The role of political ideology in media coverage of science

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One sentence summary: News outlets across the ideological spectrum cover high-quality research.

We study the role of political ideology in the diffusion of scientific knowledge by media outlets. We document, using a novel measure of scientist ideology that spans more than 600,000 papers, that outlets are statistically significantly more likely to cover scientists with similar ideology. However, the role of scientist ideology is small in magnitude when compared to the role of scientific quality, as measured by academic citations, journal quality, and research funding, in media coverage of science. On average, outlets are more likely to cover high-quality research written by misaligned scientists than low-quality research written by ideologically aligned scientists.

Introduction

Scientific research enables evidence-based decision-making in a variety of contexts, from global policy decisions about climate change mitigation to individual decisions about diet and exercise (Yin *et al.* (*1*)). For scientific research to inform decision making, high-quality research must be communicated to the relevant non-scientific actors. If frictions limit exposure to the most accurate scientific research, then the social value of science may be substantially diminished.

In this paper, we investigate the role of news media in the diffusion of scientific information. Specifically, we empirically evaluate whether a news outlet is more likely to report on published academic articles and books authored by scientists who share the outlet's ideological perspective. We then compare the role of scientist ideology in coverage decisions to that of paper quality to understand whether these coverage propensities result in exposure to worse (not just different) science for readers of certain ideological perspectives. Last, we ask whether the importance of ideology in media coverage of science relates to the political relevance of the research topic.

We focus on news media and political ideology for two reasons. First, many people rely on news media as a source of scientific information (*2*). Second, disagreements about scientific facts often track partisan divisions (*3–5*) and outlets are known to ideologically slant coverage in other domains (*6–12*). Therefore, media coverage may influence a large number of non-scientific actors, and there is reason to be concerned about ideologically-motivated frictions in the diffusion of scientific information.

To answer our research question, we develop a novel and large-scale measure of scientists' political ideology based on their political donations. Our measure covers over 200,000 scientists and over 600,000 papers authored by them from 2015–2020 in all major fields of science. Our

publicly available measure is portable to future research on politics in science.

We first document that media outlets are statistically more likely to cover ideologically aligned science. A one standard deviation increase in ideological alignment between a media outlet and a paper is associated with a modest 2.5% increase in the probability that the outlet cites the paper.

Whenever politics influences media coverage, a key question is whether this effect results in a decline in the quality of content and, consequently, harms society. In most domains, there is no objective way to measure the quality of coverage, so previous studies have been unable to empirically evaluate the importance of the trade-off between quality and ideology. Our study provides a unique opportunity to study this trade-off because there are well-established measures of scientific paper quality such as citations, journal quality, and research funding (*13–15*).

We show that media outlets are much more likely to cover high-quality scientific articles, regardless of ideology. All types of outlets are more likely to cover high-quality science from ideologically misaligned authors than low-quality science from ideologically aligned authors. We conclude that in science reporting, the ideology of scientists plays a limited role and has little impact on coverage quality.

The modest effects we observe in the aggregate may mask important heterogeneity: even if ideology does not matter at all in many areas of science, that does not mean that it cannot substantially affect coverage in controversial or polarized subfields. We find that in many large and important fields of science, media coverage is essentially unrelated to ideological alignment, while ideology is much more important in a handful of fields. For example, in the category that includes most climate science research, a 1 standard deviation increase in ideological alignment is associated with a 10% increase in coverage probability—over 4 times larger than the average effect. More generally, we find that field-specific associations between alignment and coverage probability are the largest in fields where coverage is most polarized. We note that, even in the

fields where the association between alignment and coverage is the strongest, quality continues to have a larger impact on coverage probability.

We further show that the importance of ideology can change over time within a field of research using a case study of the COVID-19 pandemic. We compare scientists who eventually wrote papers about COVID-19 ("COVID authors") to a comparison group of medical scientists who never wrote papers about COVID-19 ("non-COVID authors"). Before 2020, the association between ideological alignment and coverage probability was similar for papers written by COVID authors and non-COVID authors of different political ideologies. After the onset of the pandemic, the association between alignment and coverage increased substantially for COVID authors, while we did not observe an increase in the association for non-COVID authors. The result illustrates that even if science coverage is apolitical most of the time, ideological slant may arise once issues become politically salient.

