Is There a Link between Climate Change Scepticism and Populism? An Analysis of Web Tracking and Survey Data from Europe and the US

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Word Count (Main document, minus appendices): 8000 words

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Abstract

Climate change and populism are two major phenomena in contemporary politics. Recent successes of populist parties and politicians, especially in Europe and in the United States, have given rise to extensive debates in the academic literature and beyond. Yet the link between populism and climate change scepticism (henceforth 'scepticism'), has so far received little attention. This paper examines the link between scepticism and populism by means of a unique dataset: a survey and detailed web browsing histories of participants from France, Germany, Italy, Spain, the US, and the UK. The web tracking data includes more than 150 million website visits over a period of three months and the survey contains questions about political attitudes and attitudes towards climate change. We analyse the 8893 websites which contained 'climate change' and its cognates in the URLs and link these website visits and the content of these websites to the political attitudes and climate change orientation of those who visited them. The contribution is both methodological (linking surveys and web tracking data, including cross-country comparison) and substantive (uncovering links between populists, their climate change orientations, and the content of related websites they visited). Our analysis demonstrates the value of computational methods in political communication research and provides insights into the link between populists and climate change scepticism.

Keywords: climate change; populism; survey; web tracking

Introduction

Climate change and populism are two major phenomena in contemporary politics. Recent successes of populist parties and politicians, especially in Europe and in the United States, have given rise to extensive debates in the academic literature and beyond. Climate change in these countries is also a longer-standing issue, pitting those who want to put climate change at the top of the political agenda against those who deny that it requires action or that it is a human-made or anthropogenic problem ('sceptics'). The link between populism and climate change scepticism has so far received little attention (but see Lockwood 2018; Huber 2020). To investigate the link, this paper combines survey analysis with computational social science methods. We use web tracking data providing insights into the online information diets of study participants from six countries with a dataset of more than 150 million website visits over a period of three months which is coupled with a survey of the same population which included questions about their political attitudes, voting intentions and attitudes towards climate change.

Our research questions examine the link between populism and scepticism, first, linking it to populist party support; then, second, examining how offline events like climate activism increase online attention to climate change issues; third, examining the difference between the online media diets of supporters and non-supporters of populist parties when it comes to climate change websites; and lastly and fourth, examining the difference in the media content of with regard to climate change consumed by supporters and non-supporters of populist parties. To do this, we first analyse the association between climate change attitudes and political attitudes using the survey data (N = 9625). We then analyse the 9639 websites which contained 'climate change' and its cognates in the URLs and link these websites to the political attitudes of those who visited them. We find a number of differences between populist party supporters and non-supporters in their attitudes toward climate change

issues and policies and the types and content of websites that they visit. Findings from the study shed light on the influence of support for populist parties and their distinctive online information about climate change.

Literature review and background

Populism is defined here, following Mudde's widely cited work, as anti-establishment or anti-elite, in favour of an exclusionary 'people', and seeking more representation of this 'people's' will (Mudde & Rovira Kaltwasser, 2017). Populism has also been analysed as a particular communication 'style' (de Vreese, Esser, T., & Stanyer, 2018; Moffitt, 2017) which favours direct communication between political leaders and their supporters, a focus on the leaders' qualities, and leaders adopting the (sometimes crude) language of ordinary people and which pits them against the 'elites'. Whether populist supporters are prone to particular diet of media consumption has been the subject of very recent research (see the overview in Schulz's [2019] Ph.D. thesis, which includes several publications on the topic). As Schulz points out, there is variation in the media diet of populists in Western democracies and there are puzzles: One example is that although populist supporters complain about unfair treatment by public service media, they also consume these media more than supporters of non-populist politics (perhaps because they get angry at this mistreatment or perceive a lack of representation of their views on certain issues?). In any event, the relation between climate scepticism and political ideologies is well-documented (Hornsey, Harris, Bain, & Fielding, 2016). However, by relating this scepticism to support for right- and left-wing populist parties and non-populist party supporters, we move beyond existing works since populism does not necessarily align with traditional right- or left-wing political predispositions that have been the main focus of previous theoretical models (see [removed for review]). Finally, the literature on populism has recently grown dramatically, and for the sake of space we mention only key related works in what follows.

Coverage of climate change in the media has been analysed extensively (for an overview, see Boykoff 2011), and we focus here more specifically on digital media. Digital media have, of course, been used for political activism concerning climate change, and Segerberg has reviewed the various modes of activism through the lens of networked 'connective' logics. Yet as Schäfer and North point out (2019), there are arguments both for why digital media are making it worse and better to have a constructive climate policy: worse, because digital media fragment the debate and make it more uncertain which sources are trustworthy and they may also allow the public to choose sources that align with their own views; better, because digital media allow more dissenting and grassroots voices to be heard.

We have abbreviated climate change scepticism to 'scepticism' throughout, but it is worth pointing out that scepticism of course has different meanings: for example, there could be various subtypes of scepticism, including whether there is an overall trend towards a hotter planet, whether climate change is human-made (anthropogenic), and whether individuals should take personal responsibility for tackling climate change, or if the scientific knowledge is reliable. We leave these differences to one side for reasons of space but bracket these various types together under 'scepticism' by which we mean questioning the current scientific consensus about climate change.

There is, of course, a wealth of knowledge about how the public understands science (Bauer, Allum, & Miller, 2016) but this needs to be updated for digital media and for how public attitudes may have shifted in more recent times in view of increasing scepticism towards experts. Schäfer (2017) has charted recent changes in science news coverage, noting that digital media have put traditional news outlets under pressure such that they cover science less or have stagnated in coverage in recent decades. At the same time, science news

has become pluralized and, in the case of climate change and other issues, politicized, so that climate science is also not just treated separately as a science topic.

Pearce, Niederer, Özkula, and Sánchez Querubín (2018) analysed research on social media and climate change, identifying certain themes in this research (such as polarisation) but also noting the bias towards studies of Twitter – bias insofar as other social media are equally if not more important in climate change communication.One such early study, by Williams, McMurray, and Lambert showed that discussions among climate 'activists' and 'sceptics', as evidenced by prominent hashtags on Twitter, are largely antagonistic, and that 'opinion leadership on Twitter is in general likely to promote (activist) views supportive of the scientific consensus and actions to mitigate or adapt to climate change'(2015, p. 137). Another study, by Painter, Kristiansen and Schaefer (2018), systematically compared legacy news media (such as The Guardian and The New York Times) and online only news media (Huffington Post, Vice and Buzzfeed) in the coverage of the COP21 climate change conference. They found a mixed picture: although, for example, Vice covered the civil society protests more than other outlets, the Huffington Post adhered to its policy of not giving voice to sceptics. Finally, Allgaier (2009) examined 200 YouTube videos related to climate change and climate engineering that garnered more than 100000 views. He points to how many of these videos relate to unorthodox topics such as the 'chemtrail conspiracy', and how topics like these are not covered by professional media organizations. As Allgaier points out, on YouTube, minority opinions can get just as much attention as videos that put forward the consensus viewpoint, especially if, as is often the case, they are dressed up to appear 'scientific'.

Again, we have only provided a brief overview of the most relevant literature for reasons of space. As mentioned, the connection between populism and climate scepticism has so far not (to our knowledge) been explored systematically. Lockwood (2018) contrasts two

approaches to the link between right-wing populists and the climate change agenda: the 'structuralist' approach, which focuses on economic changes related to climate (such as those working in the coal industry) and the 'left behind' – versus the 'ideological' approach which focuses on socially conservative and nationalist values of 'the people' against 'cosmopolitans'. He is more convinced by the 'ideological' approach since it is often not just those in areas of the declining coal industry or in the oil industry, who are both climate sceptics and populists. Huber reinforces Lockwood's conclusion: by reference to a detailed survey of the UK population, he finds that people with 'populist attitudes perceive a lack of representation' of their views on climate change and 'because of their anti-elitist stance, reject climate and environmental policies' (2020: 17). In other words, populist anti-elitism is more important for scepticism than an economic explanation that focuses on the 'losers of globalization'. A further study about populism in the US by Huber et al. (2020), however, finds mixed effects concerning anti-elitism and responsiveness to climate policies. For populist radical-right participation in government, Ćetković and Hagemann (2020) show that this had a negative effect on climate policy efforts.

We will return to the rejection of elites or scientific expertise which lies at the nexus between populism and scepticism in the concluding section since it goes the heart of the question of which views are represented in the media and in politics. Howsoever they may be linked, scepticism and populism obviously have separate roots: scepticism has been prominent in the US, for example, for several decades, and so predates the recent success of Trump's populism in the US (Guess, Nyhan, & Reifler, 2020). Even though populism has deeper roots in the US in the 19th century (Kazin, 1998a). Conversely, in Europe, where populism has been rising since the 1990s (Mudde, 2007), scepticism has received greater attention in very recent years – even if climate change and environmentalism have been on the agenda for longer. Furthermore, there is considerable variation in the degree of

scepticism, and three cases can be compared briefly to illustrate this point; Germany and the US: in Germany, one of the main reasons for scepticism is the strength of the German car industry. Environmental restrictions on cars, such as higher gasoline prices and more restrictive speed limits, which have been promoted by the Green Party, have therefore been seen by sceptics – and by the AfD – as overly zealous efforts by climate change activists and leftists who urge more state regulation. In the US, there is far more scepticism of government generally , and it is well-known that the energy and oil company lobbies have been instrumental in fomenting the (false) view that there is still uncertainty or lack of consensus over the findings of climate change science – in this way encouraging scepticism (Oreskes & Conway, 2011). But in France, at that time left-wing populists (the Giles Jaunes) have been at the forefront of protesting against increases in fuel prices.

Finally, given that populist attitudes are closely related to populist party support (Van Hauwaert & Van Kessel, 2018), the skewed media diets of populist party supporters, including so called 'hyperpartisan' websites, might also leave marks in their climate change attitudes (see alsoAuthors, removed for review It is an open empirical question, though, whether the contents seen with regard to climate change differ between left- and right-wing populist party supporters and supporters of mainstream parties.

Research questions

In view of the foregoing discussion of the relation between populism and climate scepticism, we will consider the following research questions:

RQ1. Is there a link between populist party support and climate scepticism? We hypothesize that there will be a statistically significant relationship between support for right-wing populist parties and climate scepticism, after controlling for political attitudes and demographic variables. We also hypothesize that there will be no link between support for left-wing populist parties and climate scepticism.

RQ2. Do offline events like climate activism increase attention to climate change issues?

RQ3. What is the difference in the online media diets of supporters and non-supporters of populist parties when it comes to climate change websites? Do different groups prefer different media platforms to seek information about climate change and global warming?

RQ4. What is the difference in the media content with regard to climate change consumed by supporters and non-supporters of populist parties?

