory and confirmatory research (Dienlin et al 2021; Bakker et al 2021). Preregistering studies can contribute to addressing publication bias, by

[^4]: https://www.coalition-s.org/plan_s_principles/
[^5]: https://ajps.org/ajps-verification-policy/ See also a BJPols policy here: https://www.cambridge.org/core/journals/british-journal-of-political-science/information/instructions-contributors
increasing reporting of unexpected, negative or null findings and as a result increasing the rigour of the published research (de Vries et al. 2018).

**Replication**

Replication entails other researchers independent of an original piece of research closely replicating that study by following the methodology applied (Chambers 2019). One underlying cause of the credibility crisis recognised in several scientific fields (psychology has had perhaps the most open reckoning with its practices) is that most studies do not replicate across contexts and time, which sheds some doubts on the credibility and trustworthiness of the major findings. For instance, the Reproducibility Project: Psychology (RPP) systematically replicated 97 psychological studies that reported positive findings and found that only 36% of those replicate. Camerer and colleagues (2018) replicated 27 experimental studies in the social sciences published in Science and Nature journals across 5 years (2010-2015) and found significant effect in the same direction as 62% of the original studies and with the effect sizes being 50% of the originally reported effect size. Replication therefore can provide important safeguards and scrutiny against overclaiming and different types of research error.

**Open-access publishing**

Publishing the scientific articles which are publicly available for any member of the society (i.e. not only the academics, but also laypersons) rests on the principles of transparency, openness and accessibility of scientific research. Major grant agencies, such as European Research Council (ERC) have made this research practice one of their requirements, as publicly funded research ought to be accessible to the public. A culture of transparency it is hoped can incentivise and induce best practices and lead to publication of transparent and higher quality research.

**Critiques of Open Science**

The Open Science movement, or aspects of its practical application have been resisted by several scholars. While some principles of OS may seem prima facie difficult to disagree with, were there no resistance to the movement, there would be hardly the need to discuss it, and some resistances can be considered more reasonable than others. For instance, in a discussion of an experimental special issue providing ‘results-free’ reviews based on pre-registration of studies for Comparative Political Studies, the journals’ editors broadly consider the costs greater than benefits (Ansell and Samuels 2016: 1812). They argue that the practice does not necessarily reduce gaming, and that it is actually a good thing that editors and reviewers can make post-hoc choices over which results are more or less substantively interesting and worthy of publication. Moreover, preregistration has been argued to reduce the incentives to do certain kinds of research, like that of exploratory nature (see Dirnagl 2020 for a review).

Some of these arguments are explained by differences in research cultures, but others may be the result of misunderstandings. Much like many licensing laws, the practice of pre-registration is likely to reduce gaming even if it does not fully eliminate it. And though the expertise of editors and reviewers is important, there is enough evidence that our collective biases as researchers have meant that current safeguards of e.g. blind peer review are not sufficient to avoid publication of error-strewn research that is not representative of the real world. After all, political scientists have failed to represent minority voices, predict important political events, and replicate findings. If open science is practiced with care it is ought to help reduce those sorts of biases.

Other critiques reveal more fundamental disagreements about what kind of research and research processes are valued by colleagues. There are epistemological and ontological conflicts that OS perhaps ignores. For example, some will simply argue that the search for a single replicable truth is futile. They see the social research process through a lens where transparency and openness are crucial goals, but that

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they require rejecting procedures that sterilise research by pretending the researcher can take the role of disinterested observer. The DA-RT statement by political science journals was criticised for the way in which it treated qualitative research (Monroe 2018), and a series of public deliberations have led to more bespoke sets of standards being developed for different approaches (Jacobs et al. 2021).

A final relevant critique is that open science costs too much. What is almost certainly true is that the opportunities to do open science well are not equally distributed, but that should be an argument for more equal distribution of training, time and sharing of knowledge than an argument against open science.

**Open Science Practices within the Democratic Innovations Sub-field**

Much of the difficulties for adopting open science lie in collective action problems and institutional constraints. The incentives for openness and sharing are clear at the collective level but not for individuals. Moreover, DI research is marked by plurality. Researchers come from a range of fields with different cultures and standards. DI research began in normative work about how democracy should change but has undergone a significant empirical turn, yet data sharing in the field is in the authors’ experience irregular and presents problems for robust scientific accumulation of relevant research.

