Does Climate Protest Influence Political Speech?

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First version: July 30, 2021

Abstract

How does protest affect political speech? Protest constitutes an important form of political claim-making, and yet our understanding of its influence on how legislators communicate remains limited. Our paper extends a theoretical framework on protests as information about voter preferences. We evaluate this framework using crowd-sourced protest data from the Fridays for Future protests in the United Kingdom in 2017–2019. We combine these data with ~2.4m tweets from 553 elected UK MPs over this period as well as text data from ~150k parliamentary speech records. We demonstrate first that local protest prompts MPs to speak about the climate—but only online. Using word-embedding techniques, we then uncover a semantic shift towards language of greater urgency both online and offline after the outbreak of mass protest. Our results demonstrate that protest significantly shapes the timing and substance of political communication by elected representatives. They also highlight an important distinction between the offline and online speech of legislators.

Keywords accountability; representation; political communication; protest; social movements; climate change; Twitter;

1 Introduction

Climate change has become a central political issue globally. While recent international climate negotiations have produced major new climate agreements, such as the 2015 Paris Agreement on Climate Change, these commitments are insufficient to prevent dangerous climate change. Some scholars advocate for redesigning international climate negotiations to unlock greater cooperation between countries (Victor 2011; Hale 2020), while others highlight the domestic drivers of climate policy, such as public opinion and interest groups (Mildenberger 2020; Stokes 2020). The global Fridays for Future climate protests encapsulate these two dynamics. They represent a transnational bottom-up protest movement dedicated to pressuring national governments to implement more ambitious climate policies.

The movement began life as a solitary protest outside the Swedish parliament during school hours. It quickly snowballed into a global protest movement pressing domestic governments to address climate change. Over time, it came to be organized under the hashtag Fridays for Future or `#FFF` . These protests have been galvanized by the recent scientific assessments and explicitly articulate their demands in terms of the shared goals codified in the Paris Agreement. Specifically, the Fridays for Future (FFF) protests urge national governments to "listen to the science" and "keep global temperature rise below 1.5°C" (Fridays for Future 2019). These protests have been particularly prominent in the United Kingdom, especially following the first Global Climate Strike in March 2019. During the 2017–2019 UK parliament, over 600 FFF protests took place in over 200 electoral constituencies.

We are interested in the effect of FFF protests on legislators' political communication: does climate protest influence political speech? Existing research on protest has identified effects on public opinion (Enos et al. 2019), voting behaviour (Madestam et al. 2013), media reporting (Wasow 2020), and legislative outcomes (Agnone 2007). One common explanation for these outcomes stresses that protests change the distribution of information in society (Lohmann 1994). Engaging in protest is individually costly, but collective action can signal the breadth and depth of support for a political idea; protests can act as an informative cue about voter priorities. This should be especially important for climate politics, where a longstanding perception holds that

voters have relatively weakly held support for climate policy (Howe et al. 2015; Mildenberger and Leiserowitz 2017). The application to the behaviour of members of parliament is particularly relevant since local protests clearly map onto the contours of dyadic legislative representation and accountability (Miller and Stokes 1963).

Many existing studies estimate the effect of protest on political outcomes, but it has not always been possible to match the location and timing of protests to corresponding legislative behaviour due to issues in reporting, aggregation, and delays. We address these issues by constructing a new dataset of climate protests and legislators' communication at the MP-day (or equivalently, constituency-day) level for the 2017–2019 UK parliament. We use crowd-sourced data on the timing and location of FFF protests and assign these to UK parliamentary constituencies. We gather MPs' online speech from Twitter ("tweets"), as well as their offline speech in the House of Commons during this period. Combining these yields an exceptionally fine-grained and high frequency dataset of protest and political speech. We then use a series of regression models to estimate the effect of climate protest on the timing of online speech (tweets) and offline speech (in the House of Commons) about climate change. Finally, we use word-embedding techniques to gauge not only whether protest affects the timing of legislative speech but also whether there has been any semantic shift in climate-related speech during our observation period.

We find a strong positive effect of climate protests on the timing of climate-related tweeting. MPs in constituencies with climate protests are more likely to tweet about climate change immediately after the protests than MPs in constituencies without climate protests. These results hold controlling for unobserved heterogeneity at the MP- or constituency-level and over time variation in climate protest and climate tweets through the use of fixed effects. We do not, however, find an effect of protest on offline speech. Even during the subset of particularly open (i.e., unconstrained) parliamentary debates addressing climate change at the peak of climate protests in late 2019, MPs were not more likely to discuss climate change following local climate protests. We do, however, see in the word-embedding analyses that the first Global Climate Strike was followed by a semantic shift in both online and offline speech towards language of greater urgency in climate-related speech, and that the timing of the shift coincides with this first major protest episode.

We make substantive contributions to the literatures on climate politics, protest, political communication, and representation. First, we show that protest does substantively affect the (online) communication of political elites, indicating one channel of influence for policy demands. Second, we highlight the important distinction between online and offline forms of political communication. While offline protest may influence the online speech of political elites, in our case it leaves little trace in their offline speech. From a methodological standpoint, we demonstrate the value of linking high frequency, high resolution protest data to speech data, as well as the potential of word-embedding approaches to understand changes in public political discourse.

2 Existing Literature

There is a large literature examining how elected politicians respond to protest (Amenta et al. 2010). A common underlying theme of this work is that policymakers should respond to protests because they provide information about public dissatisfaction with a social problem (Lohmann 1993). Following this argument, scholars have explored the impact of protests on two kinds of outcome. First, various studies have explored the link between protests and policy change. Work in this vein has asked whether protests about a given issue increase the passage of legislation addressing that issue (Agnone 2007; Bernardi et al. 2020; Costain and Majstorovic 1994; Johnson et al. 2010; Olzak and Soule 2009; Walgrave and Vliegenthart 2012), affect the relevant government budgets (Giugni 2007), or increase the legislative support for relevant policy proposals (Burstein and Freudenberg 1978; Gause 2020; McAdam and Su 2002). Second, others have examined whether protests about a given issue increase the attention that legislators give to that issue through congressional hearings (Johnson et al. 2010; King et al. 2007; Olzak and Soule 2009; Soule et al. 1999), roll-call votes (Fassiotto and Soule 2017; McAdam and Su 2002; Soule et al. 1999), parliamentary questions (Hutter and Vliegenthart 2018; Walgrave and Vliegenthart 2012), or congressional speeches (Wasow 2020).

Two shortcomings of this literature limit our ability to understand how protest affects legislator behaviour. First, existing studies have largely focused on aggregate legislative outcomes,

such as the number of bills passed or congressional hearings held, rather than the *individual* behaviour of legislators. This matters because the extent to which legislators provide 'dyadic' representation of voter concerns is of both normative and practical importance (Dassonneville et al. 2020; Hanretty et al. 2017; Miller and Stokes 1963). Moreover, aggregate-level analysis cannot easily uncover the precise mechanisms by which public protest influences legislative behaviour. Recent work has begun to address this shortcoming, with several studies linking district-level protests to the individual voting behaviour of US legislators (Gause 2020; Gillion 2012; Madestam et al. 2013). To date, no work has examined the relationship between local protest and individual legislator behaviour in any country beyond the US.[1] To our knowledge, no work in any context has investigated the relationship between local protest and the political speech of individual legislators.

The second shortcoming of this work is that it has largely focused on how protest affects MP behaviour in the legislature, but not online. This focus is understandable, as it arguably captures legislators performing their most important and consequential role: representing constituents inside formal political institutions. Yet in recent years, online communication has become an increasingly important avenue through which legislators interact with both the media and electorate (see e.g. Barberá et al. 2019; Enli and Skogerbø 2017; Graham et al. 2013; Umit 2017). Compared to legislative behaviour, online speech is further removed from the policy-making process, but potentially more visible to constituents. A satisfactory understanding of legislator responsiveness to protest thus requires us to consider both online and offline political speech.

