Online engagement with 2020 election misinformation and turnout in the 2021 Georgia runoff election

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Following the 2020 general election, Republican elected officials, including then-President Donald Trump, promoted conspiracy theories claiming that Joe Biden's close victory in Georgia was fraudulent. Such conspiratorial claims could implicate participation in the Georgia Senate runoff election in different ways—signaling that voting doesn't matter, distracting from ongoing campaigns, stoking political anger at out-partisans, or providing rationalizations for (lack of) enthusiasm for voting during a transfer of power. Here, we evaluate the possibility of any on-average relationship with turnout by combining behavioral measures of engagement with election conspiracies online and administrative data on voter turnout for 40,000 Twitter users registered to vote in Georgia. We find small, limited associations. Liking or sharing messages opposed to conspiracy theories was associated with higher turnout than expected in the runoff election, and those who liked or shared tweets promoting fraud-related conspiracy theories were slightly less likely to vote.

Twitter | elections | misinformation | turnout

Before and after the 2020 general election, President Donald Trump, Republican politicians, and prominent conservative commentators promoted conspiracy theories that Democrats were "stealing" the election. Much like similar rhetoric in past contests, these conspiracy theories cast aspersions on tallied votes, especially in Democratic strongholds, and were used to justify subsequent attempts to restrict voting opportunities. Unlike past rhetoric, these messages continued at unusually high levels long after Election Day and, to many observers, appeared to include calls to overturn the election results outside of the democratic process. Trump supporters' attack on the Capitol on January 6, following a rally at which Trump repeated these claims, only reinforced this view on the intent of these messages.

Conspiracy theories regarding election theft, and more general rhetoric undermining faith in elections' outcomes, are not new in US politics. There are a variety of reasons to be concerned about such rhetoric—not least of which that it undermines faith in democracy (1). However, we know less about how beliefs regarding such conspiracy theories correspond to real-world democratic participation. There are multiple possibilities in this particular case, which offer competing expectations. Conspiracy theories regarding election theft could have signaled to adherents that their votes would not affect the runoff elections' outcomes, making them less likely to turn out. They could also have led adherents to perceive that the Republican Senate candidates in Georgia, by campaigning on the fact that their victory was necessary to prevent a Democratic trifecta in the House, Senate, and presidency (2), declined to demonstrate sufficient commitment to Donald Trump (and, by extension, the conspiratorial claims) and were therefore not worth supporting. However, election conspiracy theories could also encourage participation in subsequent elections by stoking political anger, directing adherents to continue democratic participation as a means of rectifying political opponents' previous malfeasance. Finally, conspiracy theories could also anger nonadherents who are targets of the conspiracy theory—in this case, Democrats and, by extension, Democratic voters—who would then be expected to turn out at higher rates.

It is important to clarify that elite promotion of conspiracy theories about election theft undermines democratic norms, regardless of their potential associations with citizen-level behavior in the short term. However, it is nevertheless important to document the nature and extent of such relationships, so as to build toward understanding them. As discussed below, there are a variety of plausible causal mechanisms that offer competing expectations regarding the relationship between stances on election-theft conspiracy theories and subsequent voter turnout. Each mechanism offers its own implications for the health of US democracy. While we do not isolate a particular mechanism here, our observational account renders some more plausible than others and can serve as a foundation for further work in this area.

Significance

After the 2020 election, Republican officials, including then-President Trump, publicized conspiracy theories claiming the election was "stolen," and Republican voters reported reduced faith in electoral institutions in surveys. We test whether public stances on these conspiracy theories online were associated with a behavioral indicator of faith in elections—voting—in Georgia's subsequent Senate runoffs. Engagement with election conspiracy theories carried small, but detectable, associations with turnout: positive among those opposing such claims and negative among promoters. These observational findings among social media users document the 2020 election-theft claims' correspondence with real-world, offline behavior. Those promoting conspiracy theories questioning the legitimacy of the US electoral process were, at the same time, somewhat less likely than defenders to participate in it.

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We examine a specific case, testing for relationships between public stances on conspiracy theories concerning the 2020 general election and participation in the subsequent runoff elections for the US Senate in Georgia. In this, we test whether Georgia citizens who publicly endorsed or rejected conspiratorial content on Twitter prior to that state's Senate runoff elections turned out in those elections at different rates than similarly situated Twitter users in Georgia who did not. If those who endorse such conspiracies vote at significantly lower rates, it would be consistent with journalistic accounts suggesting that election conspiracies hurt Republican Senate candidates in Georgia by demoralizing their base supporters (3, 4).

We analyze two unique datasets that link Twitter users to external indicators of their political attitudes and behaviors. Our primary dataset links Twitter users to voter file records in Georgia. For this matched sample of users, we identify those who expressed stances regarding election-related conspiracy theories (either endorsing or rejecting them) by examining whether they retweeted or liked tweets labeled for such stances by Abilov et al. (5). (For likes, we use Twitter's "decahose," or 10% sample, discussed in greater detail below.) We then estimate the relationship between taking such stances and voting in the 2021 Georgia runoff elections, controlling for a variety of observable characteristics, including past vote history, demographic characteristics, and additional forms of online engagement. This linkage allows us to test whether real-world, public endorsements of conspiracy theories are associated with real-world voting behavior. Further, while work on the effects of voter-suppression attempts typically focus on targeted and potentially disenfranchised groups, the unusual valence of the allegations (i.e., that the election was "stolen") may be associated with participation among those hoping to delegitimize others' votes.

We also evaluate a separate dataset of Twitter users who volunteered their handles in the context of a public-opinion survey that, among other things, asked about beliefs regarding the integrity of the 2020 general election. Preliminary work indicates that, unlike beliefs regarding many other forms of misinformation or conspiracy beliefs with partisan valence (6, 7), survey-based beliefs regarding "the Big Lie" that the 2020 general election was stolen appear to be stable and sincere (8, 9). In our analysis of survey-linked Twitter users, we find that users who endorse such claims online are significantly more likely to report corresponding attitudes in surveys, supporting the expectation that public stances regarding the conspiracy theory reflect sincerely held beliefs.

Our analysis is observational in nature and does not isolate a mechanism that produces the relationships we observe. In order to identify the causal effects of 2020 election conspiracies on 2021 voter turnout, we would need to be able to exploit random or as-if random exposure to such conspiracy theories before measuring our outcome of interest—and perhaps independently of other partisan talking points.[*] As essentially the entire country was "treated" in that the conspiratorial claims were widely publicized and the slant of coverage at the media source level was likely to be reported along with many other partisan messages, we expect focused and as-if random exposure to be limited in our observational context. Furthermore, experimentally inducing random exposure that carried the potential to negatively affect real-world voter turnout and faith in the electoral process would

be unethical (see ref. 19 for related discussion). This being the case, we evaluate the quantity we can estimate—likelihood of participating in the 2021 runoff election conditional on endorsing (or rejecting) 2020 election conspiracy theories—in terms of how consistent it is with hypothesized mechanisms specified in prior literature and after accounting for all relevant observable characteristics. We further consider possible (nonrandom) exposure to these conspiracy theories by analyzing associations between Twitter following relationships in 2018 and turnout in 2021, as these following relationships partly drive what users see on Twitter. After presenting our results, we discuss alternate potential mechanisms that we cannot rule out, given the data we observe.

