The Polarizing Effect of the March for Science on Attitudes Toward Scientists

Matthew P. Motta*
PhD Candidate
Dept. of Political Science
University of Minnesota
motta018@umn.edu

Americans' attitudes toward scientists have become more negative in recent years. While researchers have considered several individual-level factors that might explain this, little attention has been paid to the political actions of scientists themselves. I consider how *March for Science* rallies that took place across the U.S. in late April 2017 influenced Americans' attitudes toward scientists and the research they produce. In an online panel study surveying respondents three days before – and two days after – the March, I find that liberals' and conservatives' attitudes toward scientists polarized following the March. Liberals' attitudes toward scientists became more positive, while conservatives' became more negative. However, the March appears to have had little effect on the public's attitudes about scientific research. In addition to answering questions about the March's political impact, this research calls attention to the possibility that the political actions of scientists can shape public opinion about them.

Keywords: Anti-Science Attitudes, Mobilized Science, Public Opinion, Ideological Polarization

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In recent years, Americans' attitudes toward scientists and other experts have become more negative. Trust in the scientific community, for example, has declined steadily on the ideological right since the mid-1990s (Gauchat 2012), and has remained only moderately-positive on the ideological left (Mullin 2017). This increased negativity has important implications for American political life, shaping citizens' preference for anti-science political candidates and encouraging disbelief in scientific consensus (Motta 2017).

An important line of scholarly research has focused on individual-level factors that might explain why some Americans hold negative attitudes toward scientists. For example, several studies have investigated the effects of citizens' knowledge about science, ideological conservatism, and the interaction between the two on attitudes toward scientists and science more broadly (Hofstadter 1963; Sturgis & Allum 2004; Gauchat 2012; Kahan et al., 2012; McCright et al., 2013; Bolsen, Druckman, & Cook 2015; Blank & Shaw 2015; Gauchat et al., 2017). Americans' religious preferences, perceptions of scientific consensus and understanding, and attitudes toward modernization have also been linked to their attitudes toward scientists (Hofstadter 1963; Gauchat 2008, 2012; McCright, Dunlap, & Xiao 2013; Nichols 2017).

Much less attention, however, has been given to *scientists and experts themselves*, especially with respect to their involvement in politics (see: Cofnas et al., 2017 for a review). This is an notable shortcoming in the literature, as President Trump's skepticism toward science, and interference with scientific research (see: Tobias 2017) has lead scientists to organize on behalf of their political interests.

This raises an important question. When scientists organize politically, and visibly, do their actions influence public opinion? The *March for Science* events taking place across the country in late April 2017 offered a unique opportunity to answer this question.

Leveraging online panel data from three days before and two days after the events, I find that liberals' and conservatives' attitudes about scientists and experts polarized, immediately following the March for Science. While liberals and conservatives were divided before the March about their attitudes toward scientists and experts, the March appears to have *exacerbated* these differences. Interestingly, while liberals and conservatives were also divided on their attitudes toward scientific research before the March, the events did not appear to polarize these attitudes. The results suggest that, in this case, "mobilized science" can have polarizing effects on the public's affect for scientists and experts, but does not necessarily impact their attitudes toward the research these individuals produce.

Mobilized Science & Public Opinion

While scholars have made important strides in understanding how individual-level factors affect attitudes toward science, less work considers how the political actions of scientists themselves might shape public opinion (although see Brulle's 2018 critical reflection on the effectiveness on the March for Science). I refer to the public efforts of scientists, academics, and experts more broadly to advance their collective political interests as *mobilized science*. I conceptualize mobilized science as a general term to describe the efforts made by these groups to draw attention to, or take action on, matters relevant to their shared goals.

The March for Science events taking place in April 2017 can be thought about as an example of mobilized science. The March was organized by dozens of scientists and academics (March for Science 2017), in partnership with several pre-existing interest groups devoted to the advancement of scientific interests (e.g., American Association for the Advancement of Science, or AAAS). Through an extensive social media campaign (March for Science 2017), the group organized 610 semi-autonomous "satellite" marches across the country (and the globe). Today, the organization continues to operate, organizing a "Week for Action" in the final week of April, soliciting donations, and creating platforms by which interested visitors to their website can contact policymakers.

Critically, the marches received substantial attention in the popular press (see Figure 1, which I describe in more detail shortly). The flagship march in Washington DC had several celebrity hosts and guests (Gibson 2017), and even received attention on Twitter from President Trump. High levels of popular attention to the March raise the possibility, at least in theory, that it may have impacted public opinion.