Methods

In this study, we combine surveys with the tracking of people's online behaviour on desktop computers. While the survey helps to understand the relationship between populism and attitudes toward climate change, web tracking data contributes to our understanding of the consumption of online content among supporters and non-supporters of right-wing populist parties. Figure 1 shows a flowchart of the process of survey and web-tracking data analysis conducted in this paper.

Survey

The survey includes 9625 panellists across six countries: France, Germany, Italy, Spain, UK, and US. The surveys were in the field between April 23 and May 11, 2019.

Dependent variables: Climate attitudes were measured using two groups of dependent variables, most of them adapted from the European Social Survey. The first group of variables measures attitudes toward climate change, including four Likert-scale questions. The second group of variables measured attitudes towards climate change policies, including three Likert-scale questions (see the question wording in the Table A1 in Appendix A).

Independent variables: We use two sets of independent variables as potential factors that account for variances in the dependent variables. Table A2 in Appendix A shows summary statistics of independent variables. The first set of independent variables measures political predispositions, including support for populist parties, political interest and left-right leaning. Support for populist parties was measured by right- or left- wing populist party identification (the original variable measures which party the panellist feels closest to). The coding of populist parties is based on the PopuList (Rooduijn et al., 2019) (see Table A3 in Appendix A for the list of coded right-wing and left-wing parties). Left-right ideology was measured in a scale ranging from left (0) to right (1) to right (10). Political interest was measured using a Likert-scale from not interested at all (1) to very interested (4). The second set of independent variables are demographics, including age, gender, education, religion, region, and income level. Education was recoded into a country-comparative scale of low, intermediate and high education according to the International Standard Classification of Education (ISCED) 2011. Finally, we include country dummies that control for differences in political and media systems.

Web tracking

Web tracking data for this paper was collected from the online access panel of Netquest, a market research company, in full compliance with the EU's General Data Protection Regulations (GDPR).[1] Panellists are incentivised by the market research company to install tools that track their online activities on desktop computers and mobile phones.[2] The tracking data consists of anonymised IDs of panellists, full URLs of websites, domain names of websites, and a precise time stamp and duration of a website visit. The research period was

[1] The study received IRB approval from [removed for review].

[2] In this study, we only use only web tracking data from desktop computers that contains the full URL for each website visit, whereas the smartphone data is more limited.

March 15 to June 16, 2019. The advantage of web tracking data is that it provides a more direct measurement of exposure to climate related contents than the survey-based self-reports used in most previous research.

After searching for a list of keywords about climate change in a web-tracking dataset that consists of more than 169 million website visit entries, contributed by 8758 panellists, we identified 9639 website visits to URLs that contain climate change keywords (see Table B1 in Appendix B for summary statistics of sample sizes of the web-tracking and survey dataset, and Table 1 in Appendix C for a list of keywords we used to identify climate-related website visits). Due to issues such as deleted news articles, or articles accessible only to subscribed users, the content from 1730 of these websites in our web-tracking dataset could not be included, so in the end we successfully crawled content from the 7909 websites in the dataset that contained these keywords. The content of the websites was generated and retrieved using the DiffBot API, which automatically extracts text content from websites.[3]

Using the climate website visit dataset, we conducted an analysis of attention to climate change content across different groups by measuring time spent on climate websites per day. We also ranked the top 50 domains visited by different groups in the climate web-tracking dataset, including the top 50 website domains for right-wing populist party supporters, left-wing populist party supporters and non-supporters of populist parties.
All website domains in the climate web-tracking dataset had been coded into news or non-news domains. The list of news domains was curated by three researchers [Insert the authors' previous paper]. All news domains were also categorized into five different types of news. Domains that did not fall into these five categories were coded by two of the authors with an intercoder reliability of 94.44%.

[3] https://www.diffbot.com/products/automatic/#article

For the content analysis of climate websites in this paper, we focus on content from news domains only and select the climate website URLs that contain English content. Among all visits to climate websites in the web-tracking data, we identified 790 website visits to news domains that contained English content, from which the English content from climate news visits was divided into three groups: content consumed by supporters of left- and right-wing populist parties and non-supporters of populist parties. After text cleaning, there were 12,039 unique tokens from 790 climate news websites in the corpora (details of the data cleaning process for topic modelling can be found in Table C3 in Appendix C). We applied Latent Dirichlet allocation (LDA), a popular topic modelling method in computational linguistic analytics, to conduct unsupervised generative probabilistic modelling of the corpora. LDA has been widely used by political scientists (Jelodar et al., 2018) as well as media scholars (Jacobi , van Atteveldt, & Welbers, 2015) to identifying latent topics in large-scale text. Topics identified in LDA represents underlying themes of the content by assigning word probability in each topic. Themes of topics could be interpreted from analysing words with highest probabilities for each topic. For each group, we select the number of topics that yields the optimal coherence score. In this research, we used nPMI (normalised Pointwise Mutual Information) and cosine similarity to evaluate the semantic similarity of top-ranked words in topics (Syed & Spruit, 2017). To determine the optimal number of topics, we plotted the values of coherence scores with different number of topics and discuss the choice of the number of topics for each topic model in Appendix C.

Survey analysis results

Relative importance of climate change issues

Before running analysis on the survey data, we visualised the relative importance of climate change issues compared to other social issues among different political groups

(Figure 2) and across different countries (Figure 3). Among non-supporters of populist parties, climate change is ranked the fourth most important social issue. While supporters of left-wing populist parties consider climate change the third most important issues facing the society, climate change is the third least important issue for right-wing populist party supporters. We also find country variations in the relative importance of climate change among social issues. German panellists, in particular, are most concerned with climate change issues: They ranked climate and environment as the most important social issue facing the country. We will explore country variations in more detail in the regression analysis.

Political and demographic factors of attitudes toward climate issues and climate policies

We conducted ordinal logistic regression analysis on the dependent variables of attitudes toward climate issues and attitudes toward climate policies. Ordinal logistic regression models on attitudes towards climate change issues (Model 1 to Model 4) are summarised in Table D1 and Table D2 in Appendix D. Figure 4 visualises the odds ratios, which consists of the exponentiated coefficients of the independent variables in each model for the climate change issue attitudes. In terms of attitudes toward climate change issues, right-wing populist party supporters have lower odds of prioritising the environment over economic growth, believing that climate change is caused by human activities, trusting climate experts, or taking personal responsibility for tackling climate change. However, we did not find statistically a significant association between climate change denialism and support for populist left-wing parties. In addition to party affiliation with right-wing populist parties and right-leaning political orientation, lower interest in political issues is associated with higher climate scepticism. Among all the demographic factors, we find education level to be associated with all four aspects of climate change attitudes: panellists who have lower

education levels are more likely to be sceptical of climate change issues than those with higher education levels. Another variable accounting for climate denialism is religion, as we find panellists with no religion have higher odds of prioritising environmental protection over economic growth, belief in anthropogenic climate change, and trust in climate scientists. Female panellists are also more likely than males to take personal responsibilities for tackling the climate crisis and for age, although older generations are less likely to believe that climate change is due to human activities, they have higher odds of being willing to take personal responsibility for tackling climate change. The odds of prioritising protecting the environment over economic development is 1.27 times higher among panellists who live in rural areas than urban dwellers.

Figures 5 to 8 show the joint effect of right-wing party support and country on attitudes towards climate change issues. We notice Trump's supporters have a lower probability of believing in human-made climate change and taking personal responsibility for tackling climate change than right-wing populist party supporters in other countries. Right-wing populist party supporters in Spain show a higher probability to trust climate experts than right-wing populist party supporters in other countries.

Ordinal logistic regression models on attitudes towards climate change policies (Model 5 to Model 7) are summarised in Table D3 and Table D4 in Appendix D. Figure 9 visualises the odds ratios of independent variables in each model for climate policy attitudes. When it comes to attitudes towards climate change policies, the odds of opposing increasing taxes on fossil fuels, subsidising renewable energy or banning least efficient appliances among right-wing populist party supporters are 1.81(1/0.551), 1.30(1/0.77) and 1.25 (1/0.798) times higher than among non-supporters of right-wing populist parties. Interestingly, we find left-wing party supporters with 1.34 times higher odds of supporting climate policies to subsidise renewable energy than non-supporters of left-wing populist

parties but no significant differences in attitudes towards the two other climate policies. Like attitudes towards climate change issues, right-learning panellists and those who have lower political interest have lower odds of supporting climate policies. Education level, along with income level, are important socio-economic factors in models of attitudes toward climate policies. A high education level is associated with higher odds of supporting all three types of climate policies, while those with higher income levels have higher odds of supporting increasing taxes on fossil fuels and banning least efficient appliances than those with lower income levels. Religion also matters in climate policies as people with no religion have higher odds of supporting climate policies than those with religious beliefs. Rural residents and older generations have lower odds of supporting tax increase on fossil fuels than urban residents and younger generations, while females are 1.2 times more likely than males to support the banning of least efficient appliances.

Figures 10 to 12 show the joint effect of right-wing party support and country on attitudes towards climate policies. We observe that right-wing populist party supporters in France are more likely to oppose increasing taxes on fossil fuels than right-wing party supporters in other countries. Right-wing populists in Spain have a higher probability of supporting subsidies for renewable energy than right-wing populist party supporters in other countries. Trump supporters have a higher probability of opposing subsidising renewable energy and banning less efficient appliances than right-wing populist party supporters in the other five countries. Because we find a positive association between left-wing party support and support for climate policies subsidising renewable energy, we show in Figure 13 the joint effect of left-wing party support and country on attitudes towards climate policy for subsidising renewable energy. We observe a higher likelihood of support for subsidising renewable energy among supporters of left-wing populist party in Spain than left-wing party supporters in other countries.

Web tracking analysis

Change of online attention to climate websites by political groups

To understand the change in attention to climate change issues, we aggregated the duration of viewing climate change websites on each day across all countries. Attention to this topic was strongly shaped by certain events during our data collection. Attention to climate events has of course been long-standing, but 2019 stands out as a year when the issue received prominence that it has not received since Al Gore's book and film 'An Inconvenient Truth' in 2006. Overall media attention to the topic of climate change reached a recent peak in 2019.[4] The previous such peaks were in 2010 and 2016. Yet recent climate-related events have driven online attention to certain kinds of climate-related content. This is of course expected, but our period of data collection happened to coincide with events related to climate change that episodically dominated the news, related especially to the Fridays for Future protests that started in August 2018 by school children and the related attention to Greta Thunberg as well as the Extinction Rebellion protests. This finding raises the question of how central or peripheral offline events were during our data collection period. Attention to climate change or climate activism or denial is partly event driven, but populism is only partly event driven, such as the so-called 'refugee crisis' of 2015, and mainly driven by longer-term structural factors (for example, Norris and Inglehart 2019).

