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The effects of turnout at major climate protests on politically-interested bystanders: a survey field experiment

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Do people change climate-related opinions when they learn that thousands protested? Two survey field experiments tested how turnout at major climate demonstrations shaped politically interested individuals' views in a German national election. Turnout significantly increased perceived movement efficacy, especially among more involved participants, and potentially increased internal political efficacy. Pro-environmental attitudes and vote intentions remained unchanged. Protest days appear to signal collective capacity rather than drive immediate attitude change.

Direct effects of protest turnout

Large-scale protests have been integral to climate movements, most notably the Fridays for Future (FFF) demonstrations. Whereas extensive literature examines the long-term impacts of similar events on the political and media agenda, the immediate, direct effects of climate protests on public opinion remain under-researched, and the first studies yield partly contradictory findings^{1–6}. Even in the general literature on social movements, empirical insights into the direct effects of protest marches—as opposed to entire movements—are rare and usually focus on long-term effects on participants^{7–9} but¹⁰.

In this research brief, we study how public opinion shifts during the day of the protest. Protests are typically prepared by extensive mobilization in the weeks before a march. Interested bystanders often learn about the call to protest in advance, and anticipation and discussion build in the days prior. On protest day, bystanders learn through varied media channels or by walking by whether the mobilization was successful, how many participants took to the streets, and whether a considerable portion of their fellow citizens marched for pro-climate policies. Prior studies show that large-scale demonstrations can signal public support for protesters' demands, that priming for participation in an FFF protest can affect youth attitudes, and that exposure to FFF demonstrations may increase voting for an ecological party^{6,11,12}. However, only one study examined direct effects on protest day: Haas and colleagues randomly routed pedestrians past an FFF demonstration in Berlin, finding no changes in environmental attitudes and vote intentions, but increases in donations to climate causes³.

The elaborate design of Haas and colleagues shows that direct effects are notoriously hard to demonstrate³. In this Brief Communication, we apply a novel experimental design that randomly manipulates survey timing. Our approach is inspired by Jiménez-Sánchez and colleagues, who used

rolling cross-sections over 20 days to document attitude changes around International Women's Day in Spain¹⁰. We invited participants from an existing respondent pool to answer climate-related items in an online survey either on the day before or after protests. This design allows us to identify protest-day effects beyond pre-event mobilization. Our treatment was the publicly available information that FFF realized a substantial turnout. The control condition represents a situation where people might have been aware of the mobilization effort but could only anticipate turnout.

We examined the protests' direct effects on four outcomes. Related to the protests, we considered perceived movement efficacy and individual political efficacy. Related to climate politics, we examined general support for climate policies and the intention to vote for a pro-environmental party. Following, we reasoned that a high realized turnout—tens of thousands of citizens taking to the streets—may function as a signal about descriptive and injunctive norms of support³. Such cues can be processed heuristically and may, in the short term, update people's belief structures. Based on this and acknowledging the stability of political attitudes on polarized issues, we expected that any observable effects would be more likely for efficacy-related beliefs, as the signal of mass mobilization aligns more closely with movements and the engaged citizens themselves than with policy positions or vote intentions. At the same time, in an opportune context such as an election, even small and short-lived changes—particularly among undecided voters—could be consequential, making it worthwhile to examine even these less likely political outcomes empirically.

To this end, we study two nationally salient FFF demonstrations in Germany during a high-attention electoral period. Germany is a major site of climate mobilization¹¹. In the 2021 national election, the climate crisis was a top issue, fueled by catastrophic flooding that killed over 180 people¹³. The first demonstration took place on the Friday before the election (September