3 Theory

To address these shortcoming, we elect to focus on individual legislative behaviour both online and offline. Specifically, the paper tests an argument linking district-level protest activity to the online and offline speech of individual legislators. The following section outlines successively why legislators should respond to protest in their political speech, why this responsiveness

[1] Wouters and Walgrave (2017) do study individual Belgian politicians, but analyse responses to a survey experiment rather than actual legislative behaviour.

should vary between MPs, and how it should differ between online and offline speech.

3.1 Legislator responsiveness to protest

Our central argument is that legislators have an electoral incentive to respond to protests by their constituents. In line with existing work, we assume that legislators' primary motivation is achieving re-election, not for is own sake, but as a necessary pre-condition for achieving any other political goals (Mayhew 1974; Strøm 1997). The main determinant of legislators' re-election chances is usually the popularity of their party's collective 'brand' (Aldrich 1995). But under electoral systems that allow voters to express a view on individual candidates, MPs can also try to generate additional support that's attracted to them as an individual candidate (André et al. 2016). This candidate-based support is known as a 'personal vote' (Cain et al. 1987). In practice, legislators aim to cultivate a personal vote by persuading local voters that they have attractive qualities ('advertising'), views ('position-taking') and achievements ('credit-claiming') (Mayhew 1974).

If legislators wish to echo their constituents' views and priorities, they must first identify them. Existing work suggests that MPs learn about their constituents' views from a number of sources. On the one hand, MPs can infer a constituency's priorities from its objective economic and social circumstances. These might be relatively permanent features of the constituency, like the presence of a military base (Soroka et al. 2009), or time-varying conditions like levels of crime or unemployment (Borghetto et al. 2020). On the other hand, MPs can also respond to more direct signals of public concern, through the local strength of specific parties (Tzelgov and Olander 2018) or the popularity of other forms of political expression like petitions (Blumenau 2020).

In the same vein, protests can influence legislators' behaviour by providing them with information about their constituents' views (Gillion 2012; Lohmann 1993; Wouters and Walgrave 2017). Collective action involves various costs, ranging from the simple opportunity cost of attending a protest, to the serious risk of encountering physical harm or legal difficulties as a consequence (Gause 2020, 3). Protest thus highlights to legislators that an issue is sufficiently salient among a group of citizens for them to incur these costs. Of course, even large protests

are typically attended by a relatively a small percentage of the overall population (Chenoweth and Belgioioso 2019). Even so, protesters are demonstrably politically active and organised, so may well be an important portion of voters at the next election. Moreover, the wider public may also take their cue from local protests (Lohmann 1994), giving them an electoral impact beyond simply the votes of those who attended. Indeed, other climate protest movements, such as the Sunrise Movement in the United States of America, have articulated their goals in terms of mobilizing a critical mass of voters to signal the strength of support for climate action (Prakash and Klein 2019).

How can MPs signal their responsiveness to local protests? In many democracies, individual legislators have relatively limited influence over policy outcomes, due to rules that concentrate influence with party groups, and especially the government (Cox and McCubbins 2011). As a result, a more feasible strategy is so-called 'position-taking' – publicly expressing views and priorities which accord with those of the protesters. MPs have a range of venues for doing this, but two are particularly important. First, they can speak about constituents' priorities in parliament itself. This is a public – and publicised – arena, which provides a highly visible platform for signalling responsiveness to constituents' priorities. While very few citizens observe parliamentary behaviour directly, they can learn about it indirectly through news coverage and MPs' own publicity, hence the growing comparative evidence that legislators' individual parliamentary behaviour has at least some impact on their public image and electoral fate (e.g. Ansolabehere and Kuriwaki 2021; Däubler et al. 2016; Hanretty et al. 2021; Williams and Indridason 2018). Second, MPs can attempt to communicate more directly with voters, via social media. Platforms like Facebook and Twitter provide politicians with a very low-cost way of posting messages online, which can then be shared widely by their supporters. As a consequence, politicians' online communication has become an important avenue for cultivating popularity with constituents (see e.g. Barberá et al. 2019; Enli and Skogerbø 2017; Graham et al. 2013; Umit 2017).

We therefore expect that politicians should respond to local protests by giving greater emphasis to those protests' subject-matter in their offline and online political speech. Applying this to the issue of climate protest produces our first hypothesis.

Hypothesis 1 (MP responsiveness). *Climate protests in a given electoral district lead that district's MP to place greater emphasis on the climate.*

3.2 Conditional responses to protest

However, we do not expect all MPs to be equally responsive to climate protest. Based on existing literature, we expect the effects of protest on political speech to be moderated by two variables in particular.

First, we expect MPs to be more responsive to local protests if they represent a left-wing political party. Because left-leaning parties cross-nationally are generally more strongly committed on environmental policy than right-leaning parties (Farstad 2018), and that pro-environment sentiment is generally stronger among left-leaning individuals than right-leaning ones (Drews and van den Bergh 2016), we expect that left-wing MPs would have the strongest political incentives to signal their responsiveness to local environmental demands. By contrast, MPs from right-wing parties may face a greater conflict between the demands of protesters and their own pre-existing ideological commitments to limited state intervention and regulation.

Hypothesis 2 (Party). *Climate protests should have a larger effect on the political speech of left-wing politicians.*

Second, we expect MPs to be more responsive to local protests if they are less electorally secure. MPs elected by narrower margins are at greater risk of losing their seat at a future election. They should thus invest greater time and effort into avoiding this outcome. As a consequence, they have a stronger incentive for engaging in personal vote-seeking, relative to their more electorally secure colleagues. Existing literature shows that more vulnerable legislators make more use of tools that allow them to signal their effort to voters, such as bill proposals (Williams and Indridason 2018) or parliamentary questions (Kellermann 2016). In line with this, we expect that legislators elected by smaller margins should be more responsive to local protests.

Hypothesis 3 (Marginality). *Climate protests should have a larger effect on the political speech*

of electorally insecure politicians.

3.3 Online vs. offline responses

We also expect MPs' responsiveness to protest to vary between different kinds of parliamentary speech. In particular, we expect greater responsiveness in MPs' online speech than their offline speech. This is because online speech is less tightly constrained than offline speech in a number of ways (Castanho Silva and Proksch 2021). Put simply, MPs can largely tweet what they want, when they want, as often as they want. By contrast, parliamentary time is a scarce shared resource. MPs' ability to respond promptly in this arena may therefore be limited by competition from other MPs, gatekeeping by party leaders, or more prosaic issues of parliamentary timetabling. Moreover, when MPs do secure an opportunity to speak, they may have alternative messages that they choose to prioritise over the demands of local protesters. Online speech should therefore be less constrained, and more responsive.[2]

Hypothesis 4 (Online vs. offline). *Climate protests should have a larger effect on online political speech, relative to offline (parliamentary) speech.*

4 Data and Method

4.1 Case details and selection

To examine the effects of climate protest on political speech, we focus on the "Fridays for Future" campaign in the United Kingdom. Following the individual protest sit-in ("School Strike for Climate") by Greta Thunberg outside the Swedish parliament in late 2018, the campaign (also known as "Youth for Climate," "Climate Strike" or "Youth Strike for Climate") emerged as an international grassroots campaign designed to compel elected representatives to act on impending climate crisis. The hashtag `#FridaysforFuture` (or `#FFF`) came to define the

[2]Even so, it is worth noting that offline speeches are still relatively unconstrained when compared to roll-call voting, which is generally subject to tight party discipline.

movement, the stated aim of which is "to put moral pressure on policymakers, to make them listen to the scientists, and then to take forceful action to limit global warming."[3] The movement culminated in thousands of school strikes on named Fridays across the world over the coming year. The UK itself saw considerable climate protest, organized under the banner of Fridays for Future over this period (see Figure 1). For the purposes of our analysis, we set an observation period of June 8, 2017 to December 12, 2019. The start and end points of this period mark the dates of the 2017 and 2019 General Elections, and overlap with the peak of FFF protests in 2019.