For example, it is possible that the types of citizens who endorse an election conspiracy would have different turnout rates in nonpresidential elections from those who do not for reasons other than the conspiracy theory itself. Those who believed that the 2020 general election was stolen from Donald Trump might have been especially enthusiastic about Trump in particular—and less so about other Republican politicians—to begin with. These voters would, in theory, be less likely to turn out in an election without Donald Trump on the ballot, even in the absence of fraud-related conspiracy theories. We limit this concern by including a range of covariates in our models that could otherwise confound the association between variation in turnout and promotion of stances on election conspiracy theories. These include individuals' past vote history—including midterm elections—as well as demographic characteristics, inferred partisanship, overall user activity, and engagement with fraud promoters'/detractors' tweets (including those sent by Donald Trump), irrespective of whether they were fraud-related. In addition, it is less clear how the absence of Donald Trump on the ballot might implicate turnout among users who reject conspiracy theories regarding the 2020 general election.

Background

Structural Precursors to 2020 Election Conspiracy Theories. Sustained democratic governance requires that losing parties perceive winning parties as holding power legitimately. Not only must elections actually be conducted freely and fairly, but their participants—both candidates and voters—must perceive them to have been conducted freely and fairly. If democratic participants cease to believe that elections legitimately confer power, democratic self-governance breaks down (20).

A variety of factors are straining perceptions of democratic legitimacy in the United States. Politically, the two major parties have become more ideologically distinct from one another at the elite level (21, 22), raising the stakes of electoral competition. At the same time, control over government has become more competitive, with power changing hands more regularly. These factors create incentives for the parties to divert resources away from crafting policy with their opponents and toward messaging against them (23). Rank-and-file partisans have taken these cues, reporting increased hostility toward the out-party in general (24), and out-party elites in particular (25), as the stakes of electoral competition have clarified.

Recent decades have also raised the salience of institutional features that weaken democratic legitimacy. Two of the last four individuals to win the presidency entered the Oval Office without having won a plurality of votes, with such discrepancies introduced by the Electoral College (26). Over a similar time period, states across the country have considered and adopted a variety of reforms to election administration widely perceived as attempts

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[*]Estimating effects of specific claims presents distinct challenges relative to already-impressive efforts to estimate overall media effects by source, such as partisan TV (10), curated news feed (11), populist radio (12), social media (13), or independent media under authoritarian regimes (14–16). An increasingly nationalized political and media environment (17, 18) also limits variation in content from location to location.

to engineer electoral outcomes—most prominently, voter identi-fication (ID) laws. At the state level, passage of voter ID laws is likelier in competitive states controlled by Republicans (27); at the legislator level, support for such laws in competitive states is most likely among Republicans with large minority constituencies (28). Such laws are justified on the grounds that they are necessary to prevent what would otherwise be widespread fraud (predomi-nantly on the part of Democrats and racial minorities), despite an absence of evidence (29–31).

Indeed, Republican elite cues regarding illegal voting are strong and consistent to the point where winning elections does not dispel perceptions of widespread voter fraud in those very elections among strong Republican partisans (32). These cues significantly reduce confidence in election integrity among Republicans and are not easily corrected by mainstream sources (33). At the same time, the timing, content, and partisanship of these laws encourage corresponding suspicions among Democrats that their political opponents are attempting to engineer electoral outcomes by un-necessarily restricting who is allowed to vote in the first place—to the point that the very concept of voter fraud, for Democrats, has become entangled with voter suppression (34).

Finally, the 2020 election was peculiar in that it took place during the COVID-19 pandemic. Concerns regarding the safety of having citizens congregate in polling places for extended periods of time led states to make a variety of changes to their election-administration procedures—most notably, allowing more citizens to vote early or by mail with fewer restrictions. Partisan differences in concern about the COVID-19 pandemic (35, 36) led more Democratic voters to take advantage of these accommodations, substituting in-person Election Day voting with early or mail-in voting [there is little evidence that the effects of such ac-commodations extended beyond this form of substitution (37)], with Republican elites claiming that they provided ample new opportunities for voter fraud.

These trends provide crucial context for the constellation of conspiracy theories promulgated by Donald Trump, Republican politicians, and prominent conservative pundits leading up to and following the 2020 election, which served to undermine Republican voters' faith in its outcome. Deep partisan polarization combined with strong, longstanding suspicions of regularly occur-ring voter fraud set an environment in which many Republican partisans likely did not need additional elite cues to harbor suspicions regarding a Joe Biden victory. Nevertheless, sustained cues from a variety of Republican elites—including President Trump himself—combined with new pandemic-related voting procedures cultivated deep distrust in the results of the 2020 election among members of the losing party.

Who Endorses Which Political Conspiracy Theories. Uscinski and Parent (38) define a conspiracy as a "secret arrangement between two or more actors to usurp political or economic power, violate established rights, hoard vital secrets, or unlawfully alter government institutions." Sometimes conspiracies are real. The Watergate break-in, for example, was the product of a conspiracy. However, theories regarding particular conspiracies are frequently unsubstantiated, even as beliefs in such theories are consequential.

There is no partisan or ideological monopoly on endorsing political conspiracy theories (39, 40). Rather, people are likelier to endorse such theories when they serve ideological or psychological goals—particularly among those who are high in political knowl-edge and low in political trust (41)—and in response to political losses as opposed to victories (38).

This dynamic is, in many ways, intuitive. More politically knowledgeable and sophisticated citizens are more likely to be aware of political conspiracy theories and are more aware of how those theories implicate their broader political worldviews. There is also more of an incentive to reach for evidence-free explanations for identity-threatening phenomena, such as political losses, as op-posed to identity-affirming phenomena, such as political victories. In this sense, conspiracy-theory endorsement is similar to other forms of motivated reasoning (42, 43), including endorsement of political misinformation (44, 45).

Much of this existing work on beliefs in conspiracy theories seeks to explain why they manifest in the absence of elite cues. That is, given that classical accounts of public-opinion formation emphasize the central role of political elites (46) and that political elites typically do not overtly and consistently emphasize conspir-acy theories, their prevalence and persistence in the mass public is puzzling (39). However, beliefs in a specific conspiracy theory are considerably less puzzling when the theory is endorsed—and, in many cases, actively promoted—by many prominent members of a major political party, including that party's most visible leader.

In this respect, there are both bottom-up and top-down dy-namics that, together, account for widespread suspicions regarding the legitimacy of the 2020 general election among all manner of Republican citizens. Not only might such beliefs have been widespread among politically attentive, highly ideological Re-publicans following an electoral defeat in the absence of any encouragement from the formal party leadership, but these sus-picions were explicitly encouraged by President Donald Trump, Republican elected officials, and conservative commentators both before and, especially, after the 2020 general election. As such, not only were such beliefs widespread among Republicans, they were the norm. In December 2020, 77% of Republicans reported that they believed there was widespread fraud in the previous month's general election (47), and 72% indicated that they did not trust that the results of the 2020 election were accurate (48). Preliminary research indicates that these endorsements of "the Big Lie" are sincere, and within-subjects measures indicate that they are relatively stable over time (9).