This heterogeneity in the role of ideology in coverage by political salience also helps us speak to the mechanisms behind our main results. Broadly speaking, one reason that media outlets may be more likely to cover ideologically aligned scientists is that the content of the papers authored by aligned scientists is more likely to support their ideological viewpoints. Alternatively, outlets may disproportionately cite aligned scientists regardless of the content of their papers. For example, research by ideologically aligned scientists may be more easily accessible to outlets. The fact that ideological alignment plays a larger role in politically relevant fields is consistent with the former interpretation while casting doubt on the latter, suggesting that the content of research articles may be a key mechanism behind observed differences in coverage probability by ideological alignment.

Measurement

We obtain information on scientific papers released between 2015 and 2020 from Dimensions (Hook *et al.* (*16*)), a total of $2,184,628$ papers. Our data on the media coverage of these papers comes from Altmetric, a company that scrapes the websites of major news outlets and identifies mentions of specific scientific papers. See the SM materials and methods section for details on sample construction.

We use a measure developed in Bakshy *et al.* (*17*) to quantify outlet ideology; henceforth, we refer to this measure as the BMA score. The BMA score of an outlet is determined by the self-reported ideologies of Facebook users who share the outlet's content. The BMA score ranges from -1 to 1, with negative scores representing liberal outlets. The BMA score is correlated with canonical measures of media ideology (e.g, Gentzkow and Shapiro (*6*)). See SM, fig. S3 for the distribution of BMA scores across outlets in our sample.

We measure a scientist's ideology using the Campaign Finance (CF) score—an ideology measure constructed from individual donations to politicians and political campaigns (*18*). Negative and positive CF scores correspond to liberal and conservative donors respectively. The CF Score has been extensively validated in the political science literature (*19–22*). We link authors of scientific papers in our sample to their CF Scores using their name, occupation, and home state. We successfully link $259,826$ scientists. We then define the ideology of a scientific paper to be the average CF Score among authors of that paper who were successfully linked.[1] Our ideological measure covers $661,923$ papers. To our knowledge, the coverage of our measure is an order of magnitude larger than that of any other ideology measure related to science in

[1] A potential concern is that the political preferences (and other characteristics) of scientists who donate to political campaigns are systematically different from those who do not donate. To evaluate this external validity concern, note that our estimates of ideological differences in coverage do not rely on the CF Score at all. We find that ideological differences in coverage are similar for papers authored by scientists who donate and scientists who do not donate, which is reassuring. See the SM, section C.2 for details. Additionally, recent work shows that individuals who do not donate to political campaigns exhibit political preferences that are slightly weaker but comparable to those who make such donations (*23*).

the literature (*24–27*). In the SM, section 4.5, we provide details on our linking procedure and validation exercises.

We construct an index of scientific paper quality by combining four standard scientometric measures: academic citations, research funding, patents, and journal impact. While none of these measures are perfect representations of scientific quality, we believe they together constitute a meaningful proxy. See the SM, section A.4.1 for details on the construction and interpretation of the quality index.

Media ideology and science coverage

Differences in coverage between conservative and liberal outlets

Our first set of results document that liberal and conservative news outlets cover systematically different science. Even though this exercise does not provide direct evidence of ideology influencing coverage choices, it is informative for two reasons. First, a null result would make additional analysis redundant—if we were unable to establish any differences between liberal and conservative outlets' coverage patterns, then coverage differences associated with scientist ideology would be implausible. Second, the exercise allows us to study the importance of outlet ideology in coverage of *all* research papers published between 2015–2020, including papers that do not have CF Scores.