Our case selection of Fridays for Future in the UK is driven by reasons of data availability and case difficulty. The UK parliament records and publishes all political speech delivered in both Houses in the *Hansard* record. UK MPs are also highly active on Twitter (85% had active Twitter accounts over this period), meaning we are able to draw comparisons between "offline" speech delivered in the House of Commmons and "online" speech published as tweets on the micro-blogging website Twitter. Additionally, geolocated FFF protest data is available for the United Kingdom, meaning we can assign protests to politically meaningful geographic units (i.e., constituencies).

Moreover, we believe the UK context represents a "most likely" case for finding a link between protests and political speech. In comparative terms, the UK's single-member plurality electoral system gives its MPs relatively strong incentives for appealing to local concerns in their district (André et al. 2016). Moreover, this is reflected in decentralised legislative rules which do not allow party leaders to control the allocation of speaking time (Proksch and Slapin 2012). While recent research finds that UK MPs are only "minimally accountable" for their issue positions in parliament (Hanretty et al. 2021), other work does suggest that MPs may nonetheless tailor their behaviour to suit their electoral context (Bowler 2010; Eggers and Spirling 2014; Fleming 2020; Kam 2009; Kellermann 2016). Moreover, this period also saw climate change become unusually salient in the UK, with heightened public concern and much more radical policy offers from the main parties (Carter and Pearson 2020). MPs should thus have been more willing to see climate protests as indicative of wider public opinion, and less concerned

[3]See: `https://fridaysforfuture.org/what-we-do/who-we-are/`. Last accessed: May 31, 2021

that responding to these protests would mean diverging from their party. We are thus studying a political context that maximizes the chances of finding a link between climate protest and political speech. This is beneficial, given that our study is one of the first to investigate this relationship beyond the US context.

4.2 Data

We use three main data sources to code our two dependent variables and key independent variable. We collect MPs' "online speech" from Twitter, using the `R` package `academictwitteR` (Barrie and Ho 2021). To determine the full set of elected MPs with active Twitter accounts, we began with a Twitter "list" of UK MP Twitter accounts.[4] We then cross-checked this list against the *Hansard* record of all 650 MPs elected at the 2017 General Election, adding accounts that had been wrongly omitted and removing accounts included in error. This process resulted in a set of 553 UK MPs with active Twitter accounts. With this set of users, we then collected all tweets (including retweets, quote tweets, and replies) by UK MPs using the V2 Academic Research Product Track API endpoint, which provides academic researchers with access to the full archive of all published (and as-yet undeleted) tweets. That is, our data includes every tweet published by a UK MP over this period.[5] This resulted in a dataset of ~2.4m tweets over our observation period. From this dataset, we identify tweets as climate-related if they include one or more of the following three phrases: "climate change," "climate crisis," and "global warming." This allows us to calculate our first dependent variable – the daily number of climate-related tweets from each MP in our period of study.

To compile data on "offline speech" by UK MPs in parliament, we use data from the *Hansard* record. *Hansard* records all instances of parliamentary speech; the speeches and metadata are made available by *TheyWorkForYou*. These are the same data used in recent contributions to the

[4]Lists are user-compiled sets of Twitter users, normally relating to a given subject heading or shared interest. The list of 2017 MPs was compiled by `@TwitterGov` and available at: `https://twitter.com/i/lists/217199644/member`.

[5]Data collection took place in April, 2021. While it is possible that older tweets will have been deleted by this point, we do not see any reason why deletions would systematically bias our findings. The new V2 Twitter API truncates retweet text over a certain length. To retrieve the full text of a retweet we used the `rtweet` R package by Kearney (2019) to look up tweets ("statuses") by the unique tweet ID of the original tweet.

study of UK political speech (Osnabrügge et al. 2021). For our analysis we use only instances of speech classed "Speech," which are oral questions or oral contributions to debates in the House of Commons.[6] In total, we have ∼150k Hansard parliamentary speech records for our set of 553 MPs. Consistent with our measure of online speech, our second dependent variable is a daily count of the number of speeches by each MP which include the phrase "climate change," "climate crisis," or "global warming."

Finally, to retrieve data on the incidence of climate protest, we use a crowd-sourced database of FFF protests, available on the dedicated campaign website for the movement `https://fridaysforfuture.org/`. The data were scraped from a map of geolocated protest actions, alongside corresponding information on the town where the protest occurred, precise location (e.g., "in front of townhall"), time, date, and link to Facebook or Instagram event page. We assign each protest to constituencies using shapefile constituency boundaries for the 2017 General Election.[7] Our independent variable is then coded as the daily sum of FFF protest events on in each constituency.

Our main data, therefore, consists of daily protest, tweet, and parliamentary speech data at the constituency- or MP-level for 553 UK MPs during the 2017–2019 parliament. The frequency and location of climate protest, as well as the incidence of climate tweets and parliamentary speech are plotted in Figure 1.

In addition to our two dependent variables and key independent variable, we incorporate MP- and constituency-level information for each of our 553 MPs. Specifically, we use the `parlitools` R package (Odell 2017) to generate variables indicating the MP's party and the size of their majority (measured as the difference in vote share between the MP and the second-placed candidate at the 2017 general election).[8] We also include a binary variable indicating any periods when an MP served as a Minister or Shadow Minister, based on Colebrook and Priddy

[6]This means removing e.g. "Procedural" and "Division" speech that records the formalities of parliamentary proceedings like the results of votes or parliamentary order of the day. These data are available as indexed .xml files at `http://parser.theyworkforyou.com/hansard.html`

[7]We use reformatted constituency and protest shapefiles produced in QGIS for CRS consistency and locate protests to shapefiles with the aid of the `sf` and `sp` R packages (Pebesma and Bivand 2005; Pebesma 2018).

[8]Some MPs changed party affiliation during the parliament, due to being suspended by their party and/or defecting to another. In such cases, we retain the affiliation under which MPs were initially elected.