In this paper, I explore the possibility that the March for Science may have influenced the public's attitudes about science, research, and expertise. I suspect that the March may have polarized opinion along ideological lines, potentially taking one of the following forms.

One possibility is the *Affective Polarization Hypothesis*. Fundamentally, the "public face" of the March for Science is the *people* taking place in the March. Though they gathered in support of several common goals – some of which concerned academic and scientific research (e.g., federal funding for research and hiring practices) – media coverage about the march itself was primarily focused on *who* was doing the marching (Nyhan 2017; Smith 2017). Consistent with this view, some scientists voiced concern (prior to the March) that the events might encourage the public to view scientists as a "liberal constituency" (Mullin 2017).

A second possibility is the *Generalized Polarization Hypothesis*. According to this model, the March for Science is a broadly polarizing event, encouraging conservatives (liberals) to view both scientists and their research more negatively (positively). Like the Affective Polarization Hypothesis, this view recognizes that the March might polarize public opinion about scientists. However, consistent with recent insights on how citizens formulate political judgments (Lodge & Taber 2013), negative feelings toward these individuals might subsequently spill over to shape citizens' attitudes about related concepts, like scientific research.

Although these expectations are exploratory, I suspect that the Affective Polarization Hypothesis is particularly good candidate to explain potential change in public opinion following the March. Given the high amount of media attention given to the March, in an increasingly-polarized political landscape (Abramowitz 2010), the March's personal focus on those doing the protesting creates a clear possibility for polarization on the basis of affect toward scientists and experts.

Three additional notes bear mentioning, before moving on. First, this study concerns the polarization of attitudes about scientists as a group. While it is certainly possible that liberals (conservatives) evaluate some types of scientists differently than others (McCright et al., 2013) recent survey research has found that conservatives tend to be more distrusting of scientists *writ large* than liberals (Blank & Shaw 2015). Second, this study focuses on ideological polarization, in efforts to speak directly to extant literature on the subject (Gauchat 2008, 2012). Given the strong correspondence between ideological self-placement and partisan identification, however, I consider whether or not the March polarized partisans on these issues in the Supplementary Materials. Third, it is important to caveat that this study is only a "first step" in understanding how mobilized science shapes public opinion. Future research ought to explore the dynamics of elite polarization on mobilized science, and how media coverage of elite polarization might influence opinion formation about scientists and their research (see: Druckman, Peterson, &

Slothuus 2013 and Bolsen & Druckman 2015 for more work on this general phenomenon).

The Panel Study

To test these hypotheses, I fielded a two-wave panel study measuring public support for scientists, experts, and their research immediately before and after the March for Science. I did this to exploit how change in the saliency of the March for Science might alter opinions about scientists and research at the individual-level, for the exact same individuals.