What Engagement with Conspiracy Theories on Twitter Rep-resents. It is important to clarify what our key independent variable—engagement with 2020 election conspiracy theories on Twitter—represents, both in the context of the platform itself and in the context of the broader information environment. Overall, those taking public stances online, especially for con-tentious political issues or misinformation, tend to be exposed to and engage with more content in general,[†] be more confident and/or less ambivalent in their stances (and perhaps overconfident generally),[‡] and take stances because doing so is important to their

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[†]To expand, we note that engagement requires exposure. The population of users who like or retweet a given tweet is a subset of the population who saw the tweet in the first place. This exposure, in turn, depends on selection into following specific accounts, algorithmic feed ranking of content from those and other accounts, and being on Twitter at all to see that content. We do not observe the full exposure process, as Twitter exposure data are not made available to independent researchers. Given the overall salience of the 2020 election and related claims of election theft, we anticipate that if someone was on Twitter during the postelection period, then they would have been very likely to be exposed to such claims [though not necessarily the high-precision content included in the Abilov et al. (5) data]. To account for mere exposure through high activity effects (that might not reflect the influence of the content or agreement with it), we control for activity using logged values of likes and retweets, control for likes and shares of fraud-promoting and -detracting users generally, and analyze highly active users separately.

[‡]Those more likely to share misinformation tend to be overconfident in their ability to identify misinformation (49). Twitter users who are still ambivalent or uncertain about salient and emerging political issues on surveys do not appear to express that ambivalence or uncertainty on Twitter, suggesting that those who do take such public stances are those with more settled and strongly held views (50).

political identity and activism.[§] Public engagement is therefore likelier to correspond with behavior than private beliefs, which we anticipate would be more weakly held and/or less politically and socially important to the individual.

In studying the relationship between engaging with election conspiracy claims and turnout, we will analyze two poles of confident beliefs and expressed political identities—engagement with content that promotes the claims and engagement with content that detracts from them—relative to lack of engagement, controlling for levels of engagement with other forms of content on Twitter. To independently support the confidence side of this engagement variable, we report analyses in *SI Appendix* (also described below), finding that those liking or sharing tweets that promote or oppose the election conspiracy theories tend to state that they are either not at all confident or very confident in the fairness of the 2020 election.

We also note that the group who does not engage with election conspiracy theories is perhaps as important for our analysis as the groups who promote or detract from them, as these users form the basis of our comparisons. These users are more heterogeneous because they include both those without beliefs regarding the underlying claims and those who hold such beliefs, but do not publicly express them. Because partisanship is closely related to privately reported beliefs regarding election conspiracy theories on surveys, we can control for partisanship, and attempt to hold partisan influences on beliefs constant by proxy, to estimate associations with turnout for higher-confidence public promoters (or detractors) compared to lower-confidence passive believers (or nonbelievers).

Potential Relationships between Election Conspiracies and Turnout. There are multiple ways in which widespread claims regarding attempts to steal elections could affect, or be merely associated with, turnout. We discuss those that we consider most plausible here—some of which are supported by our findings and some of which are not—acknowledging that the potential mechanisms we list are not exhaustive.

These explanations include effects of election-theft rhetoric on efficacy and faith in the electoral process, opportunity costs of promoting such rhetoric at the expense of the promotion of Georgia Senate candidates, effects of election losses generally (which opposition campaigning after a concession might or might not counteract), and vagaries of the 2020 and 2021 election campaigns specifically (e.g., effects of voting by mail).

Anger and efficacy. First, election conspiracy theories could be associated with increased turnout among individuals who express any stance regarding them—either promoting or rejecting their claims—due to their potential to elicit anger among both groups. In the context of appraisal theory (53), anger emerges in response to threats seen as being under one's control—and, as a consequence, increases people's willingness to expend resources to address said threats. Anger has previously been associated with news interest (54), political mobilization (55, 56), and party loyalty (57). Here, those who believe 2020 election conspiracy theories may see the conspiracy as a threat to group interests or democracy itself. Those who oppose the claims may perceive threats out of concern that such claims could be used as a pretext

to justify subsequent voter-suppression efforts (34) or overturn the 2020 election result through undemocratic means (8). If these perceived threats were seen as being under threatened individuals' control, we would expect them to be associated with an increased likelihood of voting in subsequent elections.

However, one of the core implications of these conspiratorial claims—that Democrats flooded ballot boxes with illegal votes and/or tampered with ballot-counting procedures—is that legal votes do not directly correspond with electoral outcomes. Belief in these claims may therefore be associated with reduced external political efficacy, or the belief that the political system will be responsive to one's demands (58). External political efficacy has previously been associated with voter turnout (59, 60), and erosion of trust in the electoral process has previously been associated with decreased turnout among supporters of opposition parties and losing candidates (61, 62). These previous findings suggest that endorsing 2020 election conspiracy theories could be negatively associated with 2021 runoff election turnout.

Negative evaluations of co-partisan candidates. Independently of political efficacy, those who promoted conspiratorial claims regarding the 2020 general election may have penalized the 2021 Republican Senate candidates for being insufficiently supportive of such claims and then-President Trump's efforts to act on them. Such claims appeared to pose strategic challenges for the Republican Senate candidates. On the one hand, they, at times, endorsed claims of widespread voter fraud, supported a lawsuit to overturn the 2020 election result (63), and called on Georgia's secretary of state, Brad Raffensperger, to resign prior to the runoff election (64). However, they also, at times, acknowledged Joe Biden's victory (65)—particularly when arguing that the runoff election represented voters' last chance to deny the Democratic Party a trifecta in the House, Senate, and presidency (2).

While emphasizing that the runoff election's potential to serve as a check on an incoming president's power was consistent with past research finding that some voters have sincere preferences for divided government (66), this accepted the premise that Joe Biden would be inaugurated as president on schedule. This amounted to either a rejection of the conspiracy theory or, potentially worse from the perspective of an adherent, capitulation to the conspiracy itself. As such, voters who sincerely believed the conspiracy theory and believed that Donald Trump could (or even would) eventually succeed in his attempt to overturn the election (9) may have seen the Senate Republican candidates as insufficiently supportive of Donald Trump and would therefore be less likely to turn out as a result. If this were the case, the conspiracy theory would still produce a negative relationship with turnout, but it would operate through voters' evaluation of the available candidates (and their attempts to improve their election chances through previously effective campaign strategies).

Disappointment and losing power. Beyond specific narratives concerning the 2020 general election, it is possible that supporters of Donald Trump would be less likely to vote in the 2021 runoff because a 2020 general election loss would have caused disillusionment with the electoral process, regardless of whether Trump and other Republican elites had so vigorously promoted election-theft claims. This disillusionment could be accompanied by conspiracy beliefs, as conspiracy beliefs are likelier to emerge in response to identity-threatening events, including electoral losses (38). There is a well-established connection between winning (losing) elections and citizens' (dis)satisfaction with democracy, though recent work suggests that this association depends on whether one's party actually holds power—not whether one feels as though their party won the election (67). [We note that a subset of those who believed the 2020 election was stolen also

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[§]Sharing information on social media is also, at times, intended as an expression of the sharing user's political identity (51). In this context, when an individual endorses a conspiracy theory on Twitter, they are not only conveying information, but they are signaling that they are the kind of person who believes that information. In a similar vein, some users appear to share information primarily for its social value and reduce the amount of misinformation they share when experimentally encouraged to think about accuracy (52).

believed that evidence proving such claims would lead to Trump being reinstated as president later in 2021 (9).] Seeing electoral losers stop voting due to dissatisfaction with democracy would be normatively concerning and could reflect democratic erosion. However, in the US case, this could be due to partisan polarization generally.