Following Gentzkow *et al.* (*28*), we construct a measure that captures the differences in liberal and conservative coverage of science; we henceforth refer to this as the GST measure. The intuition behind the measure comes from a thought experiment where an observer must predict the ideology of an outlet after observing the outlet's citation of a single scientific article. If conservative and liberal coverage patterns are relatively similar (different), then a single citation will be relatively uninformative (informative) about the outlet's ideology. When there are no differences in coverage patterns between liberal and conservative outlets, the GST measure is

equal to 0.5. In contrast, if liberal and conservative outlets cover disjoint sets of papers, then the GST measure is at its maximal possible value of 1. We provide a formal definition of the GST measure and details on estimation in the SM, section C.

The estimated GST measure in our sample is 0.567, which is statistically different from the null. For comparison, the GST measure for a minute-long congressional speech was 0.57 in 1989–1990, and 0.73 in 2007–2008 (Gentzkow *et al.* (*28*)). Therefore, the choice to cover a single scientific paper is as informative about an outlet's ideology as a minute-long political speech was about a congressperson's political party in a relatively less polarized time. Additionally, the GST measure is similar for papers with and without a CF Score, assuaging concerns about sample selection.

Scientist ideology and coverage probability

We now ask whether media outlets are more likely to cover ideologically aligned scientists. In Fig. 1, we illustrate that conservative outlets cite science with higher (more conservative) CF scores than liberal outlets do.[2]

We then flexibly estimate (Cattaneo *et al.* (*29, 30*)) the relationship between coverage probability and scientist CF Score for liberal, center, and conservative outlets, conditional on outlets' overall propensity to cite any paper and papers' overall popularity across all outlets. We present our estimates in Fig. 2. Liberal outlets disproportionately cite papers with left-leaning authors compared to papers with more moderate authors, while conservative and centrist papers disproportionately cite moderate authors. Surprisingly, we do not detect a larger propensity to cover papers with conservative CF scores by conservative outlets.

To summarize these associations in one statistic and address potential confounders, we estimate linear-probability models (LPM) where citation probability depends linearly on the ide-

[2]Most scientists are liberal, and thus most papers have negative CF Scores (*18*).

ological alignment between the outlet and the article's authors. The main disadvantage of this approach is that we need to assume both how the CF Score of a scientist and the BMA score of an outlet map onto scientist-outlet ideological alignment as well as the functional form of the relationship between coverage probability and alignment. The former is challenging because those measures of ideology are not on commensurate scales and the latter is not true given our previous results. Despite these important shortcomings, this exercise is helpful for exposition and subsequent analysis. We discuss the details of this LPM in the SM, section D. In our preferred specification, an increase in alignment by 1 standard deviation is associated with an increase in coverage probability by 2.5%, after flexibly controlling for outlet-specific, paper-specific, and field-outlet-specific features.

Evaluating the importance of the ideology-quality tradeoff

We have demonstrated that ideological alignment between outlets and scientists is associated with a modest increase in coverage probability. A natural concern is that these ideological preferences may cause outlets to cover worse science since they would be willing to publish low-quality content as long as its authors are aligned with their ideology. In this section, we evaluate the empirical relevance of this concern: to what extent do outlets trade-off quality for ideological alignment?

Media outlets may face an ideology-quality tradeoff in many domains of coverage, but previous empirical work on media bias has been unable to simultaneously study ideological preferences and quality preferences. The challenge is that broadly accepted measures of quality do not exist for most of the content that the media publishes. Science coverage is unique in part because the literature has established quality measures (*13–15*). We leverage these measures to construct our quality index.

Similar to Fig. 2, we flexibly estimate coverage probability as a function of the paper CF

Score separately for high-quality (top tercile), medium-quality (middle tercile), and low-quality (bottom tercile) papers.[3] We present results in Fig. 3.

The broad patterns of outlet choices are similar to those observed in Fig. 3. Importantly, for all outlet types, the differences in coverage probability across different quality levels are much larger than differences in coverage probability across paper CF scores within a given quality level. In all cases, the quality effect is so strong that outlets have a higher coverage probability for high-quality misaligned scientists than low-quality aligned scientists. Overall, the relative magnitudes of quality effects and alignment effects mitigate concerns about the ideology-quality tradeoff in the context of science reporting.