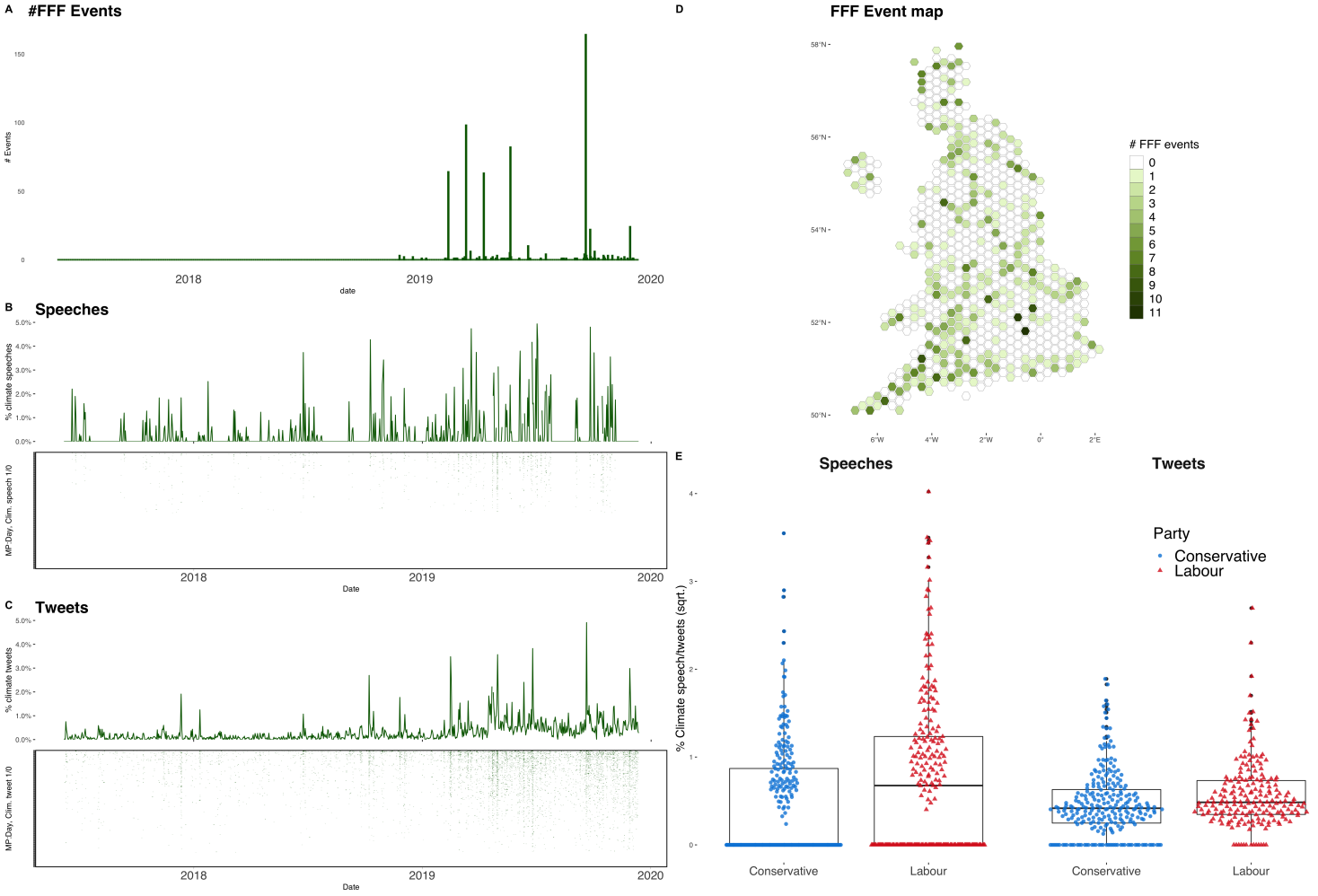

Figure 1: **A**: Barplot daily sum of FFF protests; **B**: Climate speeches mentioning climate keyword phrases over time. Top panel is daily frequency; bottom panel plots our full panel dataset, where white tiles indicate an MP speech-day where climate keyword phrases are mentioned, and dark green otherwise; **C**: Tweets mentioning climate keyword phrases over time. Top panel is daily frequency; bottom panel plots our full panel dataset, where white tiles indicate an MP tweet-day where climate keyword phrases are mentioned, and dark green otherwise. **D**: Map of total number of FFF protest events by constituency over entire observation period; **E**: Kernel density plot of climate tweet and speech by two main parties. Points represent daily square root percentages of speeches/tweets mentioning climate; width of density curve corresponds to relative frequency at given point in distribution. Overlaid boxplot shows median, first, and third quartiles of distribution. Climate keyword phrases are: "climate change," "climate crisis," and "global warming."

(2020) and the UK Parliament data portal.[9] Three MPs in our dataset did not serve their full term in parliament due to resignation, death or, in one case, recall petition. We only include data for these MPs up to the date of the by-election for their replacement.[10] Our analysis excludes the new MPs elected at these by-elections, as well as all Sinn Féin MPs (who do not take their seats in the House of Commons), and any MPs who served as Speaker or Deputy Speaker (who chair debates, rather than participating in them).

4.3 Estimation strategy

We are interested in whether local climate protests lead MPs to speak or tweet about climate change at particular points in time. To do so, we create a panel dataset for each of the 918 days in our observation period for each of our 553 MPs.[11] Of course, the underlying propensity to discuss climate change varies across MPs—as partisan identity, constituency makeup, and knowledge about climate change necessarily differ across elected representatives. These are, however, stable traits that we do not expect to change in our relatively brief observation period. As such, we include MP-level intercepts that control for these fixed MP-specific effects. This allows the effect of climate protest to be recovered as a difference in climate tweets from the average number of climate tweets for a given MP. Since MPs are entirely overlapping with constituencies, MP fixed effects also absorb all unobserved constituency-level heterogeneity, including the underlying constituency-level propensity for climate protest.[12]

We must also be sensitive to changes in the incidence of climate speech and climate protests over time. Both of these key variables increase over time (see Figure 1), which could confound our understanding of the effects of protests on legislator behaviour. We mitigate this in two ways. First, given our exceptionally high frequency (i.e., daily-level) and high resolution (i.e., constituency-level) data on both speech and protest, we are able to precisely locate both of these variables in space and time. This means that any change in MPs' climate speech can be attributed

[9] See: `https://members.parliament.uk/`. Last accessed: May 4, 2021.

[10] In the case of Fiona Onasanya, removed by recall petition after sentencing to a jail term, we include only observations up to the date of the beginning of her jail term (January 29).

[11] As noted above, not all MPs remained in position for the entirety of the observation period.

[12] As noted above, we do not include MPs who enter at by-elections, meaning that no constituency is matched with multiple MPs in the data.

to changes in climate protest at the level of their constituencies. Second, we include a vector of time dummies that absorb common trends and shocks across all MPs, for example accounting for a possible rise in climate tweets and protests around the annual United Nations climate negotiations or the visit of Greta Thunberg to the UK in April 2019. Our high frequency data enables us to include time fixed effects at the month, and even the week, level. Taken together, the inclusion of MP and time fixed effects allows the effect of climate protest on legislator tweets to be recovered through deviations in the incidence of protests from the long-term average in a given constituency, the average Twitter behaviour of an individual MP, as well as common temporal shocks across constituencies.

Our main estimating equation is then based on the following functional form:

$$\text{Climate Tweets}_{i,t} = \beta \text{FFF Protest}_{i,t} + \gamma \mathbf{X}_{i,t} + \alpha_i + \delta_d + \epsilon_{i,t} \tag{1}$$

where i indexes MPs (and necessarily constituencies), t indexes our unit of observation (in this case, MP-days), d indexes our measures of time controls (either weekly or monthly fixed effects depending on the specification), $\mathbf{X}$ is a vector of covariates that contains the sum of an MP's tweets on that given day t, and will later contain a time-varying dummy for an MP's frontbench status. Note that in this specification we are measuring protest and tweets at the daily-level t and controlling for temporal trends and shocks at a higher level of aggregation d. We estimate an ordinary least squares (OLS) regression with standard errors clustered on the MP. In the appendix, we dichotomize the count of climate tweets and present all the results for a linear probability model.

5 Results

5.1 Protests and online speech

What effect do local protests have on legislator speech? Table 1 contains our baseline models of the average effect of local climate protests on MP tweets. To measure the timing of climate speech, we construct a time window that includes the date of the protest t (mostly Fridays) and the

following day (e.g., Saturday), thereby allowing for MPs to respond after the protests. We index this operationalization as FFF Protest$_{t:t-1}$ in table 1. We find a very strong positive effect of local climate protests on MP tweets. Models 1 and 2 are estimated with year-month fixed effects, and models 3 and 4 are estimated with more exacting year-week fixed effects. Models 2 and 4 add a binary indicator of whether an MP held a frontbench position in the Labour or Conservative party on that day. The effect of protest is stable and robust across specifications. These results suggest a direct channel of responsiveness from MPs to their constituents' demands. From model 4, a local FFF protest is associated with an increase of 0.067 [0.040, 0.095] climate tweets, or a roughly 0.46 standard deviation increase in the number of climate tweets.[13]

	M1	M2	M3	M4
FFF Protest$_{t:t-1}$	0.073	0.073	0.068	0.067
	(0.014)	(0.014)	(0.014)	(0.014)
Covariates	None	Frontbench	None	Frontbench
Unit fixed effect	MP	MP	MP	MP
time fixed effect	Year, month	Year, month	Year, week	Year, week
Observations	503726	503726	503726	503726

Table 1: Direct effect of Fridays for Future protest on MPs' tweets

We also investigate how the effect of protests on MP tweets manifests over time. We expect the effect of protests to be strongest on the day of or immediately after the protests, as MPs seek to signal responsiveness to local concerns. The effect is likely to decay over time, unless protests trigger permanent changes in the priorities of MPs. Figure 2 plots the coefficient for FFF protests on MP climate tweets using variants of the specification from equation 1, with protests summed over days in a local window. The horizontal axis notes the correspondence between the day of the protest and the day of the tweet measurement, with 1 indicating the day of the protest (e.g., a Friday) matches the day of the tweet, 2 indicating a two-day window where MPs may tweet about climate on the day of the protest or the following day (e.g., Friday and Saturday; as in table 1), and onward adding additional days into the measurement window. We find the

[13]We interpret the coefficient directly, as the standard deviations of both the FFF protest and the climate tweets variables are nearly identical in their raw form and after applying the fixed effects. 226 constituencies feature climate protests, while 327 do not.