While not a perfect comparison, we note that this does not seem to have happened for Republicans in 2008 following Barack Obama's victory over John McCain. In Georgia's subsequent Senate runoff election that year, Republican Saxby Chambliss comfortably defeated Democrat Jim Martin by a 57.4 to 42.6 margin after holding a narrow 49.8 to 46.8 lead among general election voters in the first round. Further, while a Fox News poll conducted in 2020 found that Republicans were significantly more likely than Democrats to state that the 2020 election made them less likely to vote in the next presidential election, no such partisan difference was found for Democrats when the same question was asked in 2017.[¶] However, the 2020 survey was conducted in December 2020, while the previous survey was fielded in February 2017—and it is conceivable that this effect is a very short-lived one.

Additional Potential Contributors to Differential Turnout. The above is not an exhaustive list of factors that could be associated with differential rates of voter turnout among those who publicly take varying stances on election conspiracy theories.

For instance, it is possible that turnout in this particular election is related to longer-standing (lack of) faith in institutions and/or tendencies to endorse fraud-related conspiracy theories for reasons unrelated to this specific fraud-related conspiracy theory.[#] In this vein, although not necessarily a confounder, campaigns for and against voting by mail during the COVID-19 pandemic—related to election-theft concerns among Republicans—may have been correlated with promotion of and detraction from conspiracy-theory claims after the election. To the extent that the availability of mail-in voting increases turnout, for which is there is competing evidence (69), we could plausibly see lower drop-off in turnout among those voting by mail during a somewhat lower-salience (though still very high turnout) election.[‖] Another possibility is that, rather than operating through anger or efficacy, deciding whether to vote after having taken a public stance on the integrity of one's elections is a form of cognitive dissonance reduction—voting (or not) so as to maintain consistency with one's publicly expressed stance (we thank an anonymous reviewer for raising this point). In addition, we do not rule out on-the-ground campaign- and ad-spending effects, although there were comparable and historic levels of campaign spending (71).[**]

Last, it is possible that media coverage and the overall information environment in late 2020 and early 2021 contributed to differential turnout between Democrats and Republicans. However, it is extremely difficult to consider this information environment independently from 2020 election conspiracy theories. Voter-fraud allegations were a central feature of what was arguably the dominant political news story of that period—President Trump's attempts to overturn the 2020 election result, including efforts to directly pressure election officials in Georgia (72). Extensive coverage of the 2020 election could have displaced coverage perhaps more beneficial to Republican Senate candidates, including messages about the potential to counterbalance a Democratic presidency (2, 66).[††]

Overall, these points underscore the extent to which the ubiquitous nature of election conspiracy theories at the time makes causal identification prohibitively challenging in this setting. Without some form of complex random assignment (e.g., as-if randomly sequestering potential voters prior to the runoff to prevent exposure to election-tampering claims and/or 2020 election-outcome news), we cannot rule out alternate mechanisms entirely, and it is also difficult to fully separate many alternate mechanisms from stances on election conspiracy theories in their own right. Our goal here is to document the extent to which we observe associations consistent with potential causal mechanisms, leaving precise identification of such mechanisms to future work—perhaps in future elections.

Data and Methods

We combine Twitter data and Georgia voter records to assess associations between publicly promoting stances on election-fraud claims and voter turnout.

Our tests evaluate whether liking or retweeting posts promoting 2020 election conspiracies on Twitter was associated with turnout in Georgia's 2021 runoff elections. We compare these associations to analogous tests based on likes and retweets of election-fraud-related tweets that detracted from election conspiracy claims. In short, we estimate whether engagement with conspiracy theories concerning fraud in the 2020 general election was associated with the likelihood of voting in another competitive, high-salience election that immediately followed.

While neither likes nor retweets amount to explicit endorsements of the underlying tweet, both are much more likely to represent agreement than not for reasons discussed above. This is especially likely in recent years, following Twitter's introduction of "quote tweets"–a feature that allows users to comment on posts when sharing them. Recent research finds that in the relatively rare instances in which politically engaged users share content from political opponents, it is often accompanied by a negative comment in the form of a quote tweet (73). We therefore exclude quote tweets from our analysis and assume that likes and retweets are, in expectation, endorsements of their associated content.[‡‡]

In addition, we note the particular value that including likes alongside retweets as endorsements adds to our analysis. A user's likes, while technically public, are generally only visible if someone goes looking for them. When a user likes a tweet, they do not do so with the expectation that those who follow them will see what they liked. The reverse is true for retweets, which pass the underlying tweet on to one's followers and are therefore, by definition, intended as public expressions. Put simply, including users' liking behavior allows us to identify additional users who took stances on election-related conspiracy theories despite not publicly sharing those stances with their followers.

[¶]See ref. 68. Surveys are archived at the Roper Center for Public Opinion Research: https://ropercenter.cornell.edu/ipoll/study/31118142 and https://ropercenter.cornell.edu/ipoll/study/31114248.

[#]At the same time, our survey-based results (discussed below) indicate that those endorsing fraud conspiracy theories appear to be particularly susceptible to partisan messaging—and perhaps would have been affected by messages to turn out to vote in the runoff (e.g., to counterbalance a Democratic president after an accepted Republican loss) were they as prevalent as the fraud claims.

[‖]Previous work has found that voting by mail became increasingly polarized along partisan lines in 2020 (70). Unfortunately, the Georgia vote-history file does not distinguish early in-person voters from those voting by mail, so we cannot test this possibility in our data.

[**]Despite comparable and historic levels of campaign spending (71), the Republican campaigns may have failed to mobilize those endorsing conspiracy theories for reasons unrelated to those stances, and the Democratic campaigns may have been more successful mobilizing those opposing the conspiracy theories for reasons unrelated to their stances.

[††]We highlight in *SI Appendix*, Fig. S12 that Republican Twitter users were substantially less likely than Democrats to begin mentioning Senate runoff candidates after the 2020 election—and remained more likely to have ever promoted fraud claims than to have ever mentioned a co-partisan Senate candidate until near the end of the interelection period. This pattern could be driven by a displacement effect, or an unwillingness to quickly shift attention to the next election after a loss—though we do see a small shift among Republicans just after multiple news outlets called the election for Biden.

[‡‡]This follows a similar intuition as using following behavior to infer users' ideal points in political space. Despite instances of users following politically dissimilar accounts to escape their proverbial bubbles, follows are, in expectation, homophilous (74, 75). Indeed, recent advances in inferring Twitter users' stances on specific political topics explicitly make this assumption with respect to retweets (76).

To better understand the beliefs of the public promoters of and detractors from fraud claims online, we further describe associations between activities on Twitter (the same independent variables we use in our turnout analyses) and attitudes regarding election conspiracy theories among a separate sample of survey respondents linked to Twitter accounts. Most of these survey findings are presented in *SI Appendix*. As we might expect, those who promoted (or opposed) fraud claims after the election were more likely to lack confidence (or, for opposed, have confidence) in the fairness of the 2020 general election.

Finally, we examine associations between potential exposure to conspiracy-related content and turnout by considering the number of fraud-promoting/detracting Twitter users followed by a voter in 2018, as these following relationships help determine the content presented to a Twitter user. (The feeds of Twitter users contain posts and activities of users' Twitter "friends," i.e., who they follow.) The primary limitation of this approach is that we cannot say for sure that users who were potentially exposed to more fraud-related content by following more of the associated accounts were actually exposed to more of the content in question. It is also possible that exposure to conspiracy-related content would carry different associations with subsequent voter turnout than engagement with said content. However, this additional analysis is substantively useful for two reasons.[§§] First, many Twitter users do not tweet frequently, or do not tweet about politics, but still use the website as a source of political information (78). Second, as discussed in *SI Appendix*, section S4, following behavior is even more closely associated with beliefs regarding the 2020 general election's fairness reported in a contemporaneous survey than our engagement-based measures. As such, these results can help speak to similarities and differences between a broader swath of Twitter users and the smaller (but still sizable) set who publicly engage with claims regarding the integrity of the 2020 presidential election.