Heterogeneity by political salience

We have shown that *on average*, media outlets are only marginally more likely to cover aligned scientists. However, this relationship may be stronger for research in more politicized areas. In this section, we measure the role of ideological alignment in coverage probability separately for different fields of science. We also present a case study of the COVID-19 pandemic that illustrates how coverage of a field can become politicized over time.

Fields of science

We replicate the GST differences measure and our LPM measure of the association between scientist ideology and coverage probability separately for each field of science. We present the results in Fig. 4, which plots the GST measure on the x-axis against the linear relationship between ideological alignment and coverage probability on the y-axis. The figure illustrates two new facts.

First, the within-field GST measure is positively correlated with the within-field alignment

[3] See the SM, section E.3 for results using parametric (LPM) regressions.

effect. When liberal and conservative outlets have large differences in their science coverage for *any* reason, they typically also show a *specific* propensity to cite ideologically aligned scientists.

Second, we examine the fields with the largest association between coverage probability and ideological alignment. These are earth science (which includes all climate science papers), history, and the social sciences (split into economics and non-economics such as sociology, history, and anthropology). These are all fields in which research findings are used in contemporary debates on culture and public policy (Yin *et al.* (*1*)). In these politically relevant fields, ideological alignment is more closely related to media coverage: for Earth Science, a one standard deviation increase in alignment is associated with a 10% increase in coverage probability. We note that quality is a stronger predictor of coverage than ideological alignment across all fields, even for fields with a stronger alignment association like Earth Science. (See SM, fig. S7.)

Changes in topic political relevance: the case of COVID-19

We now study how the role of ideology evolved in a case study where an area of research exogenously and suddenly became politically relevant: the COVID-19 pandemic. Before the pandemic, research on topics such as epidemiological models of disease spread was of limited political interest. Subsequently, this research was frequently referenced in often polarizing policy decisions (Pew Research Center (*31*)).

We compare the relationship between ideological alignment and coverage probability for papers authored by "COVID scientists"—scientists who wrote at least one paper related to the COVID-19 pandemic[4]—to those authored by other life sciences researchers, before and after the onset of the pandemic. We present results in Fig. 5. Before 2020, we cannot distinguish the differences between the effect of ideological alignment for coverage of papers COVID vs. non-

[4]The CORD-19 database identifies all COVID-related research papers Wang *et al.* (*32*).

COVID scientists. We then see a divergence in 2020 as ideological alignment becomes more influential for COVID scientists while becoming less influential for non-COVID scientists. This increase in the alignment effect for authors who wrote about the pandemic further supports the notion that outlet ideology can strongly shape coverage in domains where science is politically relevant, as discussed in the previous section.

The above results also shed light on the interpretation of our results. One interpretation of the association between scientist ideological alignment and coverage probability is that (1) conservative (liberal) scientists are more likely to author scientific papers with conservative (liberal) viewpoints and (2) conservative (liberal) outlets prefer to cover such science (a "content"-centric mechanism). However, an alternative explanation is that outlets prefer aligned scientists independent of the content of their research. For example, scientists and journalists of similar ideologies may be more likely to have professional connections which can make it easier to access research by aligned scientists (*33*). We find that the role of scientist ideology is stronger in fields with higher partisanship and can become stronger when a topic becomes politically salient. We argue that this result constitutes suggestive evidence in favor of the content mechanism. The content mechanism provides a natural explanation for the rise in the effect of outlet-paper alignment: the political attention to COVID caused both scientist choices (1) and outlet choices (2) to become more ideological. Alternative mechanisms, such as the one described above about journalists more easily accessing research by aligned scientists, can only explain the observed to the extent that the forces at play became stronger in 2020 specifically for scientists who wrote papers about COVID.

Discussion and conclusions

This paper shows that political ideology influences the media's coverage of science. The role of ideological alignment between the scientist and the outlet is modest, while the effect of

quality is large. Almost all outlets prefer high-quality science to low-quality science, regardless of scientist ideology. However, the association between ideological alignment and coverage of research is larger for highly politicized topics.