Nevertheless, democratic innovations scholars are well-placed to understand how institutional engineering and experimentation can overcome perverse incentives to suboptimal engagement with reason-based exchange. It is not clear whether for example DI scholars are any less practiced in open science than other social science colleagues, or whether their normative and methodological commitments affect these practices.

In order to get a better picture of OS use in DI research we describe the use of OS practices by scholars. We ask what the prevalence of open science practices is within the democratic innovation field, where open science practices are defined as: open access publishing, sharing of research materials including data and code, replication, and pre-registration. We also consider how these practices have changed over time and what predictors might explain such changes.

**Methods & Data**

Figure 1 provides a schema outlining the steps taking in population definition and sampling for this study. Before accessing and analysing the data, we preregistered our research questions, sampling strategy and analysis plan at AsPredicted7. Scientific publications containing a set of keywords identifying scholarship on democratic innovations in their title, abstract or keywords were then collected through Web of Science (WoS). WoS provides searchable and downloadable data collated from a range of repositories and publication archives including basic information about publications such as author, journal, language, date of publication, DOI etc., as well as open access status and document type (whether article, book, proceedings paper, etc.).

As DI has emerged as a field over a number of years, we want to recognise that not all publications will use the term as it has gradually become an organising touchstone over time. We follow an inclusive adaptation of Elstub and Escobar’s typology of democratic innovations (2019). We searched for publications with keywords in their title, abstract or keywords consisting of "co-governance" OR "collaborative governance" OR "mini-public*" OR "minipublic*" OR "participatory budgeting" OR "referendum*" or "referenda" OR "citizen* initiative*". This produced a population of 8209 publications. From this population, 7286 publications were of the type “Journal Article”, 657 of the type “Book” and 266 of the type “Book Series”. We constrained our study to publications of type “Journal Article”, as considerations of OSP use would be more consistent across this medium. WoS also classifies the

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7 See online Appendix for a deviation from preregistration
publications according to a Document Type, which can range from “Article” or “Proceedings Paper” to “Letter” or “Meeting”. The great majority of the data belonged to the “Article” and “Proceedings Paper”, and we manually inspected the rest of the publications to understand whether they could belong to our desired population of scholarly publications of a journal type. Finally, we decided to filter and retain only the publication types of “Article”, “Proceedings Paper”, “Data Paper”, “Note” and “Reprint”, obtaining a total of 6384 publications. Note that once we had applied our search terms we did not make further subjective judgements as to whether the contents of a publication belonged to the Democratic Innovation field or not. Therefore we expected inclusion some publications from different general fields or subfields that had been included because they mention a type of DI among their keywords (e.g. articles on Brexit that had sections on the ‘referendum’). Nevertheless erring on the side of inclusive judgment of publications provides good coverage of DI and related fields. It is also possible that we missed some relevant articles that do not note any of the searched terms in their keywords or abstract. Nevertheless we can assume that the population collected through these keywords is a good approximation the full population of journal publications in the sub-field, and we have no reason to believe that any such error in collecting a full population of studies in a loosely defined field would bias the representation of OSPs.

To analyse the application of Open Access (OA) publishing, we used the full population, as WoS categorises publications by their Open Access designations. There is perhaps less controversy or deviance over the relevance of Open Access publishing across different research approaches, and the prevalence of OA was then measured by checking the Open Access designations and labelling them as “True” if they had some sort of Open Access designation (e.g. gold, bronze, etc.) and “False” if they did not have any. As the data was already coded for Open Access publishing from the source, we obtained values for our whole population.