Data. Twitter data primarily come from two sources: 1) a large sample of Twitter accounts with tweet histories since 2018, and 2) a corpus of fraud-related tweets from Abilov et al. (5). Additional linked Twitter and survey data were collected via the COVID States Project (https://www.covidstates.org/), a large-scale, multiwave online survey that, among other things, asks respondents to volunteer their Twitter handle (if they have one) at the conclusion of the survey. Most of the survey analyses are presented in *SI Appendix*, and we describe these survey data there as well. Original Twitter and survey-based data collections were approved by the institutional review boards (IRBs) at Northeastern University (17-12-13 and 20-04-12) and Harvard University (IRB20-0593), with additional analyses approved by the Cornell University IRB (IRB0009031 and IRB0010028).

The large, longitudinal dataset combines Twitter data and voter records using unique matches of names in geographic areas. This method was first published in Grinberg et al. (79); Hughes et al. (80) provide an overview of a national panel using this technique and assess its characteristics relative to survey samples of Twitter users.

We describe this linking process briefly here. In 2018, we linked the Twitter profiles of 1.5 million registered voters to a TargetSmart voter file from fall 2017. These links used unique first and last name within geographic areas [city level and then state level; see Hughes et al. (80) for more details]. Within this sample, there were 51,576 Twitter users uniquely linked to a voter record in the state of Georgia. To ensure that we had up-to-date voting histories and locations for these users, we linked these identities to a Georgia voter file acquired from the Georgia Secretary of State's office on November 23, 2020, as well as a voter history file from July 20, 2021.[¶¶] A total of 45,431 Twitter users in this panel (88%) were in the Georgia voter file in both 2017 and 2020. In *SI Appendix*, section S1, we provide more discussion and validation of this matching process.

These combined records include: 1) a Twitter profile, including all of their public tweets (barring some collection difficulties for extremely active accounts,

for whom we were missing some tweets prior to March 2020, a period not covered by our 2020 election conspiracy analyses here), a 10% random sample of their likes (from Twitter's like decahose), and their Twitter friends (who they follow on Twitter) as of 2018 (when these data were collected); 2) data from a commercial data vendor (TargetSmart) from 2017, including location, demographic information, modeled propensity to support Republicans, and turnout history from 2000 to 2016; 3) data from the Georgia voter file, including location, race, and gender; and 4) data from the Georgia voter history files, recording turnout in the 2018, 2020, and 2021 elections. As Georgia does not collect partisan registration (which is typically only collected in states that use or previously used closed primaries), we infer user partisanship based on TargetSmart's proprietary partisan score. Shugars et al. (81) show that this measure, aggregated to the county level, correlates well with 2016 presidential election vote share.

We then compare user activity within our sample of 45,431 voter-file-matched Georgians against a large collection of tweets identified in Abilov et al. (5) as either supporting or detracting from election-fraud conspiracy theories. In these data, Abilov et al. (5) identified fraud-related tweets through using hand-curated keywords and hashtags–for example, "voter fraud" and "#voterfraud"–with some machine assistance for identifying very similar variants of the keywords. The researchers added the hashtag "#stopthesteal" on November 3, 2020–on Election Day and after that hashtag began trending. This fraud-tweet corpus covers the time period October 23, 2020, through January 5, 2021 (the data originally made publicly available by Abilov et al. end on December 16, 2020. We thank the authors for sharing updated data.).

Abilov et al. (5) separated tweets supporting or detracting from election-fraud conspiracy theories using community detection, using Infomap (82), on the retweet networks of Twitter users in their corpus (community detection on these data finds clusters in which users more often retweet each other than retweet users in other clusters.). Community detection on these data identified five communities that accounted for 90% of the users in the data, and these communities were further separated into two distinct clusters–one cluster (four communities) that promoted conspiracy theories and another (one community) that detracted from them. In our analyses with these data, and following Abilov et al. (5), we code users in our sample as endorsing fraud if they liked or retweeted a tweet in the user communities that promoted conspiracy theories. These tweets were 1) about election fraud and 2) tweeted by a user who was part of a community that, by and large, promoted conspiracy theories. Users were detracting from fraud if they liked or retweeted a tweet in the user communities that detracted (i.e., debunked) conspiracy theories. Users could be coded as both promoting and detracting from fraud (although this was uncommon, with only 1% of the active user sample coded one on both variables). The Twitter-friend variables for possible exposure to content counted the numbers of users' friends who promoted or detracted from conspiracy theories. We validated that each of these measures was associated with belief in the fairness of the 2020 election using an independent survey (*SI Appendix*, section S4 and also described briefly in *Results*), after controlling for partisanship and voting for Donald Trump in the 2020 election.

In addition to the "fraud" and "no fraud" variables, we also created indicators for whether a user liked or retweeted posts by @realDonaldTrump (the official Twitter account of then-President Donald Trump) and whether a user liked or retweeted non-fraud-related posts by the users who promoted or detracted from fraud-related conspiracy theories. This can help account for changes in perceptions of election integrity attributable to baseline candidate support (83) or more general social media activity. These variables measure a user's general support for promoters of conspiracy theories during and after the 2020 election, whether or not a user specifically endorsed an election-fraud post. This allows us to estimate the association between election-fraud conspiracy-theory promotion and turnout conditional on promotion of tweets by Donald Trump and other conspiracy-theory promoters. We can further use these variables to assess whether turnout was lower for users who specifically endorse claims of voter fraud on Twitter, compared to users who liked and retweeted content by conspiracy-theory promoters otherwise.

To consider whether there were different effects for more active and visible Twitter users, who tend to account for a large fraction of content on Twitter (80), we separately analyze very active panel users. These "superusers" liked or retweeted 200 or more posts during the study period and represent the top 10% most active users in the panel.

[§§] We also note that analyses that leverage following behavior offer practical use for future research. Unlike engagement with a specific type of content, potential exposure to said content via following behavior can be more readily randomly encouraged (such as in ref. 77).

[¶¶] The Georgia secretary of state maintains a public database of who voted (the "voter history"), but the information is of little use without the voter file that contains the mapping of anonymized IDs to name, address, and demographics. Because our voter file dates to shortly after the 2020 election, we may not be able to identify individuals who did not register to vote in the 2020 election, but did register in November or December to vote in the 2021 runoff.
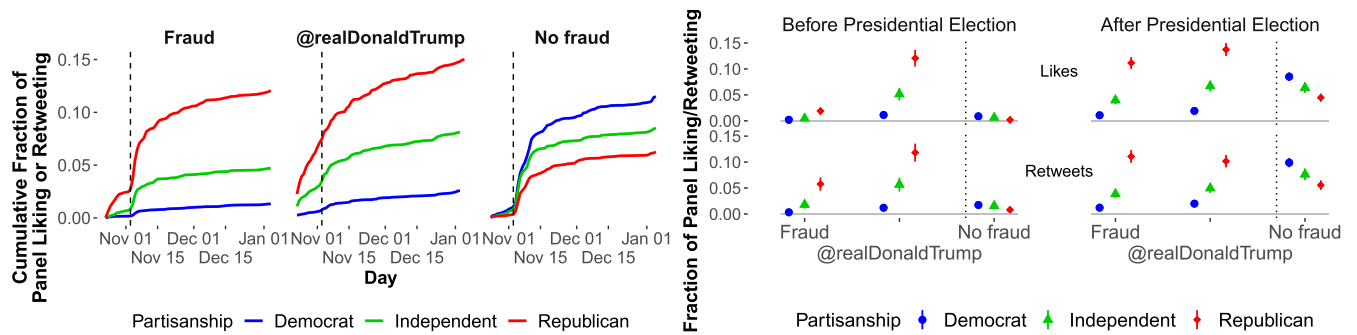
Fig. 1. Fraction of active users (any likes/retweets) in the Twitter panel that liked/retweeted fraud-related posts before and after the 2020 election. Of the 7,324 Georgia Twitter users in the panel who were active both before and after the 2020 election, 558 liked or retweeted fraud-related content by promoters of conspiracy theories (228 of 974 superusers), and 1,071 liked or retweeted fraud-related content of detractors (489 of 974 superusers).