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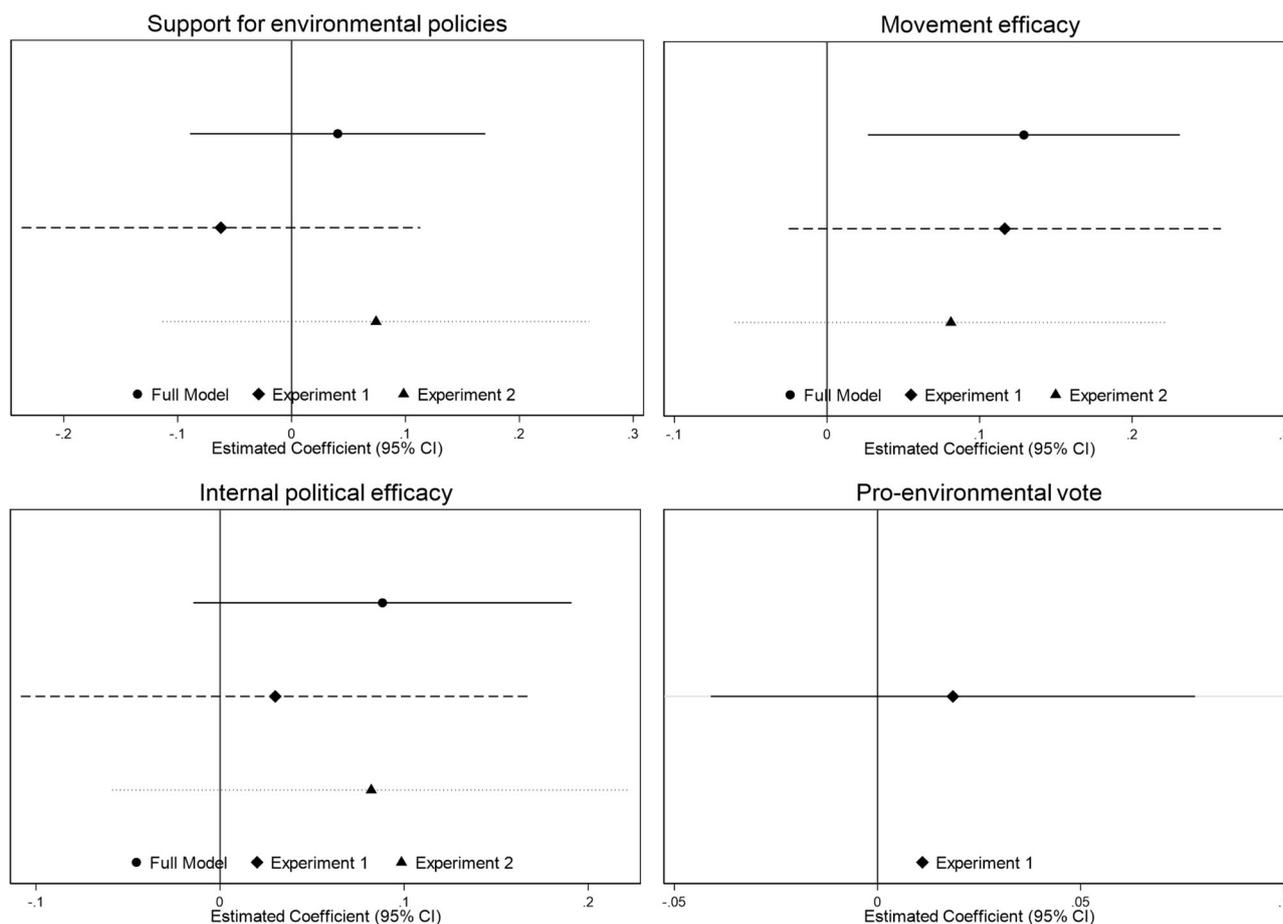


Fig. 1 | Main effects of manipulation on outcome variables. The figure displays estimated coefficients with 95% confidence intervals from the pooled full model (circles) and from models estimated separately for Experiment 1 (diamonds) and

Experiment 2 (triangles) across four outcomes: support for environmental policies, perceived movement efficacy, internal political efficacy, and pro-environmental vote.

24), a nationwide ‘climate strike’ led by a Berlin rally. Importantly, it was the first major national protest after a long hiatus. During the COVID-19 pandemic, FFF protests had largely ceased, and the movement had faded from the top tiers of the public agenda. Moreover, at the beginning of the pandemic, the movement had shifted its social media activity from mobilization toward agenda and frame building¹⁴. As such, the prospects for renewed large-scale mobilization were uncertain.

The protests became some of the largest in the history of the German movement: according to FFF, over 620,000 people joined 470 actions, 100,000 in Berlin alone (police reported a five-figure turnout in Berlin). In the election, the Greens secured ~15% of the seats in parliament—their best result ever. Early coalition talks with the social democratic SPD and the liberal FDP resulted in the publication of the intensively debated policy outline of a possible coalition. The second demonstration followed one week after its release (October 22) and mobilized 20,000 participants to SPD headquarters in Berlin, pressing for a commitment to the 1.5 °C target of the Paris Agreement in the coalition contract. Although there is no systematic analysis, anecdotal evidence suggests that media coverage of the protests was largely neutral. In the absence of violence, criticism mainly focused on pupils’ absence from school. These impressions align with a framing analysis of climate protest in German newspapers in 2022—the year after our focal protests—that shows a strong presence of legal and legitimacy frames and finds that FFF was commonly depicted as a moderate and “reasonable” wing of the climate movement, especially in contrast to the more disruptive tactics of Extinction Rebellion and Letzte Generation. Overtly negative framing was largely confined to right-wing alternative media⁵. see also ref. 15.