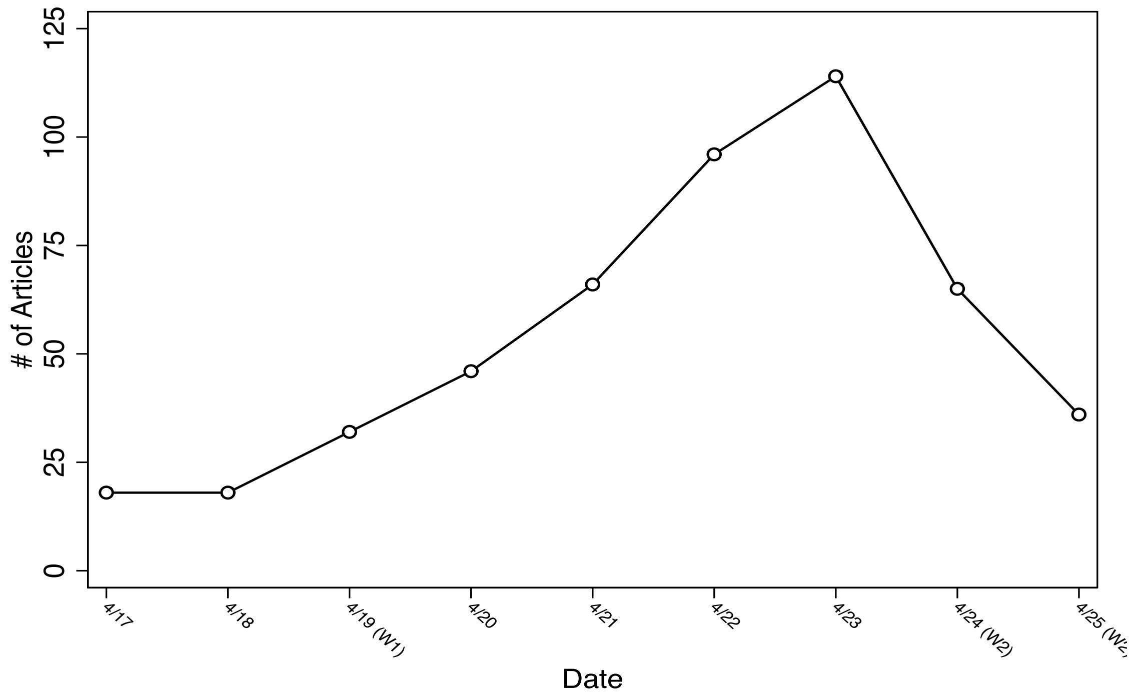
This design can best be thought about as quasi-experimental. In a true natural experiment, respondents would have been assigned to naturally-occurring treatment and control groups. Here, I alternatively employ what Shadish and colleagues (2002) refer to as a "one-group (within-participants) pretest-posttest design;" which means that all panel participants had the opportunity to be treated by the March. Consequently, I employ tests designed not to assess the raw treatment effects of the March, but the *conditional* treatment effects of the March across ideological subgroups (identified prior to when the treatment took place).

Data

To construct a pre/post March panel, I first surveyed 428 workers on Amazon's Mechanical Turk (MTurk) on April 19^{th} 2017 – exiting the field two (full) days prior to the March for Science on April 22^{nd}. I then recontacted all 428 individuals (using Turk Prime's recontact feature) and invited them to participate in a second survey, taking place from 10am (CST) on April 24 to 10am on 25^{th}. The second wave of the study produced a recontact rate of 83% and a completion rate of 82%, with a final N of 350.

I fielded the study on these dates in order to assess respondents' opinions at a time in which media coverage of the March for Science was low (Wave 1), followed by a time point in which media coverage of the March was high (Wave 2). Figure 1 demonstrates that the selection of these dates appears to have been well-justified. News coverage of the March for Science was comparatively low when the study began fielding (N = 30 articles on 4/19). This number grew rapidly after exiting the field later in the day on 4/19, producing about 250 articles between 4/22 - 4/23, in-between the two waves.

Figure 1. Frequency of News Coverage of the March for Science



Note: Lexis-Nexis search results for the phrase "March for Science," taking place in all newspapers between 4/17-4/25, 2017. Y axis is the number of total articles published that day.

Of course, the MTurk workers surveyed do not constitute a nationally-representative sample (see Table S1 for more specifics about the sample's demographics). The raw proportions described in the results may not generalize to the American population, which is an important caveat to bear in mind. Still, the *movement* in attitudes observed across ideological groups over time is likely valid for at least two reasons.

First, it is critical to note that differences in opinion *across waves* are not necessarily biased by sample composition. So long as MTurk workers do not process or react differently to the March's increased saliency than the rest of the public, change across waves is less likely to be biased. This appears to be a reasonable assumption, as liberals and conservatives on MTurk have been shown to have similar psychological profiles to those surveyed in representative samples, making the site a valid outlet for research on political ideology (Clifford, Jewell, & Waggoner 2015).

Second, to the extent that MTurk and nationally representative samples differ, cross-sample discrepancies be dramatically reduced with the inclusion of simple demographic controls in multivariate modeling (Levay, Freese, & Druckman 2016). For example, Levay and colleagues find that 93% of the difference in climate change attitudes across MTurk and representative sampling can be accounted for with the addition of simple demographic controls (e.g., race, age, gender, education).

Measures

There are two key groups of outcome variables in this analysis. The first concerns attitudes toward scientists and experts, and is measured using five different variables. The first three are standard 101-point feeling thermometers toward “scientists,” ”college professors,” and “intellectuals.” The remaining two ask respondents whether they agree or disagree (five point Likert scales ranging from “Strongly Disagree” to “Strongly Agree”) with the following statements; (1) “scientists care less about solving important problems than their own personal gain,” (2) “most experts are untrustworthy.”