Panels of Fig. 1 display the fractions of users that liked or retweeted fraud-related tweets, along with fractions of users that liked or retweeted tweets by Donald Trump. This figure shows that likes and retweets of fraud-related tweets were much higher after the 2020 election and were comparable in frequency to likes and retweets of Donald Trump's Twitter account. The figure further demonstrates that Republicans were much more likely to like and retweet fraud-related posts by users that promoted conspiracy theories compared to Democrats (and independents), but that Republicans were also somewhat likely to like and retweet fraud-related posts by users that detracted from conspiracy theories.

Methods. In our overall analyses, we measure the associations between endorsements of election fraud claims through likes and retweets before and after the 2020 election and compare these to likes and retweets that discounted the claims. We further compare turnout for 2021 versus 2020 to shifts in endorsements of voter-fraud claims. These analyses on shifts in endorsements are restricted to the subset of Twitter users in Georgia who liked any content both before and after the 2020 election and/or retweeted any content before and after the election (7,324 users). Friend analyses are not differenced, and these analyses further consider the larger sample of Twitter users who followed any other Twitter users (39,381 users).

Considering likes and retweets before and after the election allows for the possibility of differences in the content and import of the discussions in each period. We would expect the discussions prior to the election to largely resemble discussions of prior voter-fraud claims, including those from 2016 and 2018, in that they primarily discuss threats to a future election's legitimacy–threats that might still be counteracted through voter mobilization. The discussions after the presidential election, however, challenge the legitimacy of an election that has already been conducted, and perhaps cast doubt on the efficacy of voting.

All of the models in these analyses are linear regressions, and coefficients can be interpreted as percentage-point changes in turnout with a unit change in the independent variable. In particular, our analyses use change scores, 2021 turnout minus 2020 turnout as the dependent variable, and changes pre-election and postelection for each time-varying independent variable (all like- and retweet-based variables). The variables of interest in these regressions are "fraud," whether a user liked or retweeted any fraud-related content from Twitter users promoting conspiracy theories, and "no fraud," whether a user liked or retweeted any fraud-related content from Twitter users debunking conspiracy theories. We report robust SEs in each model and robust SEs clustered at the user level for models with multiple observations per user (both likes and retweets). We report an alternate binomial model in *SI Appendix*, Fig. S3 and additional robustness checks in *SI Appendix*, Figs. S4–S6–considering, for example, to what extent overall associations were driven by voters versus nonvoters in 2020 or whether weighting the demographics of our Twitter panel to resemble those in the Georgia voter record substantively alters the findings.

As also reported in each legend, these models include controls for race, gender, previous turnout (in midterm and presidential general elections from 2008 through 2018), likes and retweets of posts by Donald Trump (@realDonaldTrump), and the log number of tweets by an individual. Each model is also run with and without the inferred partisanship score provided by TargetSmart. In *SI Appendix*, we also report alternate specifications that subset on 2020 turnout, as well as match on pre-2020 turnout. Note that we have one

postelection outcome observation per user (2021 turnout) and one pre-election outcome per user (2020 turnout) that overlap with the Twitter and election-fraud data.

Accounting for the number of likes and retweets of Donald Trump controls for support of Donald Trump the president and candidate, rather than endorsement of conspiracy theories specifically. Along with the inclusion of previous vote history–including in midterm elections–this also helps account for the possibility that users who endorse fraud-related conspiracy theories are Trump supporters first and Republicans second. That is, we might expect voters who are more enthusiastic about Donald Trump than other Republicans to be less likely to vote in the runoff elections, without Trump on the ballot, regardless of their stances regarding fraud-related conspiracies. While we cannot fully rule out this possibility, adjusting for past vote history and engagement with Donald Trump's tweets helps address this concern.

In addition to the models using turnout in the 2020 and 2021 elections as dependent variables, we also report associations between the differenced "fraud" and "no fraud" engagement variables and turnout in general elections from 2008 through 2018. These models duplicate the largest models in the main analyses, including all controls other than turnout controls. We then visualize (see Fig. 3) these associations over time to assess to what extent any differences in turnout in 2021 were unusual compared to past elections. Note, however, that recorded turnout prior to 2016 is incomplete (*SI Appendix*, Fig. S9–where we see that the Twitter sample recorded that turnout for all the general elections in 2016, 2018, 2020, and the 2021 runoff was higher than for general elections 2008 through 2014), and we only measure whether a person's vote was recorded on the same voter-registration record in 2016–we might not have a recorded vote if an individual moved or if a voter reregistered after being removed from the record due to not voting in several consecutive elections.

Associated Beliefs in External Survey. A crucial advantage of the data used for our primary analyses is their links to administrative records, allowing us to observe ground-truth voter turnout. However, we can only make direct inferences about these users based on their publicly observable behavior, potentially prompting questions regarding how their private beliefs compare to these public statements. With the survey data (which has 2020 turnout and vote choice, but not 2021 turnout in Georgia), we can evaluate whether differences in expressed stances on Twitter might be a random artifact of user activity, or if Republicans (Democrats) who endorse (reject) election-fraud conspiracies are likelier to take corresponding or perhaps other notably extreme stances in the private survey context. In addition to validating the Twitter-based measures and describing the associated beliefs of those who publicly engaged with fraud claims, we hope this analysis can facilitate comparisons with others' work that uses survey data.