Figure 14 shows the time spent on viewing climate change websites aggregated by date. The colours of the lines represent populist party support. The biggest spike of attention during our data collection period was on April 21 when Greta Thunberg joined the London Extinction Rebellion protests. Offline events led by climate activist organisations led to more extensive attention to climate change websites including among right-wing populist

[4] https://sciencepolicy.colorado.edu/icecaps/research/media_coverage/world/index.html

supporters. Activities by climate activists such as Greta Thunberg in particular led to a peak of attention among the supporters of right-wing populist parties around April 21 when Thunberg joined the protests in London. We also find that responses to climate change issues from populist leaders such as Trump (on June 8) increased the right-wing populists' attention to climate change websites.

Top ranked website domains by political groups

We coded the top 50 website domains in the climate-related web-tracking dataset. Appendix E provides the coding of the top 50 domains across the three political groups of panellists. Figure 15 shows three lists of top 50 domains, for left-wing populists, non-populists, and right-wing populists. Analysis of the distribution of categories of top 50 domains suggests that populists and non-populists differ in their preferences for different climate-related websites (see Figure 16 to 18 for visualisations of the ranking of types of news and non-news domains). Interestingly, the percentage of news domains in the top 50 domains visited by populists, both left-wing and right-wing is higher than that of non-populists. Within the news domains, hyperpartisan media accounted for 20.83% of top ranked news domains for right-wing populist party supporters whereas the percentage of hyperpartisan domains is only 9.52% and 6.67% for left-wing populist party supporters and non-supporters of populist parties respectively. The percentage of climate-related organizations among website domains ranks highest in the top 50 domains among non-populists but they are not among the top 50 most visited domains for right-wing populist party supporters. Another climate-related type of website domain, climate activism, is visited neither by left-wing nor right-wing populist party supporters in their top ranked domains. Nevertheless, we find that science-related website domains account for 11.54% of non-news website domains among the right-wing populist party supporters, indicating a relatively high interest for science-related content among the right-wing populists.

Topic modelling of the climate websites content

The topic modelling of English climate news content shows that supporters of left-wing populist parties consume four types of information about climate change (see the word clouds of the 50 most probably keywords in each topic in the topic modelling result in Figure 19 and Table F1 in Appendix F). The first topic is energy industry and climate justice, which consists of top-ranked keywords such as "regulation" or "legislation" of "energy" or "gas" and "policy". The second topic is climate politics and party polarisation, represented by the names of American Democratic politicians such as Alexandria Ocasio-Cortez or Joe Biden. Keywords such as "leadership" or "president" also indicate the focus on climate politics for this topic. The third topic is climate science and changing nature, which contains the changing "temperature" of the "globe" and the functions of "photosynthesis" process in "plant(s)". Research "carried" out by "scientists" that "revealed" "shocking" findings of the changing nature is also mentioned in this topic. Finally, the fourth topic among left-wing populists is participation in environmental action, which includes "reaction" from the "people" and "entertainer(s)" such as "Hailee" Steinfeld (an American actress and singer) who participated in the "actions" to tackle climate change issues.

Compared to supporters of left-wing populist parties, the first topic that is prominent among non-supporters of populist parties in their climate information (Figure 20 and Table F2 Appendix F) is changing nature and agriculture represented by keywords such as "carbon" dioxide "emission" and the impact on "farmers". The second topic is about politics and climate policy, which consists of keywords about "energy" and "company(ies)" and their impact on the "environment" and industries such as "beer" production (which closer examination reveals as being linked to climate change). Also mentioned in this topic is the "power" of the "state" and politicians such as "trump". The third topic specifically focused on the energy industry and economics such as "oil" or "fossil fuel" "market" and how

"policy" intervention on these "industries" will lead to the "reduction" of "greenhouse gas". The fourth topic focuses on climate activism and Greta Thunberg, with content such as how "leaders" of "climate change" "protest" such as "(G)reta" "(T)hunberg" and "campaigners" of "extinction rebellion" take actions in the climate "movement".

The topic modelling of English climate-related information among supporters of right-wing populist parties shows five themes in the results (Figure 21 and Table F3 Appendix F). The first topic is climate politics and protest which consists of keywords such as "protesters" joined in "demonstrations". Right-wing populists also focused on climate activism and Greta Thunberg in the second topic, with mentions of keywords about "extinction" "rebellion" and "protest" that caused "disruption" in "(L)ondon" by "activists" such as "(G)reta" "(T)hunberg". The third topic, climate policy and sustainability, focuses on the use of "plastic bottles" that have led to "pollution". "Efforts" are called for, such as "reduc(ing)" the use of plastic and using "recycled" material. Similar to left-wing populists, right-wing populist content also prominently features climate politics and party polarisation. Keywords included in the content are "lawsuit" of "(PCFFA)", a union that represents "fishermen", against oil corporations. Nevertheless, the lawsuit is discussed in the context of American party politics with content referring to the connections between the "(D)emocrat(ic)" party and PCFFA. Finally, the last topic concerns energy industry and international relations, with content such as "lobbying" or "campaign(s)" led by oil companies such as "BP", "Chevron", or "ExxonMobil" that hindered the achievement of goals highlighted in the "(P)aris" "(A)greement". Also included in this topic are "policymakers" around the "world" such as "China" and other countries and their influence on international climate politics.

To sum up, news content about climate change consumed by supporters of left- and right-wing populist parties tend to focus more on climate politics and party conflicts whereas

non-supporters are more focused on policies and non-political topics such as environment, nature and science.

Conclusion

By combining passively recorded visits of climate websites with survey data, we have extended research on climate scepticism and populism to digital media and showcased how populists and non-populists differ in seeking climate change information. Our analysis allows us to reach certain conclusions about the relation between website visits and political orientations, but it raises many further questions: vising websites has become one of the main ways that people obtain news and political information, and for young people, this has become the main source in many countries, according to the most recent Reuters Digital News Report (Newman, Fletcher, Kalogeropoulos, & Kleis, 2019). But it is by no means the only source, and political orientations and attitudes towards climate change are formed on the basis of many sources and influences. In future work, we will also be able to do more extensive analysis of the content of the websites: at a scale of ~150 million websites, it may be possible with machine learning to identify patterns in the content of different categories of websites, and different 'camps' and their supporters among survey respondents: for example, does scepticism have different national inflections within an overall sceptical position? For now, we have merely given samples of some of the content.

Still, we have several important findings already: First, our survey analysis supports our hypothesis that there is a link between right-wing populism and climate scepticism. Such link was not found, however, between left-wing populist party support and climate denialism. Supporters of right-wing populist parties favour climate change policies to a significantly lesser extent than supporters of other parties. Our findings thus lend support to Lockwood's argument that ideological explanations are stronger than structuralist (economic) explanations in the link between climate sceptics and populism, since the survey analysis also shows that

support for right-wing populist parties is strongly correlated with both scepticism on climate issues and opposition to climate friendly policies; whereas structural factors such as the education level only explain some but not all aspects of climate scepticism. Second, our study demonstrated that supporters and non-supporters of populist parties have different climate change media diets. We showed that offline events such as street demonstrations by climate activists or public engagement by populist leaders in climate debates drove users' attention to climate content online, although with different patterns among supporters and non-supporters of populist parties. We further found that supporters of right-wing populist parties have a higher percentage of media content from hyperpartisan media than other groups. However, these same supporters also visit science-related websites about climate change more often. Populists, and right-wing populists in particular, consume more topics related to the political aspects of climate change than non-populists.

These findings relate back to the discussion of the nature of the link between populism and scepticism: right-wing populist parties, as we saw, have a range of views, but the common denominator is that they distrust the scientific consensus and put 'the people's' needs before tackling climate change. Populist supporters who visit climate change related sites are not 'head in the sand' deniers and nor are they indifferent to the issue. Instead, they seek out alternative 'scientific' explanations which would not pass muster among scientists or among balanced media frames, but which fit into the populist worldview; again, downplaying the effects of climate change in order prioritize the well-being of 'the people'. This worldview is anti-elite, which fits with Huber's (2020) account of the link between populism and climate change in the UK, but here also especially for Germany and the US. It is also aimed against liberals (again, in the American sense) and against environmentalists and governments which favour urgent action.

From our survey data we can also see how countries rank climate change differently in relation to other policy priorities, but it seems that these priorities also lead to divided views. And one thing that we can see from our analysis more generally is that sceptics not only attack the science or the expertise, but also climate activists such as Greta Thunberg whose mental abilities they question. Overall, it may be that the majority in Europe and in the US has a balanced view of climate change, believes in the scientific consensus, and favours tackling climate change. At the same time, it is common to think of sceptics as being indifferent to or actively remaining ignorant about the issue. Yet we can see that, for the populists who are most concerned about the issue, this is not the case: they seek a coherent worldview that bolsters their ideas about climate change and the science of climate change so that it fits into their overall political agenda: anti-elite and putting the interests of 'the people' first. This is a good place to mention that it has also been shown that populists are generally more interested in politics than non-populists (Schulz, 2019). The implication is that, unlike for the single-issue conflict between climate activists and sceptics, where persuasion about the scientific consensus and urgency of action may be a useful strategy, for populist sceptics, it may instead be necessary to address the root causes of populism in which this scepticism is embedded.

The strength of the paper lies in linking surveys with web tracking data and analysing website texts at scale. The question this leads to for further probing is how the politicization of the climate debate at certain moments in time can be linked to political attitudes and the associated online visits and content. Another limitation of our study is that we did not examine the populism/scepticism link from a 'top-down' perspective of analysing manifestos of populist parties or the views purveyed by populist leaders. However, a recent report (2019) documents that many populist party leaders and parties openly deny climate change or oppose policies that try to tackle climate change, though with some country-specific variation

in their specific outlooks (recall the earlier discussion of the country differences in scepticism, and also the country differences in responses to Greta Thunberg).

Future work will have to further investigate the link between (evolving) populist party cues with regard to climate change and the beliefs of their supporters. In the meantime, our paper shows that populists are highly interested in the politics of climate change, so they are also more interested, for example, in science-related websites. Another question raised then is whether populists, apart from their climate change interests, are also interested more in issues to do with science and elite expertise generally (for example, are they also more interested in the precise figures for immigration than non-populists)? This also returns us to the debates about the links between populism and scepticism, not so much about why populists would be drawn to scepticism (economic versus cultural reasons), but about populists' relation to elite knowledge, and hence about populists' trust or distrust in knowledge (including online information), and so perhaps their trust in democracy more broadly.