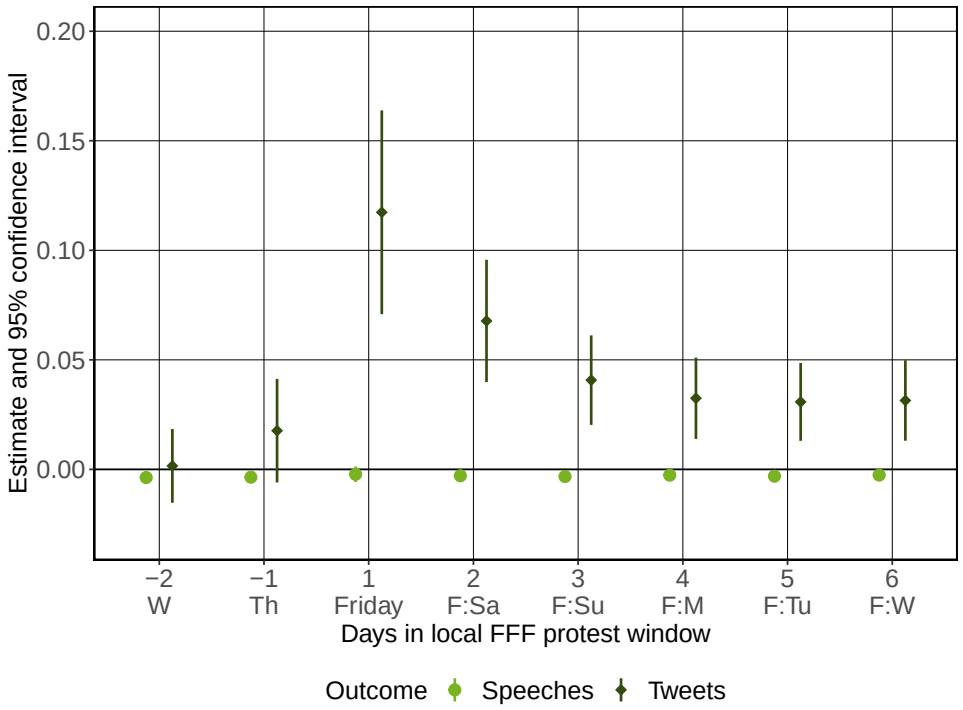

Figure 2: Direct effect of FFF protest on MPs tweets is strongest on the day of protest. Weekday markers are indicative, but not strictly accurate, since some FFF protests (9.6%) do not take place on Fridays. We recover a large positive effect of FFF protests on climate tweets, but a substantively miniscule negative effect for offline speech, see section 5.2.

strongest effect on the day of the protest ($\beta \approx 0.118\,[0.072, 0.164]$), and the effect diminishes as subsequent days are added to the measure. We also do not find any anticipation effect when we reverse the order of climate protests and tweets. By way of illustration, the horizontal axis marker at -1 shows that MPs are not tweeting about climate change on the Thursday before Friday's local protest.

In Table 2 we go on to investigate whether the effect of local climate protests on legislator speech differs across political contexts. We take our baseline specification for Table 1, model 4, and add an interaction term to test for the heterogeneous treatment effects suggested by Hypotheses 2 and 3 above. We first test Hypothesis 2 by modeling whether Labour MPs are more responsive than Conservative MPs to local climate protests. In model 5, we subset the data to only consider Labour and Conservative MPs, and introduce an interaction term between climate protests and a binary indicator of MPs sitting for the Labour Party. We do not find a

	M5	M6
FFF Protest	0.043	0.069
	(0.014)	(0.016)
FFF Protest × Labour	0.064	
	(0.033)	
FFF Protest × Marginal		-0.007
		(0.036)
Unit fixed effect	MP	MP
Time fixed effect	Year, week	Year, week
Observations	450772	503726

Table 2: Heterogeneous effect of FFF protest on MPs' tweets

statistically significant relationship for the interaction term, implying no heterogeneous treatment effects by party. In model 6, we test Hypothesis 3 by focusing on the most tightly contested constituencies in the 2017 election, and interact the protest variable with a binary indicator for whether an MP won by less than 5 percentage points. Again, contrary to our expectations, we find no indication that electorally sensitive, or marginal, MPs are more responsive to local climate protest.

5.2 Online and offline speech

Next, we consider differences between online and offline speech. Recall that Hypothesis 4 predicted protest would have a relatively larger effect on online speech compared to offline speech. In Table 3, we extend our baseline model 4 from Table 1 to consider the relationship between protest and "offline" speech in the House of Commons. Model 7 reproduces the results from model 4, and model 8 mirrors this analysis by swapping tweets for speeches as the outcome variable. We find a negative and statistically significant relationship, where MPs speak *less* about climate change following local climate protests. This completely reverses the finding for online tweets, where MPs actively mention climate change following local protests, though the effect for offline speech is very small substantively. Figure 2 plots the effect of climate protests on offline legislative speech across different protest time windows.

	M7 Tweets	M8 Speeches	M9 Tweets	M10 Speeches	M11 Tweets	M12 Speeches
FFF Protest	0.068 (0.014)	-0.003 (0.001)	0.132 (0.062)	-0.008 (0.010)	0.022 (0.022)	0.007 (0.008)
Unit of observation	Daily	Daily	Weekly	Weekly	Sitting days	Sitting days
Unit fixed effect	MP	MP	MP	MP	MP	MP
Time fixed effect	Year, week	Year, week	Year, week	Year, week	Year, week	Year, week
Observations	503726	503726	84966	84966	199738	199738

Table 3: Effect of protests on online and offline speech

Given that the data generating process differs for tweets and speeches, we hesitate to place too much emphasis on this result in isolation. The modal climate protest is on a Friday, when MPs often return to their constituencies from Westminster, and the Commons does not sit over the weekend except in exceptional circumstances. Note that whether parliament is sitting or not on a particular day affects the opportunities of all MPs to speak, and so is captured in the time fixed effects. By including the sum of an MP's speeches in parliament on that day and a common year–week dummy as controls, we are already accounting for speaking opportunities, and the interpretation of the negative coefficient in model 8 is that MPs speak less about climate change following protests. Nonetheless, it is important to consider heterogeneity in online and offline speech with additional measures that more closely match parliamentary speech's data generating process.

In models 9 and 10, we therefore aggregate the daily-level protest, tweet, and speech data to the week level.[14] This allows an effect of protests on online and offline speech to be detected in the seven-day window following a Friday protest. Model 9 recovers the same positive and statistically significant effect of protests on climate tweets at the weekly-level. However, in model 10 we investigate offline speech and we find a negative coefficient, but this effect is not statistically significant.