With this context in mind, in *SI Appendix*, section S4, we report the statements strongly associated with the differenced "fraud" and "no fraud" variables used in the turnout analyses (and similarly associated with the friend variables), as estimated from the separate survey (https://www.covidstates.org/; see *SI Appendix*, section S4 for additional details). In this, we evaluated associations between all 22 statements in the survey's "election confidence," "election fairness," and "fake news" batteries (the full list of statements evaluated can be found in *SI Appendix*, section S4), controlling for partisanship, 2020 vote choice (or support, if a respondent had not voted), demographics, the differenced Trump retweets/likes, and the differenced (total) retweets/likes. A total of 1,528
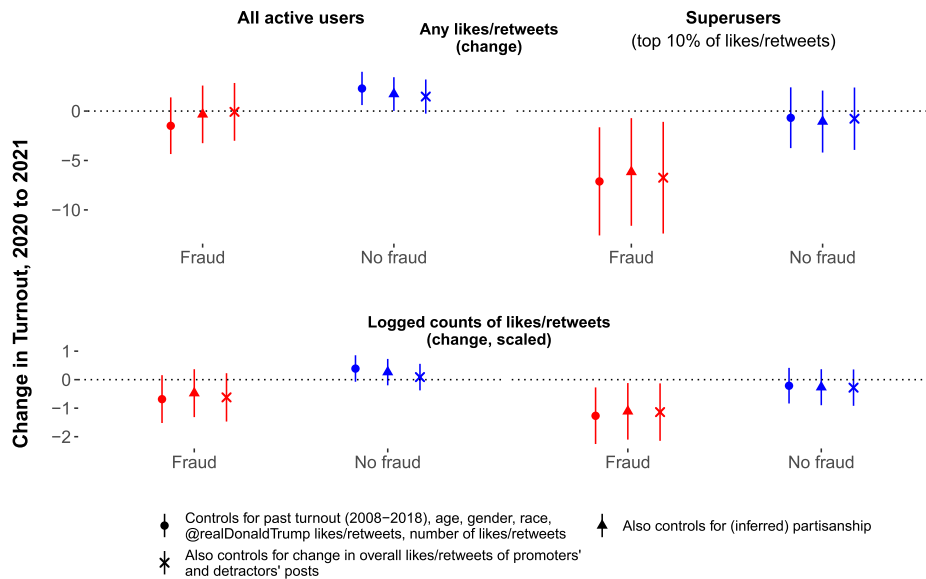
Fig. 2. Change in turnout 2020 to 2021 and liking/retweeting fraud-related posts. Full models are shown in *SI Appendix*, Tables S2 and S3. Note that the associations for "fraud"-promoting superusers, unlike for all active users, appears to reflect a large decrease in turnout relative to 2020 specifically—see *SI Appendix*, Fig. S10. Notes: The dependent variable, voted 2021 minus voted 2020, is in percentage points. Error bars are 95% CIs calculated from robust SEs clustered at the user level. This analysis assumes that likes and retweets are consistent with the stance of the original tweet. These data do not include quote tweets, which might contain comments opposing the stance of the original tweet.

respondents in this survey provided Twitter handles that could be linked to retweets and likes.

Our motivation for using these data is primarily description of the Twitter users who began promoting and opposing fraud claims after the 2020 election. And, other than associations with election-fraud beliefs specifically, we did not have particularly strong hypotheses about what we would discover. Because of this, we highlight statements individually significant at the $P < 0.05$ level after applying Bonferroni multiple testing corrections for 22 tests. We present these findings primarily to provide readers and future works additional information with which to assess the social media and turnout associations. However, broadly, our interpretation of these results is that those promoting election-fraud claims on Twitter appear to be particularly confident in–and perhaps unusually susceptible to–other unsubstantiated claims made by Donald Trump and some Republican pundits, even after controlling for party identification and support for Donald Trump. (For example, 76% of the Republicans who provided a Twitter handle and publicly promoted election fraud conspiracies also agreed with the statement that "Hydroxychloroquine is an effective treatment for coronavirus" in the survey, compared to 34% of Republicans with Twitter handles.) The beliefs of those who publicly opposed fraud claims are also broadly consistent with high mobilization and voting by mail (e.g., support for "protesting on social media" and not being concerned about mail-in ballot fraud or intimidation at the polling place). Both groups were very concerned about "inaccurate or biased vote counts."

We further validate in *SI Appendix*, section S4 that (see, for example, *SI Appendix*, Fig. S13, which compares each of the fraud-related Twitter variables), across respondents in different waves, promoting claims of voter fraud after the 2020 election was associated with lower confidence in election fairness after the election compared to before.

Results

Fig. 2 displays coefficients from change-score models (see *SI Appendix*, Tables S2 and S3 for full models). These models assess the associations between shifts in likes and retweets of election-fraud-related posts before and after the 2020 election with changes in turnout in the US Senate special election minus 2020 election turnout. Fig. 2, *Upper Left* shows that endorsing posts that promote claims of voter fraud was not significantly associated with lower turnout (95% CI: −4.4 to 1.4). At the same time, endorsing tweets that "detract" fraud (debunking it, for

example) were associated with higher turnout—2.4-percentage-points higher turnout (95% CI: 0.6 to 4.0).

We observe a small and marginally significant association between endorsing claims of voter fraud and lower turnout only for those doing so at higher rates (Fig. 2, *Lower Left*), rather than endorsing any posts. In these models, variable "fraud" measures the change in the log number of likes or retweets after the 2020 election, where the log numbers of likes or retweets have been converted to SDs and centered prior to differencing. *SI Appendix*, Tables S2 and S3 suggest that (inferred) partisanship (higher here means more likely to be a Democrat) was more strongly associated with changes in turnout from 2020 to 2021 than public endorsement of conspiracy theories on Twitter.

Fig. 2, *Upper Right* and *Lower Right* show that the associations between endorsing (but not detracting from) claims of fraud on Twitter and voting in the 2021 runoff election were somewhat stronger for more active users. Twitter use tends to be heavily skewed, with the vast majority of tweets posted by a small fraction of users. These superusers are an important subset of the Twitter population—because we have more retweets and likes for these users, we can estimate the extent to which they endorse (or might avoid endorsing) claims of fraud with less measurement error. These are also important because they are likely to be very visible.

This association could reflect 1) reduced measurement error or 2) a possibly distinct effect among very active users (see analysis in the next paragraph). At the same time, the estimates are imprecise for such a small subset of users—although we observe many more posts from these users, whether or not an individual votes in a single election might still be a relatively noisy outcome, especially after controlling for past turnout.

Next, Fig. 3, along with *SI Appendix*, Figs. S10 and S11, displays turnout associations by election year for liking/retweeting fraud-related posts in 2020 and 2021. (*SI Appendix* also reports results from a test taking 2020 general election turnout as the dependent variable, otherwise using the same specification—indicating that those who began endorsing election conspiracies after the 2020 election were slightly more likely to have voted in the 2020 general election.) These models are limited to active users 18 or older as of 2007 and do not control for prior turnout, but
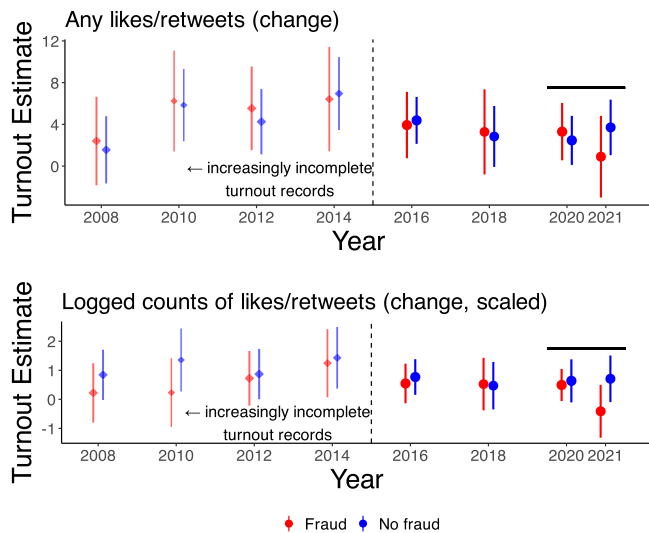
Fig. 3. Turnout coefficients by election year for liking/retweeting fraud-related posts in 2020 and 2021. These models are limited to active users 18 or older as of 2007 and do not control for prior turnout, but otherwise include the full sets of controls used in Fig. 2. The low turnout for fraud-claim promoters relative to detractors appears to have been unusual compared to general election turnout in previous years, despite very high turnout in the 2021 runoff. However, there is significant missingness in the pre-2016 turnout variables due to reregistrations (and lost vote histories) from residential moves and Georgia voter-file purges. Horizontal black bars indicate the elections for which we estimate a turnout difference in Fig. 2, and we control for turnout in the previous elections in those models.

otherwise include the full sets of controls used in Fig. 2. For all active users, the low turnout for fraud-claim promoters relative to detractors appears to have been unusual compared to general election turnout in previous years. In *SI Appendix*, Figs. S10 and S11, we see substantially more election-to-election variation in the friend analysis (see below—proxying for exposure to the claims and a wide variety of other types of content, especially in previous elections), although the turnout for those following fraud promoters is still unusually low. Further, we show that superuser fraud promoters may have been particularly likely to turn out in 2020 (when they were very active on Twitter) and that this higher turnout was not sustained in 2021.