Our analysis is limited because we only observe whether an outlet covered a scientific article, not in what context or how they discussed that scientific article. Further, we provide no evidence on how media coverage of science affects consumers' beliefs and decisions.

In contrast to much of the literature on media bias, our results are broadly optimistic: coverage of several important scientific fields is not ideologically slanted. However, stronger ideological effects in politically charged areas of science are concerning, particularly given secular increases in political polarization in the United States (Boxell *et al.* (*34*)).

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Supplementary materials

Materials and Methods

Supplementary Text

Figs. S1 to S7

Tables S1 to S8

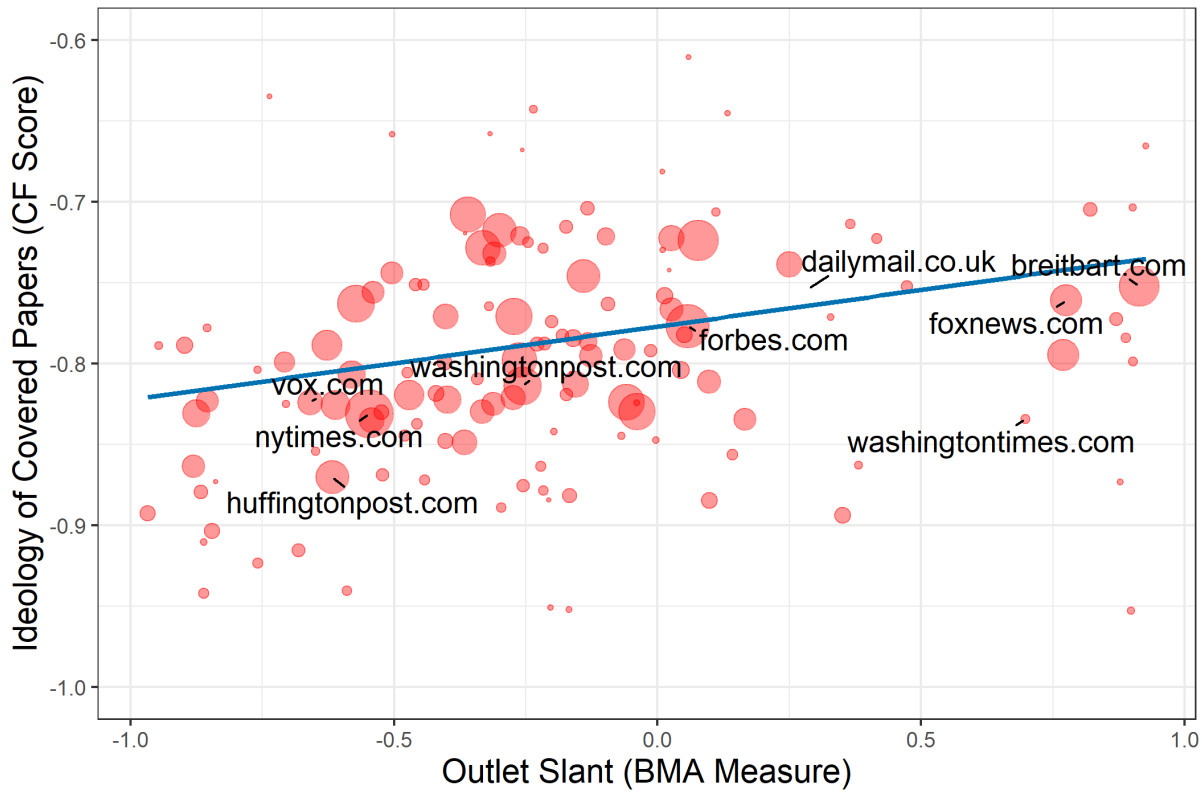

Fig. 1. Relationship between outlet ideology and science ideology. The figure presents the relationship between outlet ideology and the ideology of the scientific articles they cover. Each observation is a media outlet. The x-axis represents outlet ideology as measured by the BMA score. The y-axis represents the mean ideology of the scientific papers covered by the corresponding outlet. The larger points correspond to outlets with a higher number of scientific articles covered. For concreteness, some popular outlets are labeled.