The second group contains two variables measuring citizens’ attitudes toward scientific research. Respondents were again asked whether or not they agreed or disagreed with the following two statements: (1) “most scientific research is politically motivated,” and (2) “you simply can’t trust most scientific research.”

The key independent variable in this study is respondents’ ideological self-identification. This was measured using a standard seven-point self-placement scale, ranging from “extremely liberal” to “extremely conservative.” At times, in the analyses that follow, I recode this variable into a trichotomous indicator of whether or not individuals identified as liberals (all scores below the scale’s midpoint), moderates (the midpoint), or conservatives (all scores above the midpoint).

I control for respondents age, education, race (Black, Hispanic indicators), income, gender (0 = male, 1 = female), and interest in politics in certain multivariate models (more on this shortly). All controls are scaled to range from 0-1. Full question wording these variables can be found in the Supplementary Materials.

Results

To test my theoretical expectations, I construct several multivariate difference-in-difference tests. I chose this analytical design because it directly calculates growth in pre-to-post March levels of polarization, and can provide a statistical estimate of whether or not this movement is significantly different from what we would ordinarily expect by chance. Typically this design is used to compare naturally-occurring treatment and control groups (Ashenfelter & Card 1985). However, the quasi-experimental design described earlier calls for a test of conditional treatment effects. Consequently, the treatment and control groups are pre-treatment indicators of whether or not respondents are self-identified liberals or conservatives (respectively).

Four additional methodological points bear mentioning. First, the difference-in-difference analyses are restricted to individuals completing both waves of the survey, with moderates excluded (I consider the potential for polarization amongst moderates shortly). Further, due to the well-known tradeoffs of including covariates in quasi-experiments (Mutz 2011) I estimate difference-in-difference effects both with and without the covariates listed in the previous section. The results, as I show shortly, are quite similar across specification strategies. Third, I cluster standard errors at the respondent level in both sets of models, as is often recommended (e.g., Imbens & Wooldridge 2007). Fourth, in addition to presenting item-specific difference-in-difference tests, I guard against the possibility of random measurement error by averaging each group of items into corresponding indices (Ansolabehere, Rodden, & Snyder 2008).

The results are presented in Table 1, and are again consistent with the Affective Polarization Hypothesis. In rows 1-7, which pertain to affect toward scientists and experts, I find significant increases in change between liberals and conservatives before and after the March for Science in six out of seven models. Without controls, five produced estimates that were significant at the $p<0.05$ level (two-tailed), and one approached conventional levels at the $p<0.10$ level. These results were similar when adding in controls, with the exception that the "experts are untrustworthy" item dipped below the $p = 0.10$ threshold. In addition to being statistically significant, these effects were also substantively large; ranging from a 4% change across ideological subgroups (college professor affect, in both specifications) to 11% (belief that scientists are motivated by personal gains; 12% change in the covariate specification).

Further, the results do not provide any evidence that the March polarized citizens' attitudes toward scientific research – even when the items are averaged together to reduce measurement error. In all cases (rows 8-10), and across both specifications, I find small but statistically insignificant increases in polarization across waves. This is again consistent with the idea that the March polarized liberals and conservatives' attitudes about scientists and experts, but not their research.

Finally, while I lacked a clear *a priori* expectation about how moderates might respond to the March, relative to either liberals or conservatives, follow-up tests suggest that they tended to *follow* conservative opinion following the March. To do this, I re-ran Table 1 swapping self-identified conservatives for self-identified moderates (N = 77, for those taking both Waves). The results can be found in Table S3, and show that moderates, relative to liberals, did in fact become significantly more negative toward scientists following the March.

Addressing Potential Confounds

Before concluding, it is important to address three potential concerns some might raise with the results presented so far. First is the possibility of differential attrition. Theoretically, it could be the case that individuals who opted to take both waves of the study differed in their attitudes about science than those who were lost to attrition. Table S4 in the Supplementary Materials tests this possibility, and reveals no significant differences across these two groups.

Second, a common issue with quasi-experimental designs is the ability to disentangle treatment effects from broader time trends. Even though this study was conducted over the course of six days, it (theoretically) could be the case that the passage of time itself – and not the March for Science – increased polarization.

To test whether or not this is true, I add a *nonequivalent dependent variable* component to the difference-in-difference tests in Table 1, as Shadish and colleagues (2002) recommend. This can be thought about like a placebo test; where the goal is to run the exact same models in the Table using outcome variables that should also be polarized across ideological lines, but that should not be expected to grow over the six-day span. If I fail to observe significant difference-in-difference estimates on the nonequivalent dependent variables, we can have added confidence that the March, and not the passage of time more broadly, lead to affective polarization.