These findings suggest that endorsing claims of voter fraud was not associated with higher-than-expected turnout. Instead, we see suggestive effects for higher turnout among those endorsing tweets that oppose claims of voter fraud, though this relationship is not consistent across model specifications.

Last, Fig. 4 displays associations between potential exposure to conspiracy-theory promotion versus detraction, as measured by following relationships on Twitter in 2018. Here, like the engagement analyses, we find that potential exposure to conspiracy-theory promotion was associated with lower turnout, while potential exposure to detraction was associated with higher turnout. These associations are similar in magnitude to the engagement analyses, although the estimates are more precise in this larger sample (more people follow others on Twitter than post content on Twitter). By and large, each analysis and robustness check finds consistent results—however, we do find that the relationship inverts (higher turnout among those who followed more accounts that went on to promote the conspiracy theory and lower turnout among users who followed accounts that went on to reject it) for the minority of users who did not vote in the 2020 presidential election (*SI Appendix*, Fig. S8). This finding conflicts with the engagement associations for those not voting in 2020 (*SI Appendix*, Fig. S4).

Discussion

Our results demonstrate that endorsement of tweets promoting conspiracies about election fraud after the 2020 election were weakly associated with lower turnout in the 2021 Georgia US Senate election. Conversely, engaging with tweets by authors rejecting such conspiracy theories was, if anything, associated with higher turnout.

Interpretations for these findings highlight the nuanced potential consequences of election-related conspiracy theories. Readers may be encouraged by the lack of clear evidence that the Republican Party benefited in the short term by promoting conspiracy theories regarding election theft immediately before a set of competitive runoff elections that ultimately determined control of the US Senate. However, voter turnout is an important behavioral (proxy) measure for belief in the legitimacy of elections. In the medium- and long-term, major political parties delegitimizing elections to the point at which their own supporters become less likely to participate in them—potentially ceasing to view them as legitimately conferring political power—would threaten the health of US democracy. And, at the same time, we cannot rule out effects that might have led to higher turnout. The association between lower turnout and conspiracy-theory promotion could imply the existence of a voting bloc that is particularly susceptible to conspiratorial rhetoric, and perhaps beyond both partisanship and support for 2020 presidential candidates. Although these conspiracy-theory promoters were, for whatever reason, less likely than normal to vote in the Georgia runoff election, they might be more mobilized in future contests.

To be clear, our analysis is limited in a few key respects. The first is its scope: We are only able to link stances on conspiracy theories and voting behavior among a relatively small number of citizens who were living in Georgia and active on Twitter in both 2017 and 2020. In addition, our ability to make strong causal claims is limited by the observational nature of the analyzed data, and perhaps also the unusual salience of the election-theft rhetoric (leaving perhaps little natural random variation in exposure to such rhetoric). It is also possible that we are underestimating the extent of conspiracy-theory endorsement or rejection in our data,
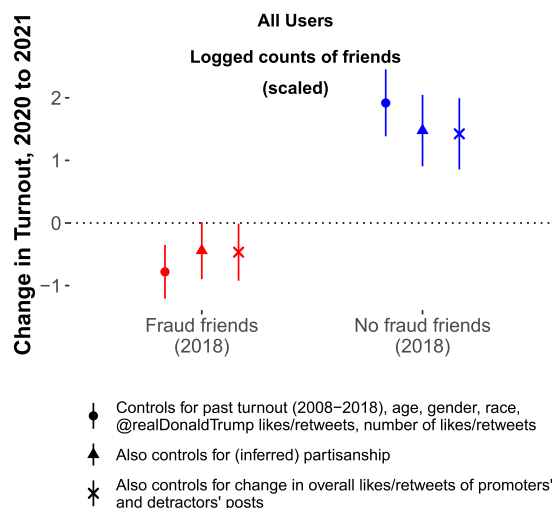

Fig. 4. This figure displays the associations between turnout and the log number of friends (as of 2018) who promoted or opposed tweets about election fraud after the 2020 election. This model controls for the log number of friends overall, along with all controls used in Fig. 2. Full models are shown in *SI Appendix*, Table S4. Note that the association for "No fraud friends," unlike the much smaller "Fraud friends" association, reflects an increase in turnout relative to 2020, but it is not an increase relative to elections prior to 2020—see *SI Appendix*, Fig. S11.

as we only observe a 10% sample of our panelists' likes, and, additionally, there are likely to be many users in our comparison groups who held strong views regarding these election conspiracy theories, but did not publicly express them. To the extent that these false negatives are nonrandom, they would likely comprise users who are either less active or less committed to those stances, and we show in *SI Appendix* that those publicly liking and sharing such content tended to be significantly more confident in views about the fairness of the 2020 election. Related to this, we observe relatively few users overall endorsing conspiracy theories, and these associations reflect 2020 to 2021 declines in turnout for a small fraction of the voting population.

Finally, it is important to reiterate that it is possible that the patterns we observe were generated by a mechanism we cannot observe. We hope that future efforts to identify natural experiments or run carefully and ethically designed randomized experiments will be better able to assess causality in the effects of endorsement of or opposition to conspiracy theories on behavioral and electoral outcomes. Importantly, this topic is likely to require message-level randomization, rather than the already-challenging and intensive source-level randomizations used to study the effects of partisan media generally (10, 11),[##] wide-ranging effects of social media access (13), and the effects of independent media under authoritarian regimes (14–16). Because of this, such efforts may require substantial funding and/or intensive collaboration from industry (84), perhaps along with political elites contributing effective messages—such as one from Donald Trump himself (85).

Our findings speak to relationships between online social media and offline voting behavior in one state in one election. In addition, they concern a particular type of relationship—between endorsing (or rejecting) a particular conspiracy theory and turning out to vote, as well as possible exposure to these conspiracy theories and turnout to vote. Future work can leverage similar methods to speak to a variety of additional questions concerning wider arrays of online expression and offline behavior. We view such work as complementary to analogous advances in linking survey responses to voter-file records.

Regardless of their behavioral consequences, the promotion of conspiracy theories regarding election fraud from the highest levels of government pose problems for continued democratic legitimacy. Such conspiracies erode essential democratic norms and threaten the peaceful transition of power between political coalitions. Nevertheless, identifying whether such conspiracy theories correspond with democratic behavior—and, if so, how—is important for understanding and addressing the challenges such rhetoric poses.

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[##]Searles et al. (11) incentivized users to opt in to curated news feeds that randomly varied the sources to which users were exposed. Although difficult and perhaps not possible for the specific Georgia runoff case, we suspect that, with sufficient funding, this design could be adapted to selectively prevent election-misinformation content (randomly removing misinformation may address ethical issues associated with randomly exposing individuals to misinformation), with near real-time crowd-sourced labeling, and be linked to offline identities and turnout, especially if these studies could be substantially larger and with participants more strongly incentivized to (primarily) access that news feed.

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