We focus on how realized turnout influenced politically interested individuals. This sampling strategy ensures successful treatment: People who closely follow politics are more likely to learn through various channels that FFF mobilizes tens of thousands of citizens. While this design choice increased the efficiency of the data collection, it has a caveat: Politically interested individuals tend to be more fixed in their attitudes, making opinion change less likely. In line with this design choice, we found that realized turnout affects perceptions of the movement, raising its perceived efficacy, especially among bystanders interested in climate issues, but not policy support or vote intentions. Put differently, protest days signal collective capacity rather than shifting crystallized preferences among the politically interested.

Enhancing perceptions of efficacy

We made four observations when regressing various climate-related outcomes on survey timing (see Fig. 1). First, participants responding after the happening of the protest marches did not show statistically significant differences in support for environmental policies compared to those responding before the marches ($b = 0.04, p = 0.54$). Second, post-protest participants reported higher agreement that the climate movement would have an impact with this protest ($b = 0.129, p = 0.013$). The effect was statistically significant with an average increase of 0.13 points on a five-point scale (about 2% of the theoretical range). Third, there was an increase in perceived individual efficacy, yet this can only be considered marginally statistically significant as a two-tailed test ($b = 0.088, p = 0.092$). Fourth, post-protest participants showed no statistically significant difference in their likelihood to vote for the

pro-environmental Green party compared to pre-protest participants ($AME = 0.019$, $p = 0.541$).

Since we have a sample of politically interested participants, we explored whether day-of-protest effects varied for those with a particular interest in climate politics. We found a statistically significant positive interaction for movement efficacy, meaning the protests boosted perceived movement efficacy more among participants with a particular interest in climate politics.

Towards a better understanding of protests' direct effects

The literature on the impact of the climate movement emphasizes agenda building and policy adoption, yet rarely shows how demonstrations directly shape what people think and feel, or do regarding the movement and climate-related policies. Given the central role of the FFF protests as a movement expression, this is a crucial debate. Our results speak directly to it. Examining two highly visible FFF protests in Germany during a politically opportune moment and focusing on politically interested bystanders, we observed that the actual turnout strengthened perceptions of the movement's efficacy. This effect was stronger among those with a particular interest in climate issues. Moreover, we found tentative indications that learning that thousands had protested may increase perceived individual political efficacy. In contrast, the protests did not shift support for environmental policies or vote intentions.

Our findings relate closely to the two other studies on the subject. Haas and colleagues, who examined pedestrians' reactions to FFF protests in the same city, found no changes in climate attitudes, voting behavior, or norm perceptions, but observed an increase in donations—suggesting protests may serve as cues for action rather than triggers of attitude change³. Valentim showed that German municipalities hosting one or more FFF protests recorded higher vote shares for the Green party, accounting for potential selection and confounding effects⁶. However, this analysis used municipal-level data and did not isolate day-of-protest effects. Their additional analysis suggested that underlying attitudinal shifts were strongest among individuals with lower political interest. Taken together, these early studies suggest that direct effects of climate protests are unlikely to follow simple patterns. Beliefs about collective capacities may update, or behavioral cues may be activated, even if crystallized preferences do not shift. This underscores the need for future studies to examine when and for whom direct protest effects occur.

Having underscored the value of future research on the topic, a second contribution of this research brief is to showcase a simple and replicable design for studying day-of-protest effects and their conditions. Scholars could further increase the design's effectiveness in three ways. First, our outcomes were broad, explicit single-item measures capturing relatively stable attitudes. Party preferences, perceived individual efficacy, and general views on climate policy are typically shaped by long-term socialization and are therefore unlikely to shift in response to a single event. Clearer patterns might emerge when incorporating additional outcomes—most notably perceived or desired issue salience—as well as more fine-grained, affective, or implicit measures (e.g., attitudes toward specific policies or warmth toward parties or activists).