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Acknowledgement [To be updated in the final version]

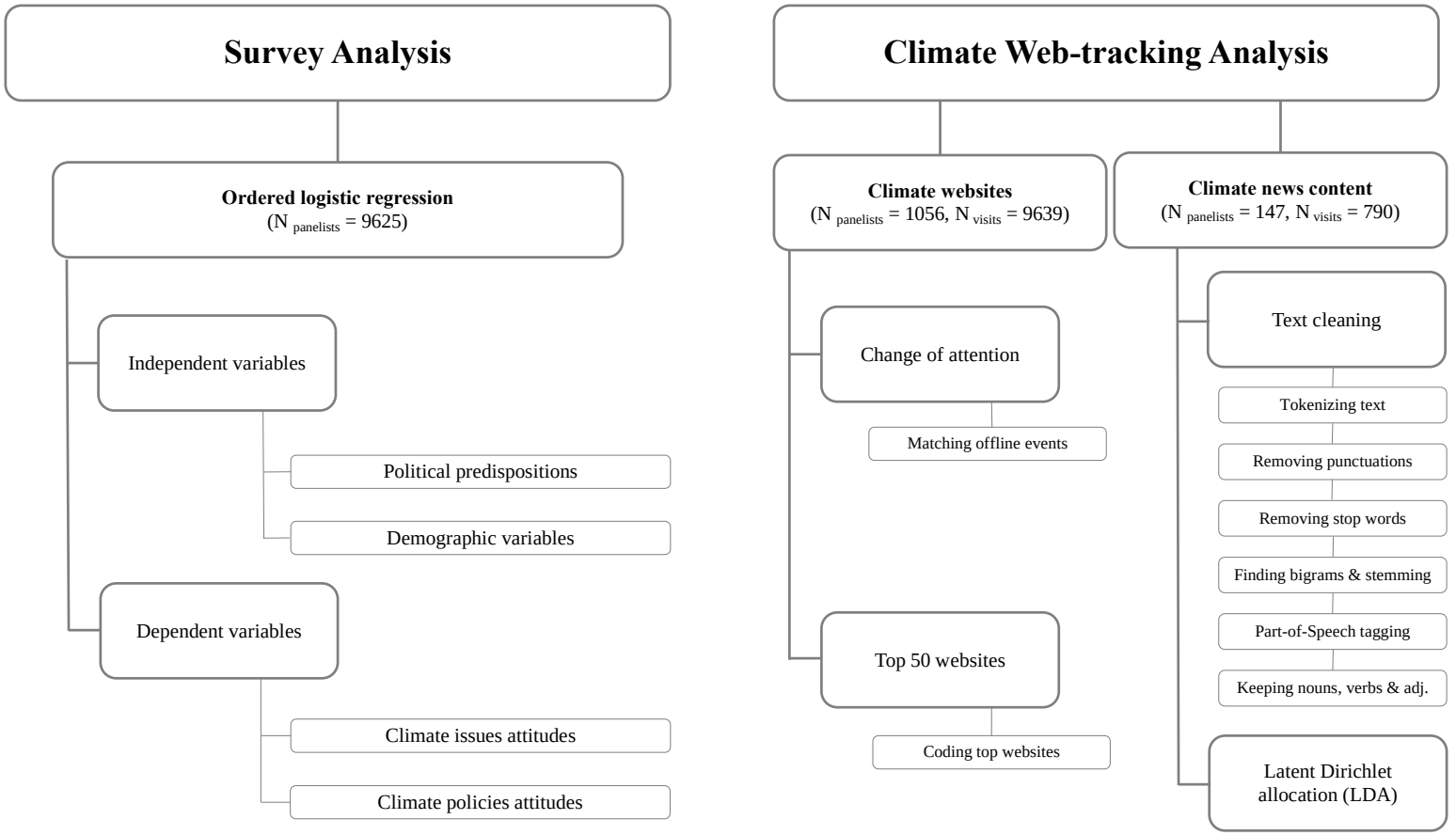


Figure 1 Flowchart of survey and web-tracking data analysis

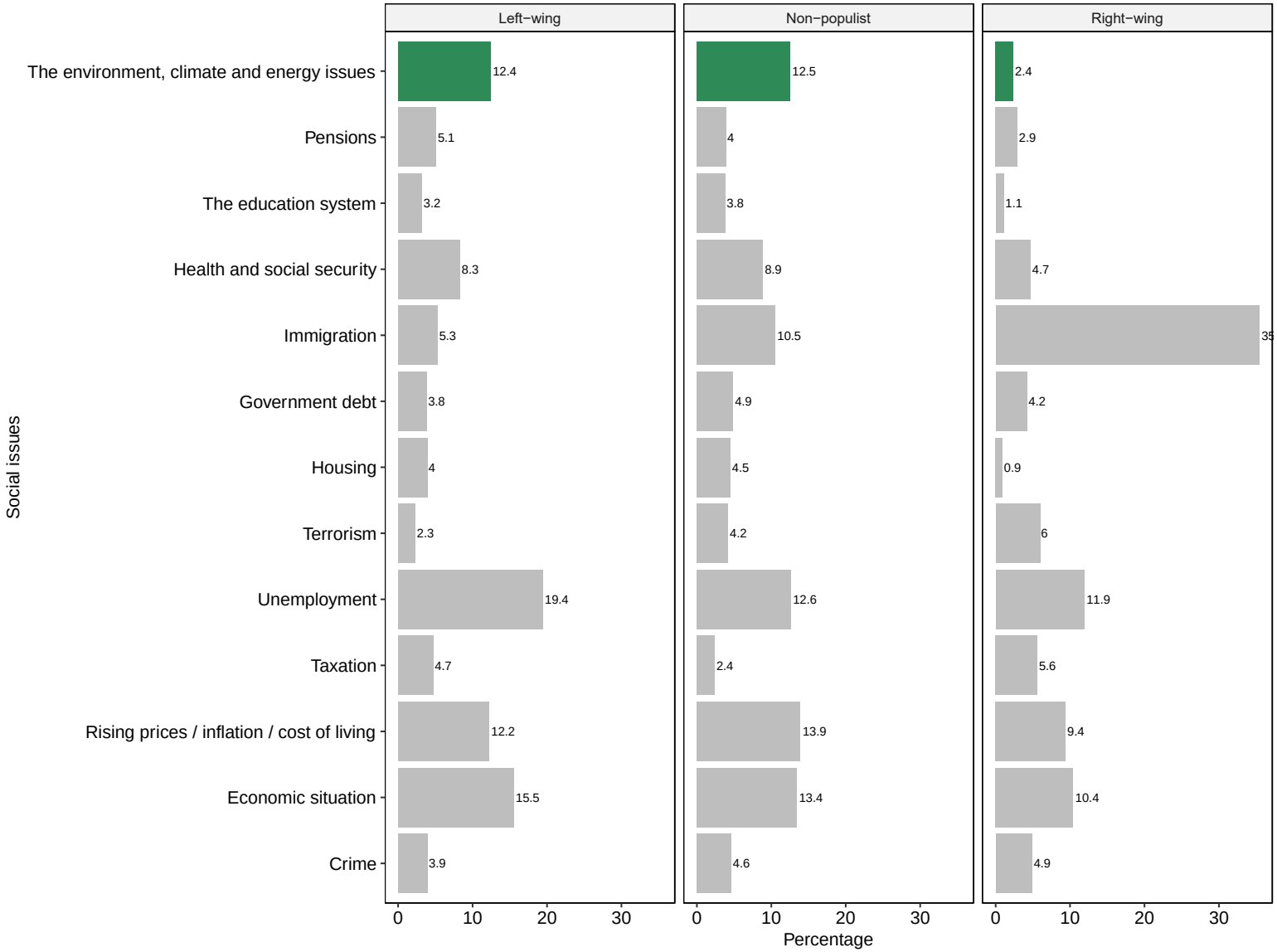


Figure 2 Relative importance of climate change issues among all social issues, by political group



Figure 3 Relative importance of climate change issues among all social issues, by country

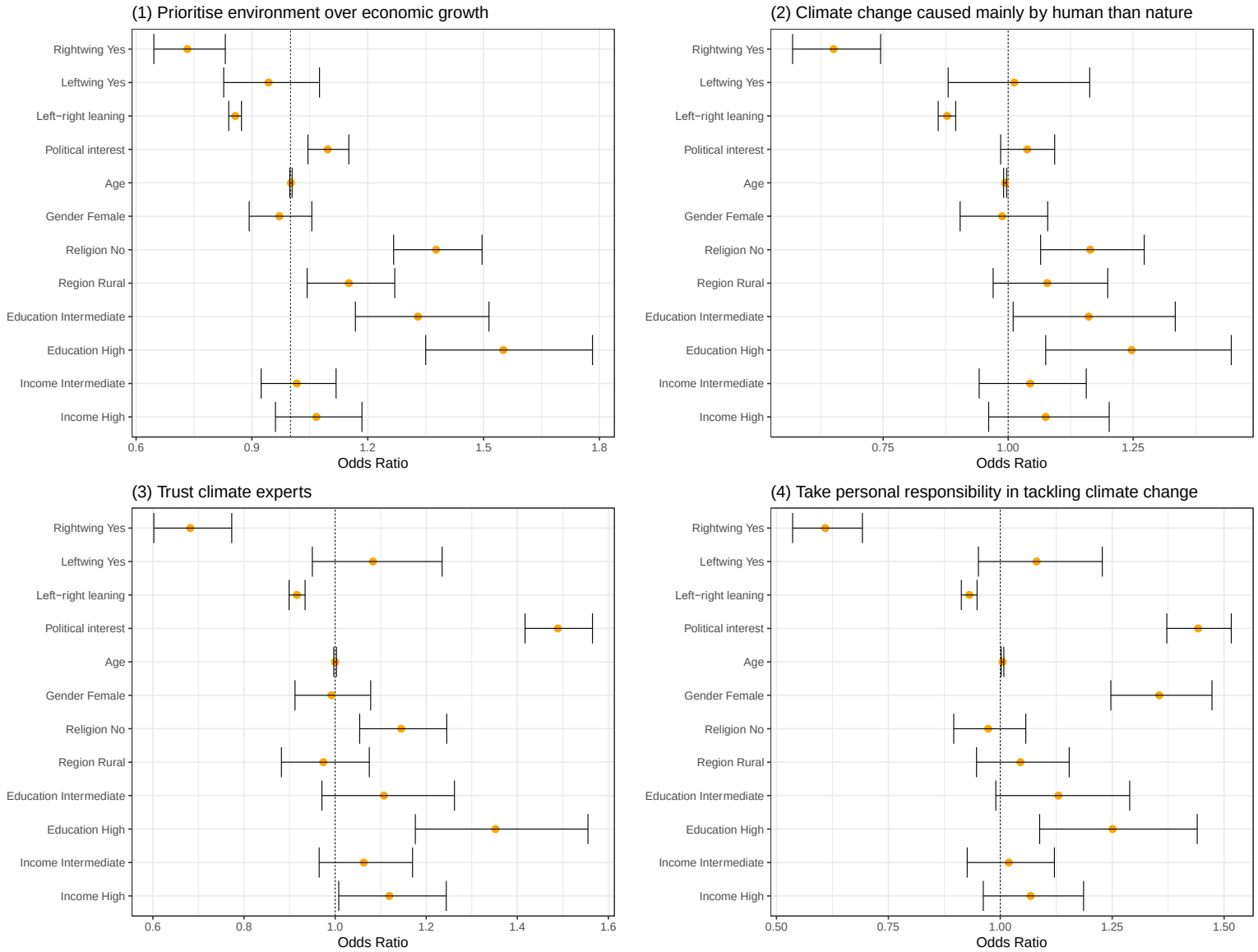


Figure 4 Visualisation of odds radio and exponentialized CIs of coefficients of political and demographic factors in Model 1 to Model 4.