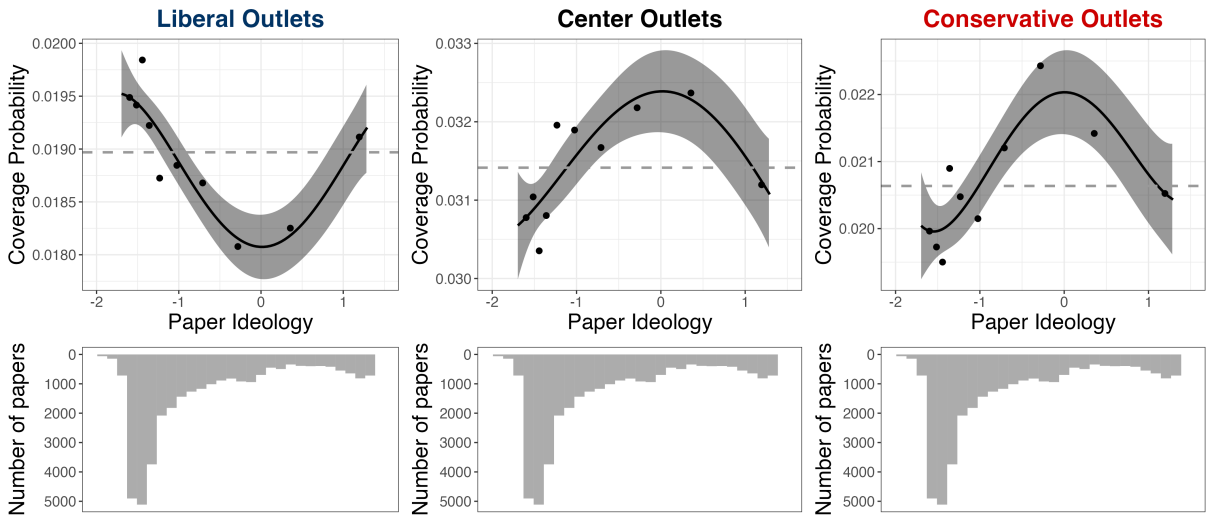

Fig. 2. Non-parametric estimates of alignment association. The figure presents coverage probability as a function of paper ideology (CF Score) for liberal, conservative, and center outlets. An outlet is liberal if its BMA score is less than -0.2, conservative if its BMA score exceeds 0.2, and is center, otherwise. The relationship between coverage probability and ideology is estimated non-parametrically using the method described in (Cattaneo *et al.* (*29, 30*)). Observations are paper-outlet pairs. We use 10 bins, with boundaries at the deciles of the paper CF score distribution. We plot the paper CF score distribution in the bottom row. Points represent mean values for observations within each bin. Error bars represent 95% uniform confidence intervals for the conditional averages.