Aggregating to the week-level may still not fully capture MPs' opportunities to speak in parliament, so we consider a further set of specifications motivated by the parliamentary calendar. We introduce a new unit of analysis at the parliamentary sitting–day-level, explicitly accounting

[14]For models 9, 10, 15, and 16, we use weeks starting on Fridays; otherwise, weeks start on Mondays.

for when parliament is sitting. We take the time between one parliamentary sitting day and the next, which may be short (e.g., Monday to Tuesday, 1 day) or longer (e.g., Thursday to Monday, 4 days), and aggregate the number of local protests, tweets, and speeches in that window. We then estimate the effect of local protests on tweets and speeches at that next time parliament is in session, controlling for the number of days in a sitting-day window. In this specification, the effect of protests on tweets may be noisier, since the unit of analysis pools many days together and we have seen from figure 2 that MPs frequently tweet on the day of or immediate after a protest, but this unit maximizes MPs' opportunities to speak on climate in parliamentary. However, even with this lenient specification for speech, we do not find a statistically significant effect of protest on speech in model 12. We find a positive effect of protest on both tweets and speeches, but neither is statistically significant. Across these three specifications, we have a relatively imprecisely estimated effect of climate protests on legislative speech that flips signs across specifications.

We evaluate one final set of models that consider climate tweets and speech during a period of heightened parliamentary attention to climate change in late 2019. The UK e-petition system allows citizens to start and circulate petitions on topics of their choice. Citizens choose whether or not to sign a petition, and petitions that gather over 100,000 e-signatures are considered for an open debate in parliament. Two climate-related petitions passed this threshold and triggered debates. First, a petition titled, "Demand the EU and UN sanction Brazil to halt increased deforestation of the Amazon" reached 123,309 signatures and led to a parliamentary debate on October 7, 2019; second, "Restore nature on a massive scale to help stop climate breakdown" gathered 109,076 signatures and triggered debate on October 28, 2019.

For our purposes, the success of these two petitions provide an additional means of estimating the effects of climate protest on political speech. Their occurrence in the second half of 2019 created a new window of opportunity for climate speech in parliament during the peak months of the FFF protests, as figure 1 shows. As such, they constitute a most likely, or even a critical, case for establishing an effect of climate protest on legislators' speech.

We now subset the observation period to September and October 2019 and reconsider the effect of climate protests. Table 4 begins, again, by extending our baseline model 4 from table

	M13 Tweets	M14 Speeches	M15 Tweets	M16 Speeches	M17 Tweets	M18 Speeches
FFF Protest	0.098 (0.026)	-0.005 (0.002)	0.101 (0.067)	-0.036 (0.021)	-0.001 (0.018)	0.013 (0.014)
Unit of observation	Daily	Daily	Weekly	Weekly	Sitting days	Sitting days
Unit fixed effect	MP	MP	MP	MP	MP	MP
Time fixed effect	Year, week	Year, week	Year, week	Year, week	Year, week	Year, week
Observations	33550	33550	5500	5500	13200	13200

Table 4: Effect of protests on online and offline speech in the petition window (September – October 2019)

1 to this new observation period. Models 13 and 14 evaluate daily protest, tweet, and speech data. We find the same strong positive and statistically significant effect of political protest on climate tweets, but find a negative and statistically significant effect on offline speech. Even during this period of heightened awareness and engagement on climate change, MPs hesitate to discuss climate change in the House of Commons following local climate protests. The effects are attenuated when moving the unit of observation to the weekly level and the sitting-day level in models 15 through 18. We find similar results in a wider observation period that includes August and November 2019.

In sum, then, we have strong evidence that the effect of protest on the political speech of legislators differs across online and offline contexts. While Hypothesis 4 predicted a relatively larger effect of protest on online speech, we did not expect no effect. Thus, this hypothesis receives only qualified support.

5.3 Content analysis

Thus far, our analyses have demonstrated that MPs, at least in an online context, were more likely to tweet about the climate in the aftermath of protest. That is, we show that local climate protests have a consistent effect on the timing of MPs' online speech. What the analyses do not tell us is whether we observe any changes in the substantive content of that speech. In Figure 1 we saw that over the course of our observation period there was a substantial increase in the incidence of climate protest. The main inflexion point here was March 15, 2019—the date of the first FFF

Global Strike for Climate, when students from over 110 countries organized and skipped school to protest government inaction on climate change. We use this date as a demarcation point to consider how the substantive content of MPs' climate tweets changes after the climate protests.

To do so, we apply a recently-developed word-embedding technique called "à la Carte on Text" to identify differences in how climate change is discussed by MPs during the 2017–2019 parliament. We use the R package `conText` developed by Rodriguez et al. (2020). This technique builds from recent contributions that demonstrate the efficiency gains of using pre-trained word-embedding layers to gauge semantic change across document-level covariates or, as in our application, time (Arora et al. 2018; Khodak et al. 2018). The ALC approach is more computationally efficient than alternative approaches that require training new embedding layers for each time period of interest (e.g., Rodman 2020). It relies on the insight that embeddings for a particular (even very rare) target word may be derived by averaging the vectors of embeddings for words within its (here: six-word) context window from a pre-trained embedding layer. In this application, we use the GloVe pre-trained embedding layer (Pennington et al. 2014). After applying a transformation matrix to downweight commonly appearing words, Rodriguez et al. (2020) show that we can then use the stacked embeddings of context words as the distributional representation of our target word, and make inferences about meaning by comparing embeddings in terms of distance in vector space. Ultimately, the ALC embeddings allow us to predict the words most likely to appear near a target word, as a function of covariates.

We compute ALC embeddings for the target word `climate` as a function of one key covariate: a time dummy for pre- and post-March 15, 2019—the date of the first FFF Global Strike for Climate. We then identify the "nearest neighbour" words for `climate` before and after March 15, where nearest neighbours are taken as those words whose vector representation (in the pre-trained embedding) has lowest cosine distance to the implied embedding of our target word. The closer the cosine distance, the closer the words are in vector space, and the closer they can be understood in meaning. Finally, a bootstrapping and permutation procedure, as described in Rodriguez et al. (2020) is used to obtain standard errors and identify any significant deviation in meaning between our two time periods.[15]

[15]We also considered models using the date of a constituency's first FFF protest as our main explanatory variable,

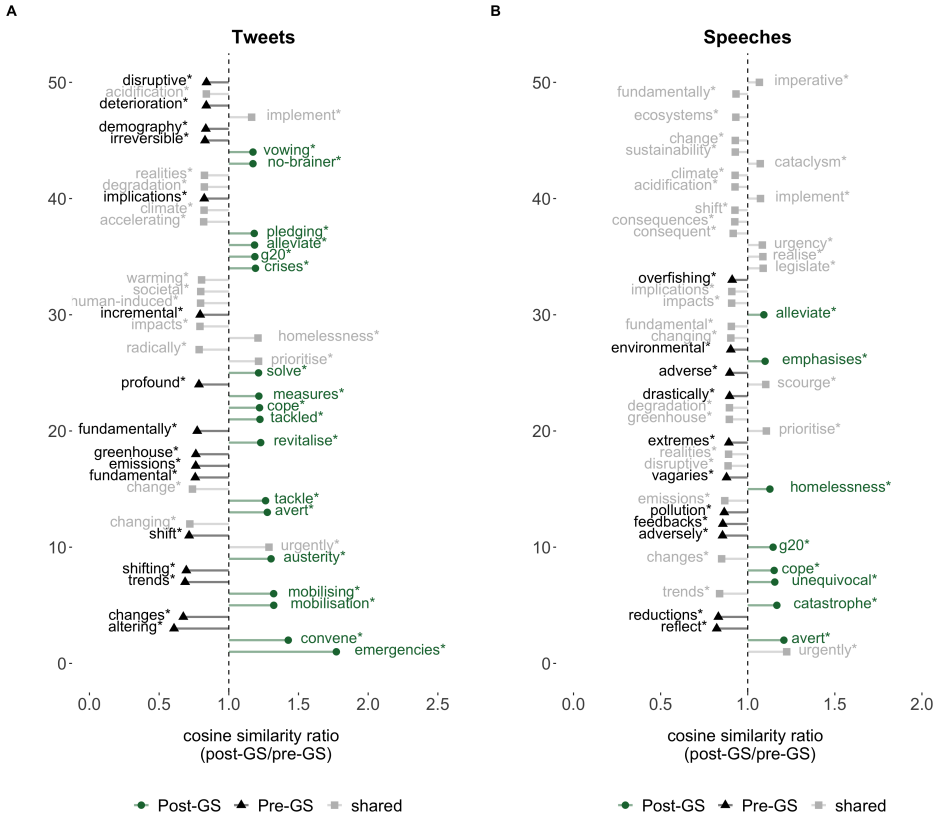

Figure 3: Changes in content of **(A)** MP tweets and **(B)** MP speeches before (pre-GS) and after (post-GS) the first FFF Global Strike for Climate on March 15, 2019. Words in green (black) appear among the top nearest neighbours of climate in the post-GS (pre-GS) period only; words in grey appear among the top nearest neighbours of climate in both periods.