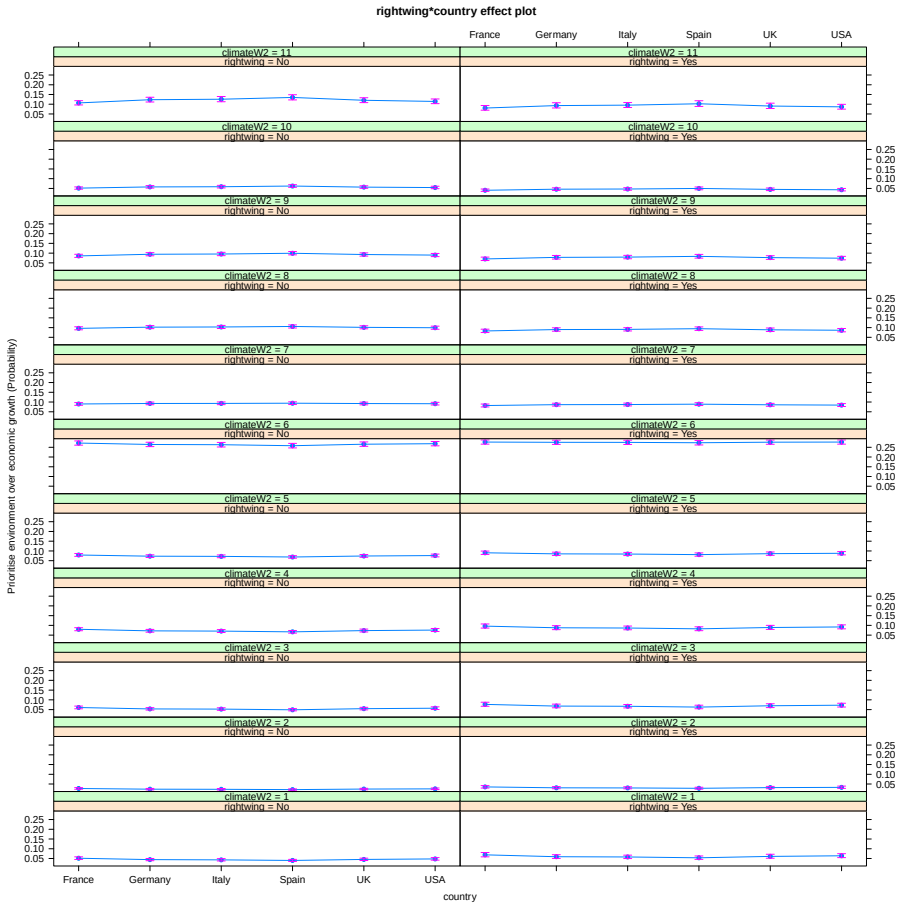


Figure 5 Joint effect of right-wing party support and country on attitudes towards climate change issues: Prioritising environment over economic growth

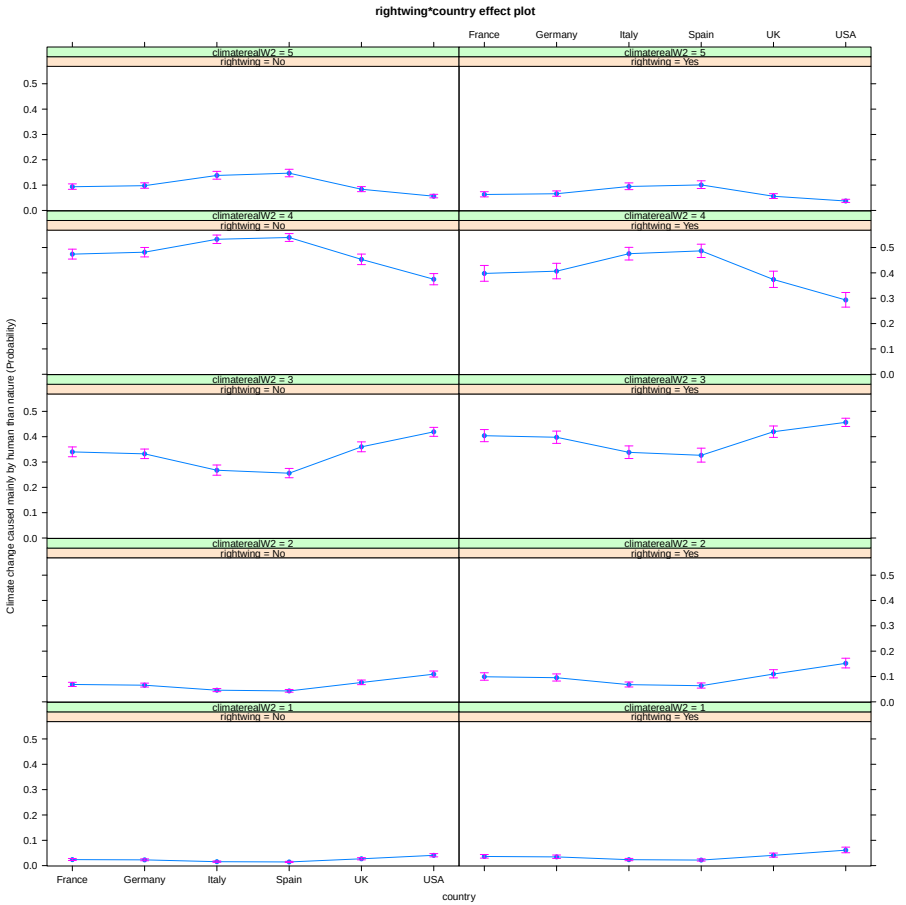


Figure 6 Joint effect of right-wing party support and country on attitudes towards climate change issues: Climate change caused mainly by humans rather than by nature

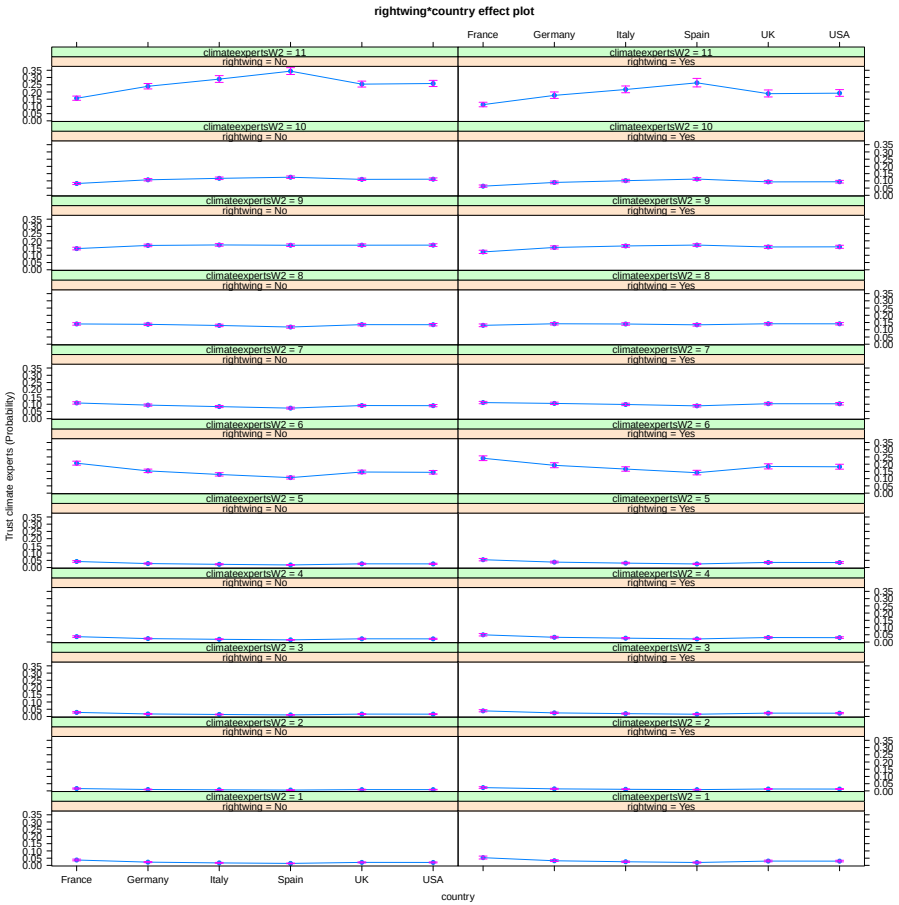


Figure 7 Joint effect of right-wing party support and country on attitudes towards climate change issues: Trust climate experts

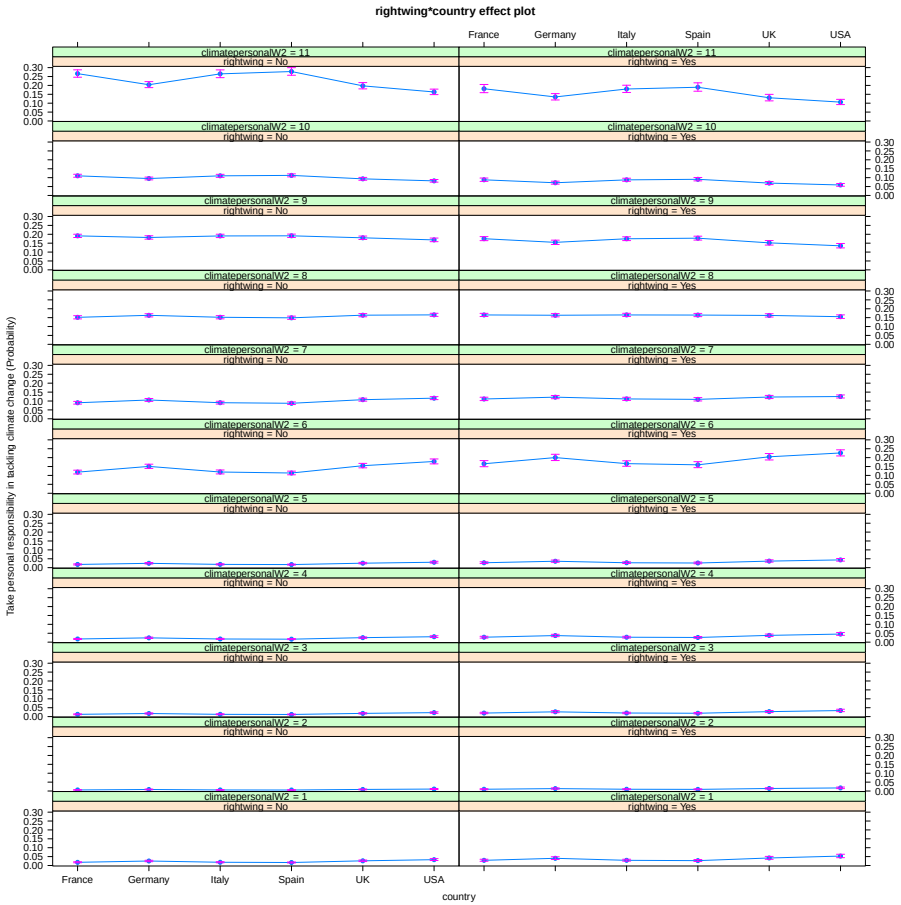


Figure 8 Joint effect of right-wing party support and country on attitudes towards climate change issues: Taking personal responsibility for tackling climate change