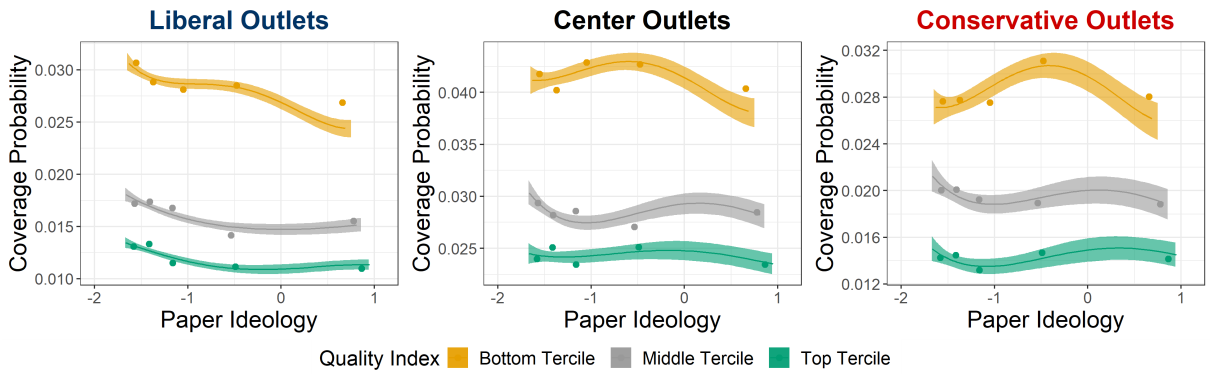

Fig. 3. Non-parametric estimates of alignment association by paper quality. The figure presents coverage probability as a function of paper ideology (CF Score) for liberal, conservative, and center outlets. Color indicates scientific quality tercile. The third tercile consists of papers with the highest quality. See the SM, section A.4.1 for details on the construction and interpretation of our quality measure. An outlet is liberal if its BMA score is less than -0.2, conservative if its BMA score exceeds 0.2, and is center otherwise. The relationship between coverage probability and ideology is estimated non-parametrically using the method described in (Cattaneo *et al.* (*29, 30*)). Observations are paper-outlet pairs. We use 5 bins, with boundaries at the quintiles of the paper CF score distribution. Points represent mean values for observations within each bin. Error bars represent 95% uniform confidence intervals for the conditional averages.