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* https://images.webofknowledge.com/WOKRS531OR13/help/WOK/hs_document_types.html
Coding Procedure

To code for replication, pre-registration and data availability, one annotator from among the authors reviewed and coded a subsample of the population. Following power calculations, we estimated that coding a random sample of 30% of the population would be sufficient to allow for inference of OS practices within the population. We thus sampled 30% (1915) of these papers. The great majority of publications in our full population (90.5%) were in English and the rest in different languages, most prominently Spanish. As our keywords were aimed to pick up publications in English, we discarded publications in other languages (they were generally picked up in our search because their abstract, keywords or title had English versions, but the rest of the paper was not available in English). Then, we discarded papers that did not engage with data (e.g. papers which are entirely theoretical or reviews). After this, our sample decreased to 1099. We therefore estimate that approximately 57.5% of the English papers in our population were empirical.

The research team met regularly to discuss the coding scheme and consider and work through issues of interpretation.

Results

Open Access publishing is gaining momentum in political science and in Democratic Innovations. Figure 2-a presents the number of publications in this subfield showing that OA publishing accounts for 31% of total publication. Replication and pre-registration practices seem to be at best in a fledgling stage and not very popular in DI studies. In our dataset we do not have pre-registration practices and the share of replicated studies is substantially low. As we discussed above, adopting the culture of replicability and data sharing in DI empirical studies needs collective action, and as we can observe from Figure 2-b the number of studies that shared full information for replication (fully available) is very low - almost 4 percent of our total sample shared full information for replication. We can disaggregate this information by different types of partial availability (not shown in figures), showing that the most common partial fulfilment of OSP is the provision of a link to secondary data that the researcher used but without providing the codes or other information necessary to repeat the analysis (13.01% of papers). Provision of some supplementary materials including novel data or extra analysis that might provide robustness and transparency but again with replication materials missing account for 8.83% of papers. 5.55% of the sampled papers invited readers to request replication materials from the author should they so wish, but we know that responses to such requests are patchy. Publications with partially available information for replication account for around 27 percent of the subsample. Partially available replication materials designates studies that share some information for replication (e.g data, supporting information such as extra analysis, figures, and tables), but where other important information to allow replication is missing (in most cases data, code or crucial information on how data was processed).

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9 Many but not all of the papers have been coded by a second author but while this work continues in the future at least one other author will code the same data again and we will study the inter-annotator agreement.
10 Coding strategy and instructions are shared in the appendix.
11 We refer to those practices where the dataset and the codes for replication are available.
Figure 2. Application of OSP in the DI subfield. a) Percentage of journal publications that were fully Open Access, that were pre-registered or that were a replication of a previous study. b) Percentage of journal publications that made their research materials fully available, partially available or not available at all. Error bars indicate 95% confidence intervals calculated through a binomial (left) or multinomial (right) probability distribution. Note that Open Access does not have confidence intervals because it was calculated from the full population, not a sub-sample.

Digging deeper into trends and what might explain them, figure 3a shows adoption of OSP over the period studied of 1970-2021. Our analysis of Open Access publishing (Figure 3-a) reveals that Open Access was not very popular in the last decades of the previous century when technologies and capacities were probably still not favourable to large-scale adoption of practices. Starting from 2014 Open Access publication has had a significant growth and accounted for approximately 48% of total publications from 2018 to mid-2021. The trend seems to have slowed and the practice seems to have saturated around this value for now. It is interesting to notice that this change in Open Access has been accompanied by a steep increase in the number of publications overall in the DI field, which continues increasing linearly. Notice that there are no confidence intervals in the trend because we analysed the whole population, as it was already coded for Open Access from source.

Figure 3-b, on the other hand, shows the change in adoption of the other three OSP: data availability, replication and pre-registration. From 1970 to 2000 there were not enough publications and thus no real conclusions from the actual adoption of these practices could be drawn (full time range not shown here). Still, from 2000 to 2021, we see that there is almost no adoption of pre-registration (0 cases in our sub-sample of 30%) or replication. Full availability of replication materials, however, seems to be increasing with time to almost 10%, but the confidence intervals are still too large to confidently draw firm conclusions.
Furthermore, regarding the type of journals that publish mostly open access articles, we plotted the top 15 journals in terms of total number of publications in the population (from top to bottom). As we can observe from Figure 4a there is a significant heterogeneity not only in terms of the age of journals (e.g, young journals such as Sustainability, which was established in 2009, vs established journals such as The Political Quarterly, which was established 1930), but also in terms of targeting audience (e.g mainstream political journals vs cross-disciplinary journals) and research area. This is likely explained by the increasing popularity of fully OA journals which compete with traditional journals more likely to retain subscription-based or hybrid models of access to research publications. Likewise, we analysed the prevalence of Open Access publishing in the 15 most common research fields, as labelled by WoS (ordered from top to bottom). In Figure 5 we can observe that the most common field of research, Governance & Law, which accounted for almost half of the publications, does not necessarily account for the highest percentage of Open Access publications. The research field of Science & Technology seemed to account for the highest percentage of Open Access publishing in this subset of research areas.