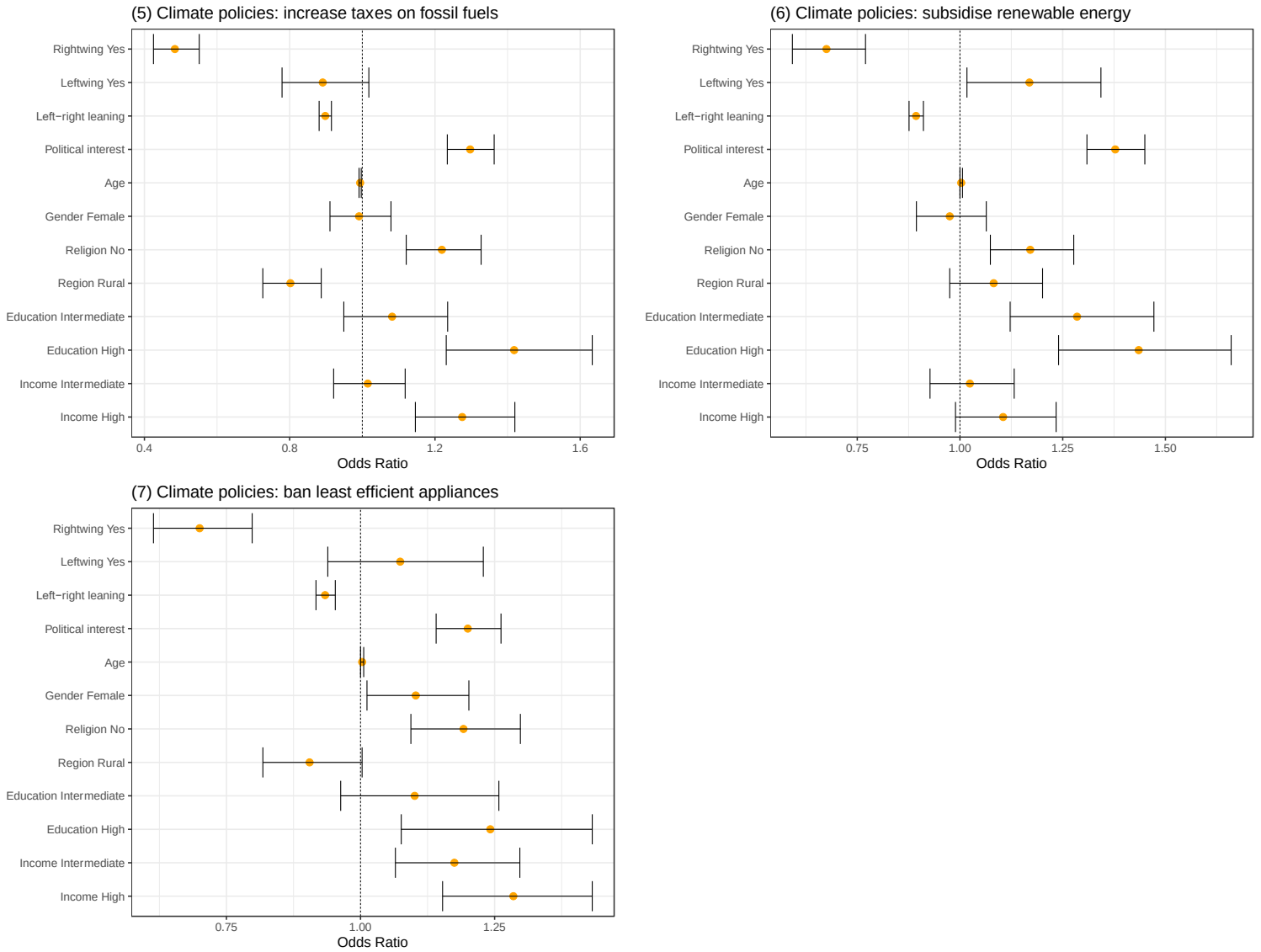


Figure 9 Visualisation of odds radio and exponentialized CIs of coefficients of political and demographic factors in Model 5 to Model 7.

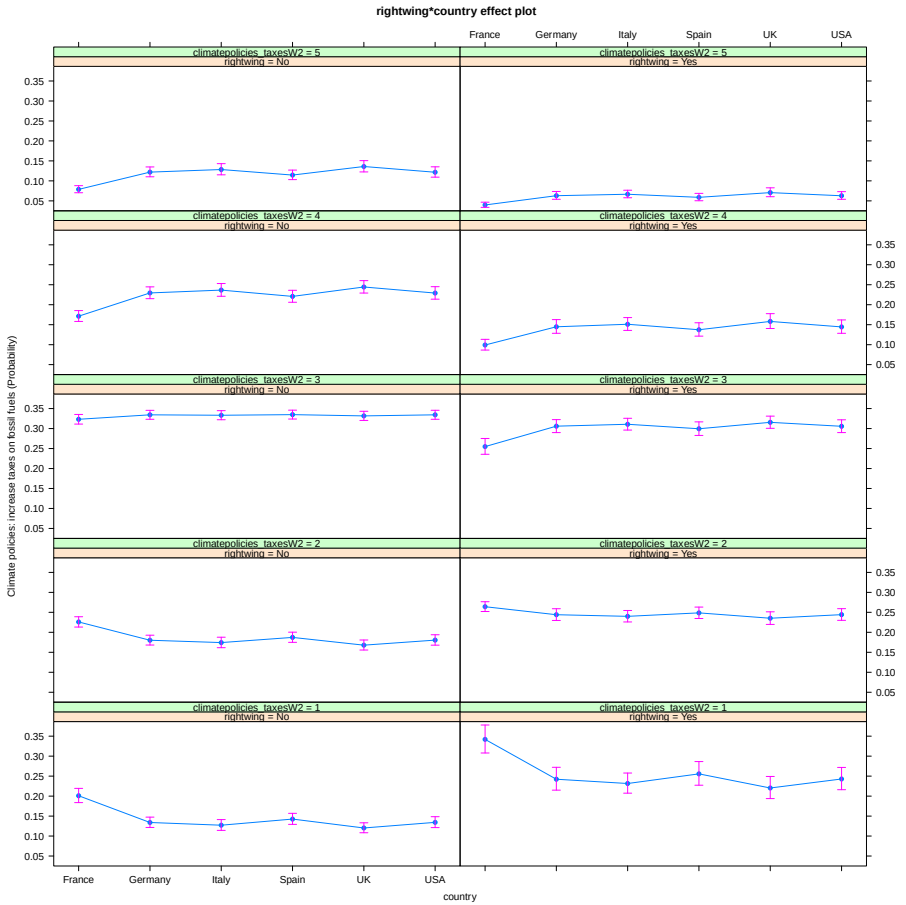


Figure 10 Joint effect of right-wing party support and country on attitudes towards climate policies: Increasing taxes on fossil fuels

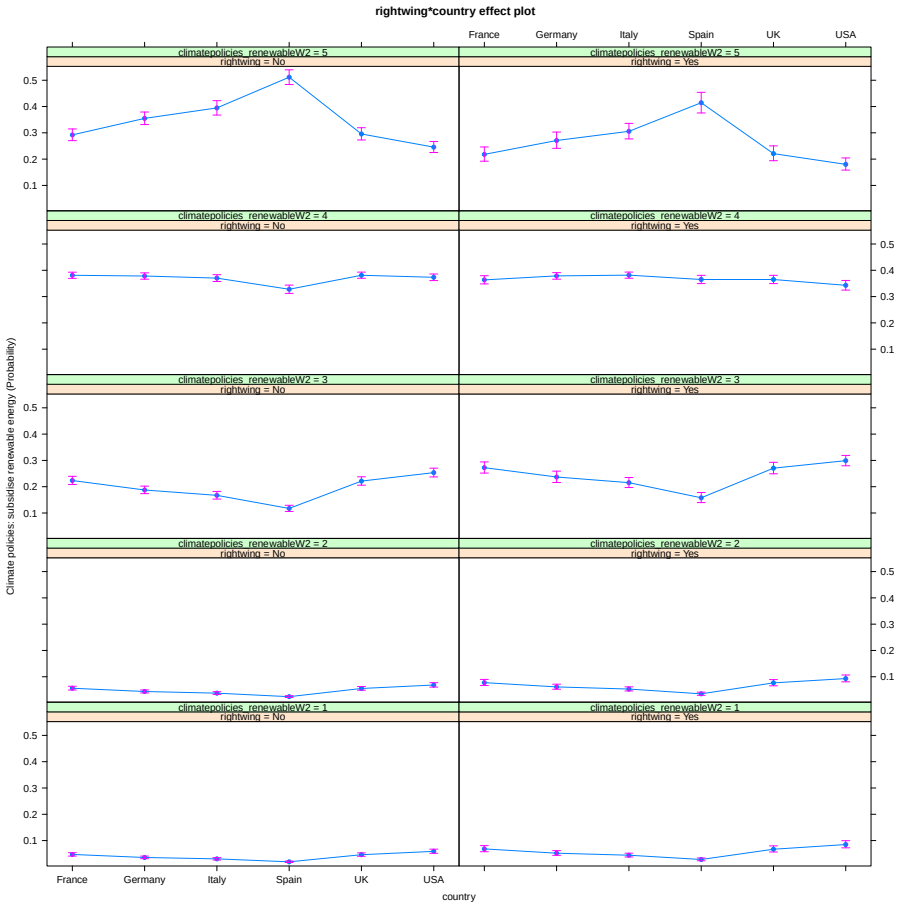


Figure 11 Joint effect of right-wing party support and country on attitudes towards climate policies: Subsidising renewable energy