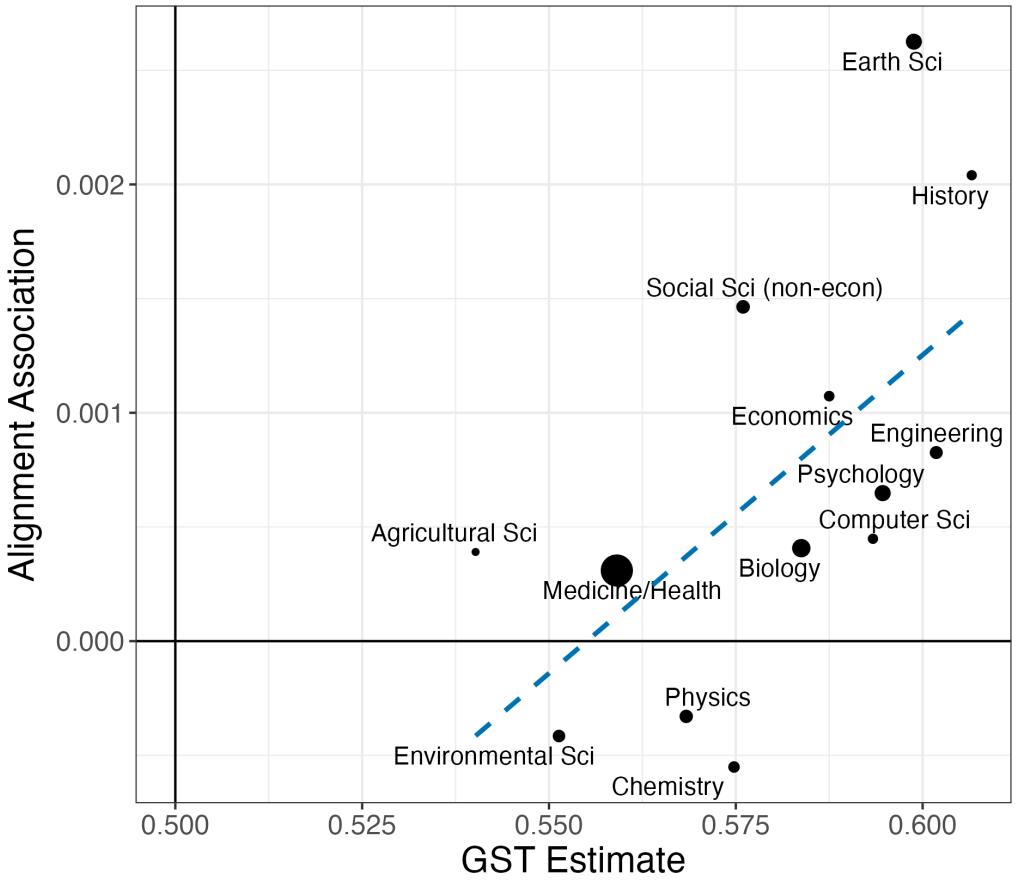

Fig. 4. Heterogeneity of outlet differences and alignment associations by field of science. The figure presents the relationship between the within-field GST measure and alignment associations for different fields of science. Each observation is a field. The x-axis represents the within-field GST measure and the y-axis represents the within-field alignment association. The blue line is a linear best-fit line across the different fields. The size of the points illustrates the number of papers covered by the media for a given field, with larger points denoting fields with more coverage.

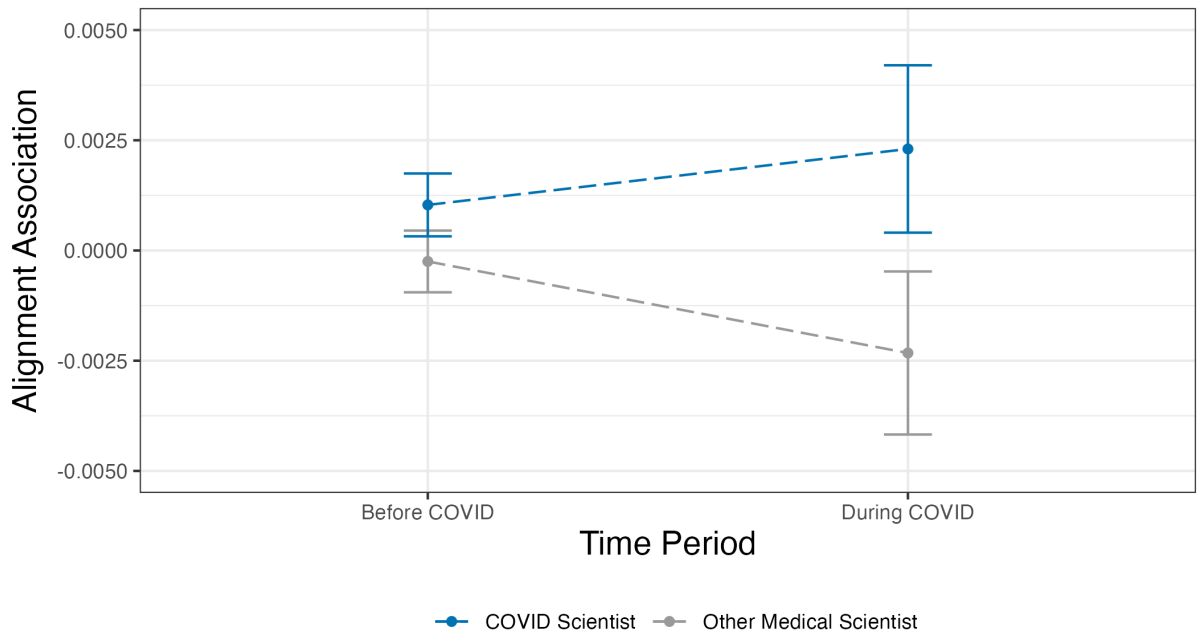

Fig. 5. Alignment associations for COVID-19 related research. The figure presents changes in alignment associations for "COVID scientists" and "Other Medical Scientists". A COVID Scientist is a scientist who authored at least one paper related to COVID after the onset of the pandemic. "Other Medical Scientists" are medical/health scientists who did not author any COVID-related papers. COVID-related papers are papers that appear in the CORD database (Wang *et al.* (*32*)). We estimate alignment associations for these groups of scientists before and after the onset of the pandemic in 2020. Colors denote groups of scientists. The x-axis represents the time period and the y-axis represents the alignment association estimates. The bars denote 95% confidence intervals for the point estimates of β. The p-value for a t-test of the null that alignment associations are equal for COVID Scientists and Other Medical Scientists in 2020 is 0.097.