Notice that one publication can belong to more than one research field. Therefore a publication being categorised as Governance & Law, for instance, does not mean it cannot be categorised in a different research field at the same time.
To further inspect potential explanation for these trends Figure 6 presents the year of publication and the number of authors. Open science practices were generally started by single authors (e.g. Spector, 1970; Hahn, 1970). Starting from the beginning of 1990 co-authorship increased with mostly two authors, and starting from 2010 to 2021 publications with many authors have increased which possibly reflects growing interest in multidisciplinary research approaches. Larger research teams might generally increase the propensity and capacity for OS through peer scrutiny and increased resource – although research fraud has also been prominent in teams where bullying or omerta may unfortunately prevent transparency. We still need to analyse more carefully, however, whether the number of authors is a predictor of the use of Open Access publishing, or it is the correlation is only reflective of wider trends towards publishing with large groups of authors which has become more common in the past two decades in most fields.

**Figure 5.** OA by subject area- a) OA frequency by subject area and b) number of Publications by Subject area

**Figure 6.** Number of publications that published in Open Access in terms of the number of authors that collaborated in the study.
Discussion, Limitation, and Preliminary Conclusions

This paper presents a preliminary descriptive summary of OSP practices in the field of democratic innovations. We started by outlining the importance of OS practices for both research integrity and for quality of research. DI practices are becoming more ubiquitous as the normative campaign for necessary improvements to traditional democratic practices has gained increasing acceptance in many parts of the world. Nevertheless confidence in applications may be short lived if either intentional manipulation of research is allowed and uncovered, or perhaps more dangerously a lack of vigilance to our own tendencies to serve problematic or conflicting incentives allows general tolerance for questionable research practices. Observers are more likely to question democracy itself if researchers and the advocates who increasingly rely on democratic innovation research find that their interventions do not meet the results that the body of research on democratic innovation lays claim to.

The paper provides a brief overview using an innovative methodology for describing open science practices across an interdisciplinary and growing field. We find that while open access publishing has increased rapidly in the field in recent years, this practice seems to have reached some saturation in recent years and a majority of publications are still not open. Some journals or fields of research seem to provide significant OA coverage, so it might be worth looking to why different norms apply. There is significant momentum towards OA publishing in the wider community though negotiations with major publishers and learned societies are also slow.

We also find that provision of materials for replication is improving though this trend is slightly less dramatic and there is a variation in the quality of access to replication materials where attempts to provide them are made. Replications themselves and preregistration are very rare in the field. What we do not capture in this study is data regarding authors’ perception perceptions, attitudes, and beliefs or even awareness of OSP. We might speculate that we will find strong differences across generations of researchers, by methods or approaches most frequently used, by national research culture, or by other factors. The authors themselves have been part of teams that have taken different attitudes towards OSP. OSP can often come up against competing incentives. OS requires good training, planning and organisation in order to deliver the required practices. The time or other resources such awareness and access to training and use of materials (e.g. programmes that allow for easy linking and annotation of data) are not equally distributed.

We hope that democratic innovations scholars will engage with this debate. We are interested to know if they are not engaging in practices due to issues of awareness or more deeply held convictions that OSP are not as useful or necessary as we have suggested here. Follow up research will ask what should change and how we might achieve that change. If enough are convinced by the merits of OSP, perhaps more than any other group, DI scholars might hold the answers to the question of how collective action that overcomes at least the more perverse incentives that reduce OSP can be avoided through clever institutional engineering.

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