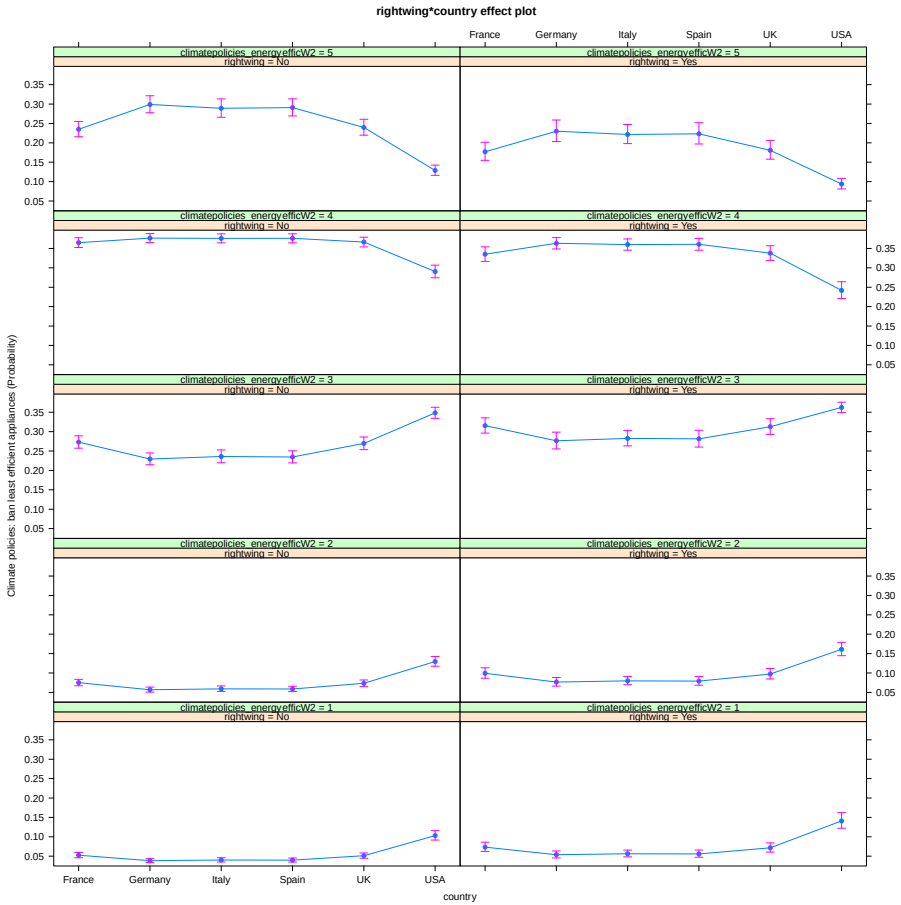


Figure 12 Joint effect of right-wing party support and country on attitudes towards climate policies: Banning least efficient appliances

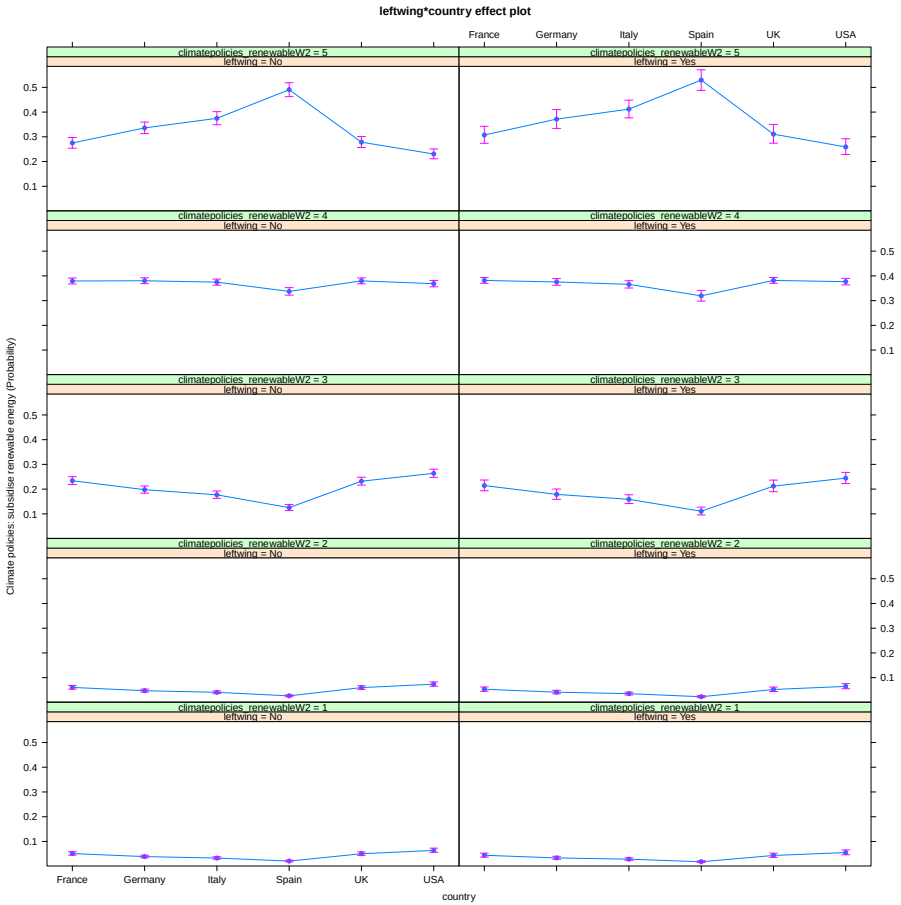


Figure 13 Joint effect of left-wing party support and country on attitudes towards climate policies: Subsidising renewable energy