In Figure 3, we plot the cosine similarity ratio of the ALC embeddings for "climate" before and after the Global Strike for Climate for both MP tweets and speeches. A large cosine similarity ratio value indicates that a word is closer to the post-Global Strike understanding of "climate" than the pre-Global Strike understanding. Only words with significant deviations from one are displayed, where one indicates no difference in the cosine similarity ratio. Before the Global Strike, MPs tended to tweet about climate change descriptively in terms of its "profound" "implications" and "realities", while also discussing "incremental" "change" and "trends." Following the Global Strike for Climate, climate tweets shift from description toward

but this created very short post-period time windows for some MPs and introduced new temporal dependence into the data.

crisis and advocacy: "avert[ing]" climate change becomes a key focus of discussion, the climate "crises" are "emergencies" around which we need to be "mobilising," and the UK government will "convene" with other "G20" countries, "vowing" new "measures" to "solve" climate change. A similar, if slightly less pronounced pattern can be seen in MP speeches, where talk of "changes," "reductions," and more general environmental concerns around "overfishing" turn, in the aftermath of the Global Strike for Climate, to talk of a "catastrophe" to be "avert[ed]" with "urgency."

The change in tone of MPs' tweets reflects the greater sense of urgency around climate action that the FFF protests have sought to instill into policy debates. Thunberg (2019, 57–68) chose to speak of the climate *crisis*, *emergency*, and *breakdown* instead of climate *change* in her speech to the UK Houses of Parliament in April 2019. The following week, MPs endorsed Labour leader Jeremy Corbyn's motion to declare a "climate emergency," which he introduced with reference to the "unprecedented upsurge of climate activism."[16] *The Guardian* also subsequently updated its style guide, stating a preference climate "emergency" and "breakdown" (Carrington 2019). Our ALC embeddings recover a similar semantic shift in MPs' communication around climate change following the FFF protests.

We can observe these temporal trends more clearly by calculating the cosine similarities between our target word "climate" and a set of candidate words over time for both our tweets and speeches corpus. Here, as candidate words, we use the words "crisis" and "emergency" as well as their plurals. To recover the over-time cosine similarities, we first split our observation period into year-week slices, and then get the context words around our target word "climate" for each week. Using the ALC approach we then estimate a time-period-specific embedding for the word "climate." This time, though, we take the average of the vectors of surrounding context words from our pre-trained embedding layer. In other words, unlike in the above regression-based approach where we stack the distributed vector representations of words, here we are taking the average of the context word vectors (from the same pre-trained GloVe embedding layer), and applying the same transformation matrix used above to downweight commonly appearing words. From this procedure we are able to induce a single period-specific embedding for our

[16] *Hansard*, vol. 659, col. 225, May 1, 2019.

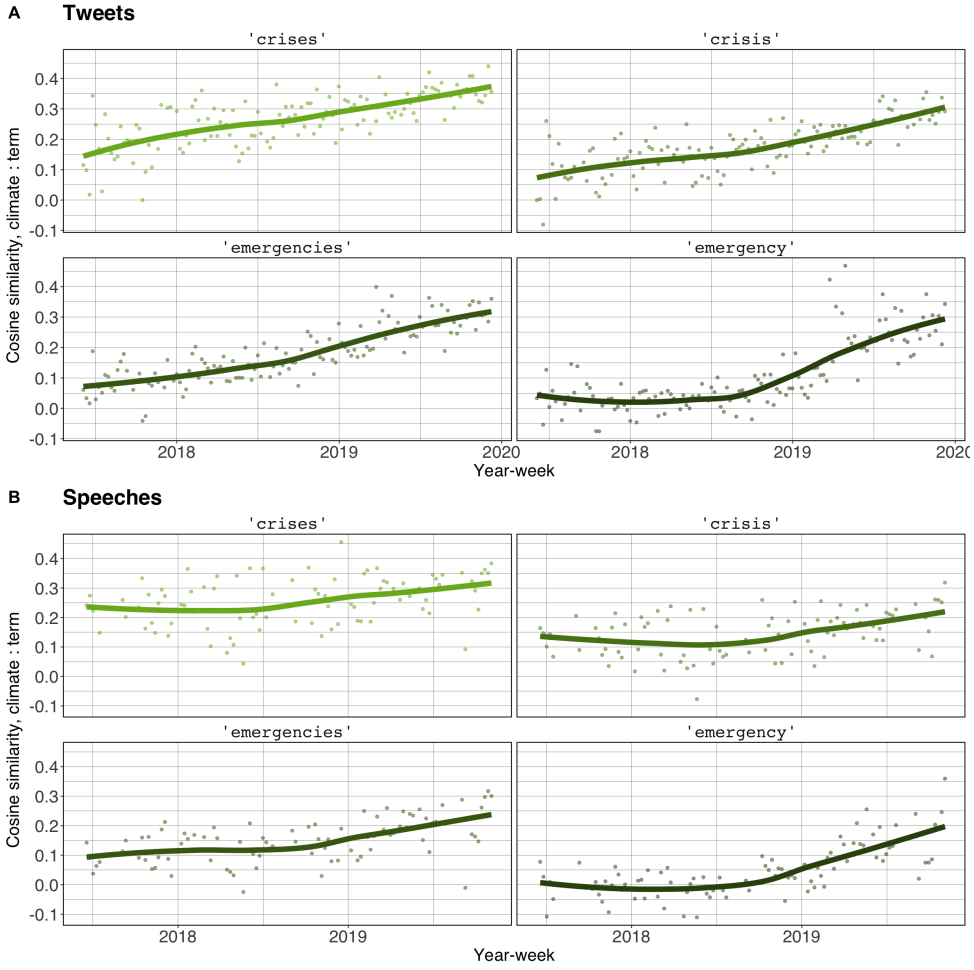

Figure 4: Weekly cosine similarities between "climate" and "crisis/emergency": **(A)** MP tweets; and **(B)** MP speeches. Lines show loess regression smoothing with bandwidth set to one.

target word "climate" over each time period. Once we have recovered these embeddings, we can then calculate the (l2-normalized) cosine distance between the vectors for "climate" and "crisis/emergency" over time. We display the results of this analysis in Figure 4.

Similar to the findings in Figure 3, we see that in both MP tweets and speeches the word climate becomes more tightly related to words invoking urgency. Again, however, this is more pronounced in MP tweets compared to MP speeches. Over our observation period, the proximity of the word "climate" to our candidate words effectively triples in size for MP tweets; for speeches, while we do see a shift toward describing climate-related questions as an "emergency," there is no pronounced trend for the word "crisis." Notably, the proximity of

"climate" to "emergency" exhibits a sharp uptick at the time of the first Global Strike for Climate in early 2019.