Second, while we studied day-of-protest effects, mobilization efforts and the public debate surrounding the protests may have influenced attitudes before the protests¹⁰. Debates about FFF's efforts to mobilize tens of thousands may have served as informational cues about the movement's strength. Media discussions can also unfold in the days following a protest, depending on reactions from public figures, and protests may be framed negatively in ways that counteract the descriptive norms implied by a large turnout. For these reasons, our estimates should be interpreted as a lower bound on potential effects across the broader protest cycle, including both anticipatory and retrospective shifts. Surveying participants continuously over two to three weeks before and after the protest at randomly assigned time points would help to disentangle (a) pre-protest effects of mobilization and media coverage from (b) the actual happening and (c) post-protest

coverage^{5,10,16}. A parallel media analysis could also account for the possibility that negative portrayals cast doubt on the movement's legitimacy.

Third, our sample consisted of adults interested in at least one salient political topic—climate, migration, or housing. To be clear: our lack of strong day-of-protest effects on climate attitudes and vote intentions does not mean turnout had no impact on the broader population. We view our findings as a conservative estimate. Whereas our participants were more likely to learn that tens of thousands protested, they also represent a hard case for attitude change, since they were more likely to hold entrenched opinions and strong party ties. For these individuals, ceiling and floor effects likely constrained measurable change. Future studies should therefore include politically less engaged and undecided populations. In doing so, researchers should verify treatment exposure.

Finally, FFF protests are recurring events. Even if our case is exceptional in featuring two large protests in a row after a long hiatus, the recurrence raises the question of whether repeated exposure diminishes or accumulates effects. Valentim found that the relationship between a municipality's exposure to a FFF protest and vote share for the Greens rose with the number of protests, up to a point⁶. Most likely, the accumulated effects depend on various conditions as well (e.g., time in between protests, trends in participation).

Understanding the direct effects of climate protests is vital for assessing their societal relevance. For the climate movement, our study shows that large-scale protests directly increased public perceptions of the movement's efficacy (and possibly individual efficacy) in a segment of the population highly attentive to politics. Even if we did not find shifts in climate attitudes and vote intentions, changes may have occurred in other strategic subgroups - which matters, for example, when the size of a demonstration sways newspaper editors or politicians before a specific policy vote. Finally, protest organizers must make strategic choices with limited resources. A better understanding of protest effects can inform decisions about the trade-off between reaching wider audiences and improving the experience of those present.

Methods

Research ethics

We implemented two identical experiments in which we randomly invited survey participants before or after a FFF protest and then compared beliefs, attitudes, and behavioral intentions related to climate policy^{17,18}. As is common in many political science and sociology departments in Germany, the ethical evaluation of the study was conducted within the departments of the first author. Since no concerns were expressed, an external ethical review was waived. The study was conducted in full accordance with the Declaration of Helsinki. All participants were informed about their rights and the content of the study. They gave written informed consent.

Sample and procedure

We draw on a non-probability sample. Participants came from a pool of people recruited for an earlier study. The recruitment for the initial study (not reported here) had happened seven weeks earlier via advertisements on Twitter and Facebook¹⁹. The ads specifically targeted people interested in migration, climate, and housing - three of Germany's most prevalent political issues at the time. The ads were formulated to ensure that people from the whole opinion spectrum participated. Individuals were routed to a survey hosted on an external server via a link. Participants were filtered out if they reported having no interest in any of the three topics. After completing this earlier study, they could leave their email addresses if they wished to be contacted for future studies.

We invited all contacts in this pool via email to participate in the current experiments. We randomly split the list of email addresses ($N = 2643$). To the first half of the email addresses, we sent the invitation to our online surveys on Thursday at midnight before the FFF demonstration (i.e., September 23, resp. October 21, 2021, at 12:01 a.m.). The second half of email addresses received the invitation on Saturday at midnight after the protests (i.e., September 25, resp. October 23, 2021, at 12:01 a.m.). On each

day, we sent out two reminders and emphasized the importance of participating during the day. Surveys were closed at 12:00 a.m. We consider those who answered our questionnaire on the day before the respective demonstrations, the control group, and those who responded on the day after the respective protest as our treatment group. This definition results in the following sample sizes: pre-election experiment $T_{\text{Treatment}} = 565$; pre-election experiment $C_{\text{Control}} = 603$; post-election experiment $T_{\text{Treatment}} = 473$; post-election experiment $C_{\text{Control}} = 561$.