I do this by swapping respondents' attitudes toward Muslims and Immigrants for the variables listed in Table 1. The results are presented in Table S5 in the Supplementary Materials, and reveal no significant difference-in-difference estimates between liberals and conservatives across waves. This provides added assurance that the quasi-experimental design is not confounded by the passage of time.

Table 1. Summary of Difference-in-Difference Tests

	Wave One		Wave Two		Without Covariates		With Covariates	
	Liberals	Conservatives	Liberals	Conservatives	|D-I-D|	p	|D-I-D|	p
Scientist FT	0.83	0.70	0.86	0.67	0.05	< 0.05	0.05	< 0.05
Intellectual FT	0.77	0.67	0.80	0.64	0.07	< 0.05	0.07	< 0.05
Coll. Prof. FT	0.74	0.56	0.75	0.54	0.03	< n.s.	0.02	< n.s.
Index	0.78	0.64	0.80	0.62	0.05	< 0.05	0.05	< 0.05
Sci. Care About Personal Gain	0.25	0.39	0.20	0.45	0.11	< 0.05	0.12	< 0.05
Experts are Untrustworthy	0.26	0.40	0.22	0.42	0.05	< 0.10	0.05	n.s.
Index	0.26	0.39	0.21	0.43	0.08	< 0.05	0.08	< 0.05
Research is Pol. Motivated	0.28	0.53	0.25	0.53	0.03	n.s.	0.03	n.s.
Can't Trust Sci. Research	0.20	0.39	0.17	0.38	0.01	n.s.	0.01	n.s.
Index	0.24	0.46	0.21	0.46	0.02	n.s.	0.02	n.s.

N = 271 (Moderates excluded; Liberal N = 182, Conservative N = 89).

Note: Multivariate difference-in-difference tests calculated using the `DIFF` package in Stata 13. Models are run first without controls, and then re-estimated controlling for respondents' gender, race, age, income, interest in politics, and educational attainment. Rows 1-3 are feeling thermometers toward "scientists," "intellectuals," and "college professors," respectively (Row 4 Index $\alpha = 0.85$). Rows 5-6 ask respondents to agree or disagree [1 = Strongly Disagree, 5 = Strongly Agree] with the following statements; (1) "Scientists care less about solving important problems than their own personal gain," (2) "Most experts are untrustworthy." (Row 7 Index $\alpha = 0.76$). Rows 8-9 again ask respondents to agree or disagree with the following: (1) "Most scientific research is politically motivated" and (1) "You simply can't trust most scientific research." (Row 10 Index $\alpha = 0.80$) All variables are scaled to range from 0-1.

Finally, given the high correspondence between partisanship and ideology (Bafumi & Shapiro 2009), I re-ran all difference-in-difference models using indicators of whether or not respondents self-identified as Democrats or Republicans. The results, found in Table S2 of the Supplementary Materials, show that the effects were quite similar.

Discussion

The results presented here offer a unique look into the polarizing effects of the March for Science on public opinion. Although liberals and conservatives held differing opinions toward scientists, experts, and scientific research before the March, the aftermath appears to have exacerbated those differences. I observe these effects only with respect to citizens' attitudes toward scientists and experts themselves, and not toward the research they produce; consistent with the Affective Polarization Hypothesis.

Of course, these analyses are not without limitations. As discussed earlier, I draw these conclusions from a non-representative sample of Americans. While the amount of change observed across ideological groups may not differ in more-representative samples, the raw estimates of where liberals and conservatives stand on each item should be interpreted with caution. Second, I study polarization only in response to one naturally-occurring instance of mobilized science. Studying future instances of mobilized science can provide further validation of the results presented here.

Overall, this study advances our understanding of how mobilized science influences public opinion about scientists on two fronts. First, it offers novel insights into an understudied topic in political science – how scientists' political actions shape public opinion about themselves. Second, it identifies an important practical tradeoff for those involved in the mobilization of science. As scientists organize to combat skepticism and interference from the Trump administration, they may indeed win support from those most congenial to their cause. However, they risk losing support amongst those who are less sympathetic. Whether or not this tradeoff is worth the cost is a question that ought to surround future mobilized science efforts.

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