6 Discussion and Conclusion

This paper set out to explore the effects of climate protest on the timing and substance of political speech. To determine the effects of climate protest on the timing of legislative speech, we matched high resolution speech data both online and offline to crowd-sourced protest event data. To gauge broader semantic shifts in climate-related speech, we employed recently developed word-embedding techniques to determine the direction and significance of temporal trends in the contextual meaning of climate-related speech. This is the first article probing the effects of protest on the legislative speech of individual MPs over time. The article also represents one of the first efforts to distinguish between the online and offline contexts of legislative speech (Castanho Silva and Proksch 2021).

We asked how Fridays for Future protests in the UK affected the online and offline speech of MPs between 2017 and 2019. Our chief expectation was that climate protests should heighten MPs' attention to the climate. However, we also expected MPs' responsiveness to protest to be greater in their online than offline speech, and to be moderated by party affiliation and electoral security. We tested these expectations with our data on the timing and location of climate protest and legislative speech both online and offline.

Overall, we found evidence that climate protest does influence the timing of legislators' online political speech. Between 2017 and 2019, UK MPs became more likely to tweet about the climate in the immediate aftermath of climate protests in their constituency. However, we found much less evidence of responsiveness in MPs' offline speech. We also found no evidence that MPs' responsiveness to protest varies according to their party affiliation or electoral position. If the timing of legislative speech differed in online versus offline domains, the broader substance of climate-related speech nonetheless exhibited some shared trends. Specifically, we found a shared move towards language of greater urgency when discussing climate-related issues.

The finding of no offline responsiveness to climate protest ran counter to our expectations.

We theorized that offline speech is more costly than online speech for elected representatives. After all, parliamentary speech is a scarce resource: MPs may choose to allocate parliamentary time to alternative issues and speech may be constrained by questions of timetabling, steering from party whips or competition with other legislators. In contrast, online speech is comparatively unconstrained: MPs can tweet what they want, when they want. Notwithstanding these differences in the nature of legislative speech across both domains, we nonetheless expected to identify protest effects across both contexts. Climate protest is arguably a "most likely" case given the broad cross-party support for climate policy reform and and unusual salience of climate-related questions in recent years. That we found no effect of local climate protest is therefore surprising.

What explains this finding? One potential explanation has to do with the audiences of both types of speech. Twitter users tend to be younger, more urban, and more left-leaning than the general public (Mellon and Prosser 2017). As such, the audience of online speech is more likely to be receptive to climate-protest-related speech than the general public. It is possible, therefore, that MPs calibrate their speech to the known demographics of social media users. A corollary explanation has to do with the nature of parliamentary contributions. Speech in parliament constitutes a more formal and lasting contribution to the individual records of elected MPs compared to online speech, which is cheaper, more ephemeral, and more easily scrubbed from their records. Consequently, MPs may be more hesitant to respond to cues from protest. A final explanation is case specific. The year 2019 saw an uncommon amount of attention devoted to a single issue: Brexit. The result may have been that Brexit-related issues out-competed climate-related questions on the parliamentary floor. Taken together, these factors may have limited the influence of protest on offline legislative speech.

As for the absence of any party-level heterogeneity in MP responsiveness, this likely can be attributed to the broader cross-party support for climate policy reform. It remains nonetheless striking that we recover no substantive differences between parties across all of our model specifications. The finding that electoral security had little to no effect no responsiveness is less straightforward to explain. One consideration has again to do with Brexit. During this period, issue attention was swallowed up by one overarching cleavage: the position of MPs in relation to

Brexit. As a result, MPs may have been less cognisant of their electoral security when speaking about other issues.

In a final section, we find that even if climate protest failed to register in MPs' parliamentary speech, we do see a broader semantic shift when discussing climate-related questions across both online and offline contexts. A shared move towards language of greater urgency may or may not, of course, be directly related to protest. It is nonetheless suggestive that the shift toward invoking "emergency" when discussing the climate coincided with the onset of mass climate protest. This would suggest that the channel of influence for protest is not merely local. That is, the national upswell of protest over the years 2017–2019 may well have exerted its influence through mainstream media coverage, accompanying lobbying efforts, and the growing evidence of public support.

These insights go some way to explaining the results we observe. But the differences we identify between online and offline climate speech—even in parliamentary contexts favourable to climate speech—open a larger avenue for future research to map out how online and offline political speech differ, and why MPs communicate differently across media. Is the difference driven by institutional features of UK politics, heterogeneity across individual legislators, or attributes of the substantive policy topic? Linking legislative speech records with the hundreds of MPs who tweet is a natural way to study this question in future research.

Our empirical strategy takes advantage of both recent advances in computational techniques for the analysis of large-scale text data and the growing availability of legislative speech data from both parliamentary corpora and social media. In this, we provide a framework for future research investigating influences on, and changes in, legislative speech more generally. More recent efforts to document legislators worldwide, including their associated social media profiles (e.g. Göbel and Munzert 2021), will make this task progressively easier.

In sum, the link between local protests and legislator speech suggests one channel of accountability and responsiveness in climate politics. However, protest movements are rarely satisfied with words alone. Future work could investigate how protests affect policy reforms—either directly by changing the preferences of legislators, or indirectly through public opinion and electoral strategies. While individual legislators have limited influence on national climate

policy in the UK, in other political contexts they are more empowered to direct policy reforms. Given that the Fridays for Future protests are a transnational protest movement, the topic lends itself well to study in numerous national contexts.

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A Appendix

Table APP-1: Main models: Binary measure of climate tweets

term	M1	M2	M3	M4
FFF Protest	0.017	0.017	0.016	0.016
	(0.005)	(0.005)	(0.005)	(0.005)
Covariates	None	Frontbench	None	Frontbench
Unit fixed effect	MP	MP	MP	MP
time fixed effect	Year, month	Year, month	Year, week	Year, week
Observations	503726	503726	503726	503726

Table APP-2: Heterogeneous effects: Binary measures of climate tweets

term	M5	M6
FFF Protest	0.006	0.017
	(0.004)	(0.005)
FFF Protest × Labour	0.022	
	(0.011)	
FFF Protest × Marginal		-0.007
		(0.011)
Unit fixed effect	MP	MP
Time fixed effect	Year, week	Year, week
Observations	450772	503726

Table APP-3: Online and offline speech: Binary measures of climate tweets and speeches

term	M7	M8	M9	M10	M11	M12
FFF Protest	0.016	0.000	0.027	-0.001	0.005	0.001
	(0.005)	(0.000)	(0.012)	(0.003)	(0.005)	(0.002)
Covariates	Frontbench	Frontbench	Frontbench	Frontbench	Frontbench	Frontbench
Outcome	Tweets	Speeches	Tweets	Speeches	Tweets	Speeches
Unit of observation	Daily	Daily	Weekly	Weekly	Sitting days	Sitting days
Unit fixed effect	MP	MP	MP	MP	MP	MP
Time fixed effect	Year, week	Year, week	Year, week	Year, week	Year, week	Year, week
Observations	503726	503726	84966	84966	199738	199738

Table APP-4: Online and offline speech in petition window: Binary measure of climate tweets and speech

term	M13	M14	M15	M16	M17	M18
FFF Protest	0.023	-0.001	0.029	-0.012	-0.001	-0.002
	(0.009)	(0.000)	(0.016)	(0.005)	(0.005)	(0.001)
Covariates	Frontbench	Frontbench	Frontbench	Frontbench	Frontbench	Frontbench
Outcome	Tweets	Speeches	Tweets	Speeches	Tweets	Speeches
Unit of observation	Daily	Daily	Weekly	Weekly	Sitting days	Sitting days
Unit fixed effect	MP	MP	MP	MP	MP	MP
Time fixed effect	Year, week	Year, week	Year, week	Year, week	Year, week	Year, week
Observations	33550	33550	5500	5500	13200	13200