When inviting participants, we had to strike a delicate balance: The questionnaire's focus was solely on the FFF, and as such, we assumed that we would have lost participants' trust if we pretended it was about another topic. On the other hand, we had to avoid the potential participants not interested in (or opposed to) the climate movement, systematically opting out of participation after reading the invitation. As such, we used generic formulations in the invitation emails and the consent that only mentioned the protest en passant and did not convey any information about the nature or size of the protest (see Supplementary Table 11).

Sample characteristics can be found in Supplementary Table 1. We achieved satisfying variance in socio-demographics; however, due to our recruiting strategy, people with above-average political interest, opinion strength, and activism are overrepresented in our sample. The high levels of political interest are advantageous for our design as they ensure that participants have heard about the FFF protests, which made headlines for days. Notably, the sample is relatively diverse regarding opinions on climate policies, ranging from FFF activists and sympathizers to opponents to undecided or uninterested bystanders (i.e., participants interested in one of the other two topics).

Finally, even though we randomly split the list of emails before each protest, we invited participants from the same pool so that 1218 respondents participated in both surveys. We statistically controlled for the influence of double participation (see below).

Measures

After giving informed consent, we informed participants that the FFF movement called for a national climate strike. Then, participants answered several questions. First, as a treatment check, we asked whether participants had heard about the (call to) protest. Second, we assessed support for environmental policies by asking participants for their agreement with the statement that the 'national government should do anything to stop climate change [Die Bundesregierung sollte alles dafür tun, um den Klimawandel aufzuhalten].' Third, we measured perceived movement efficacy by asking for agreement with the statement that 'the climate movement will have an impact with this campaign [Die Klimabewegung wird mit dieser Aktion etwas bewirken].' Fourth, we measured perceived individual political efficacy by asking for agreement to the statement that 'either way, people like me have no influence on what the government does [Leute wie ich haben so oder so keinen Einfluss darauf, was die Regierung tut].' We inverted this variable so that higher agreement implies higher efficacy. All three items' answers ranged from 1 "completely disagree" to 5 "completely agree." Finally, we measured vote for a pro-environmental party by asking participants to whom they would vote in the national election. Answer options included all parties in the parliament and an option for all other parties, non-voters, and non-eligibility. We recoded the variable into a binary variable to contrast voting for the pro-environmental Greens or all others.

Analyses

We employ linear regression models and interpret the mean differences between treatment and control groups. Main models can be found in Supplementary Tables 2–5. Since the vote choice lay in the past for all participants at the time of the second protest around the coalition negotiations, we only test the effects on this variable for the pre-election experiment. We ran separate analyses for the other three outcomes: For the pre-election experiment and the post-election experiment, and for both experiments pooled. For the latter models, we clustered standard errors on

the individual level to account for repeated observations. The models produced similar substantial results, so we report the results from the pooled experiments, as those models have the highest statistical power.

The treatment was successful, as almost all participants in the post-protest sample had heard about the event (first experiment: post-protest 95% vs. pre-protest 88%; second experiment: post-protest 84% vs. pre-protest 63%). Although we randomly allocated respondents into treatment and control groups, the final sample composition of both groups in the second experiment shows signs of selectivity, most likely due to non-response. To identify systematic differences between the treatment group and the control group, we employed stepwise logistic regression analyses and stepwise excluded variables that could not significantly explain differences between the two groups. We added all variables that significantly explained differences between the groups as control variables in our main models (i.e., household size, frequency of political engagement, and position on climate politics; see also Supplementary Note 1).

Finally, we conduct a moderation analysis to test whether the effects markedly differ for people with a particular interest in climate and the environment. For this analysis, we interacted the filter variable from the baseline study, interest in climate vs. the other two issues, with the treatment and re-ran all models (see Supplementary Tables 6–9).

For all analyses, we base our interpretation on two-sided unadjusted p values ($\alpha = 0.05$; see also Supplementary Note 2).

Data availability

The data to replicate the analysis can be found at: https://osf.io/s2b8p/overview?view_only=424c183b115d48638ad747ed6c655086.

Code availability

The code to replicate the analysis can be found at: https://osf.io/s2b8p/?view_only=424c183b115d48638ad747ed6c655086. Stata 18 was used to analyze the data.

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Conceptualization (main idea, theory): E.B., S.H., J.J., D.S., J.S. Funding acquisition: S.H., D.S., J.S. Methodology (design, operationalization): J.J.,