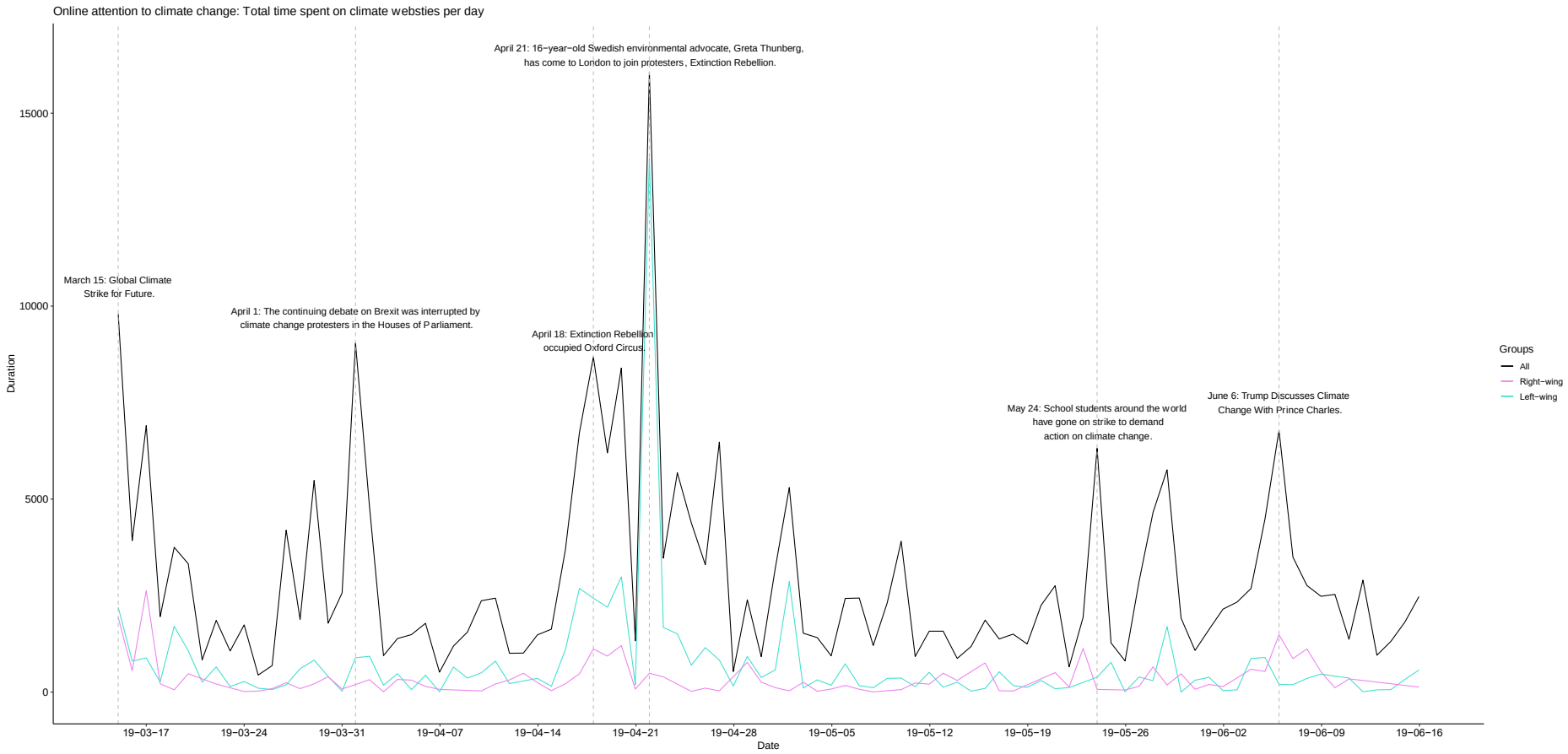


Figure 14 Time spent on climate websites per day, by political group

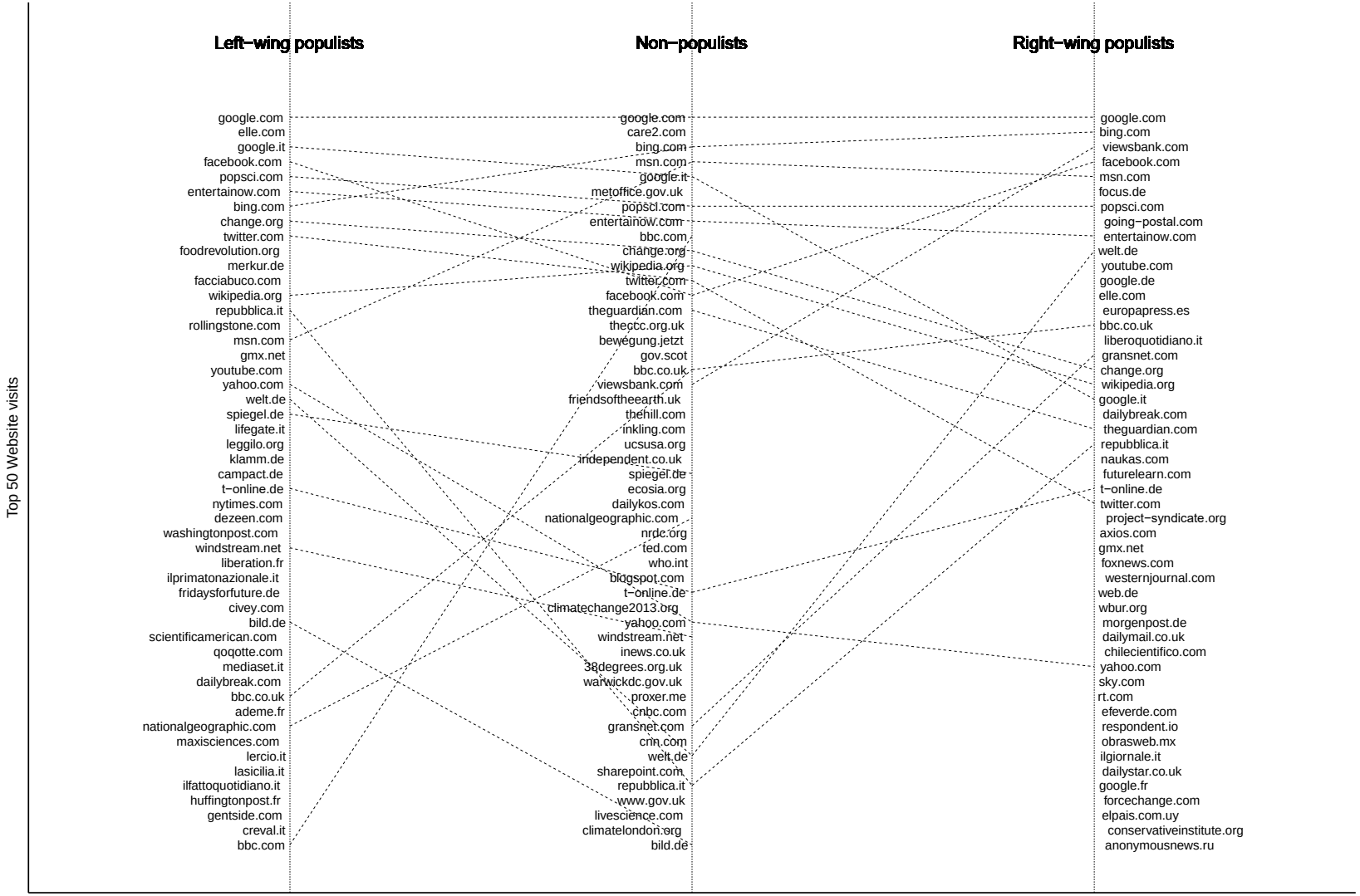


Figure 15 Top 50 climate website domains visited by left-wing populists, non-populists and right-wing populists. Dotted lines between websites indicate the change of ranking from left side to right side

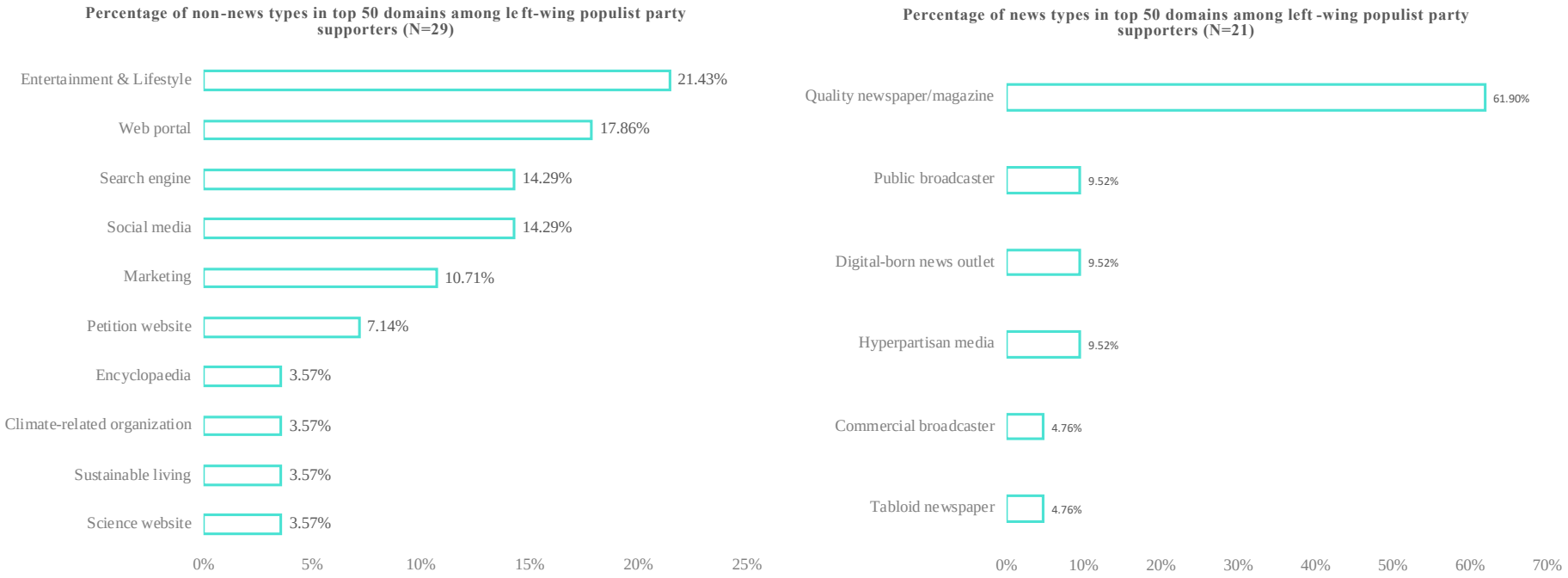


Figure 16 Percentage of non-news and news types in top 50 domains visited by left-wing populist party supporters

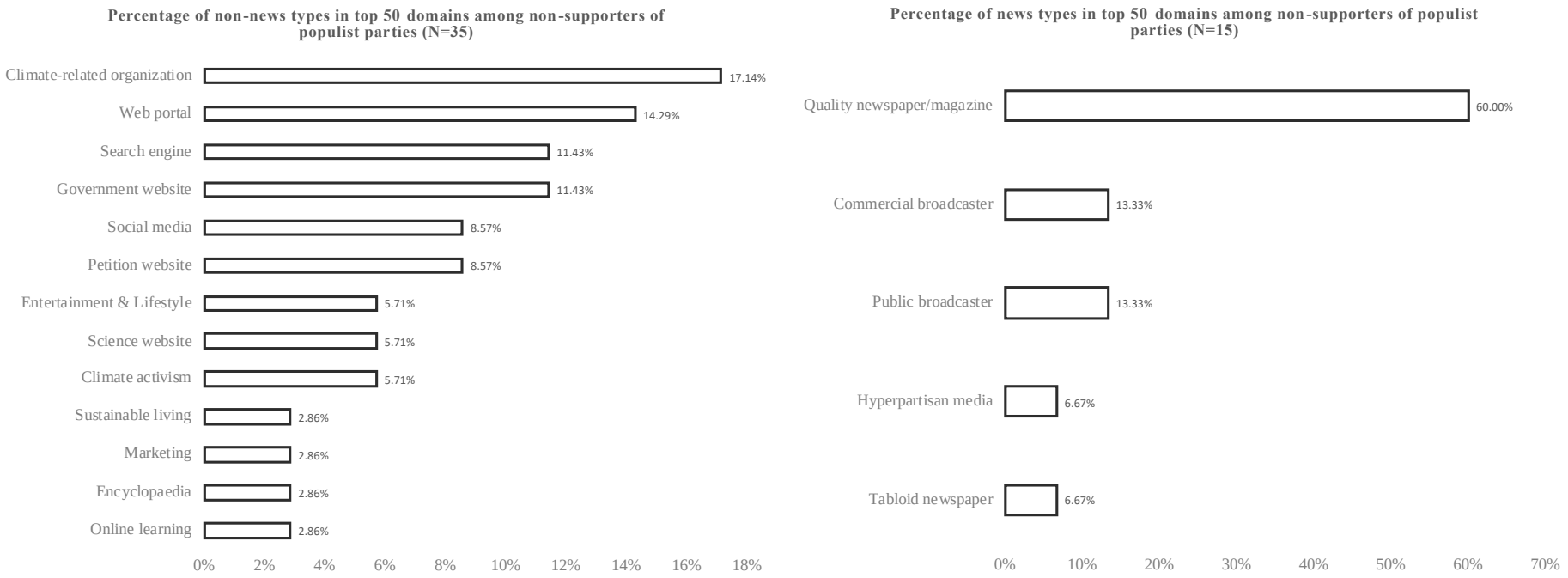
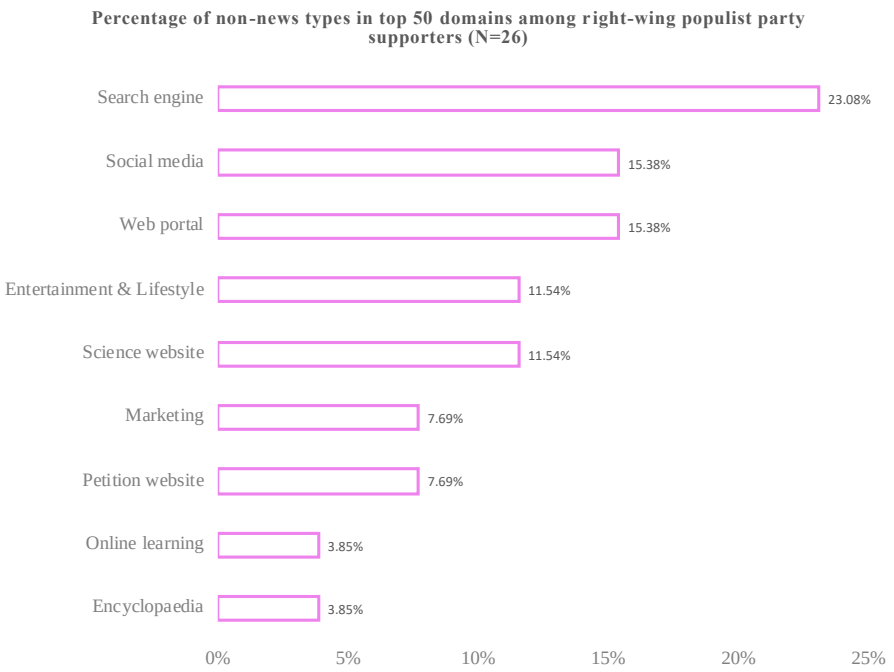


Figure 17 Percentage of non-news and news types in top 50 domains visited by non-supporters of populist parties



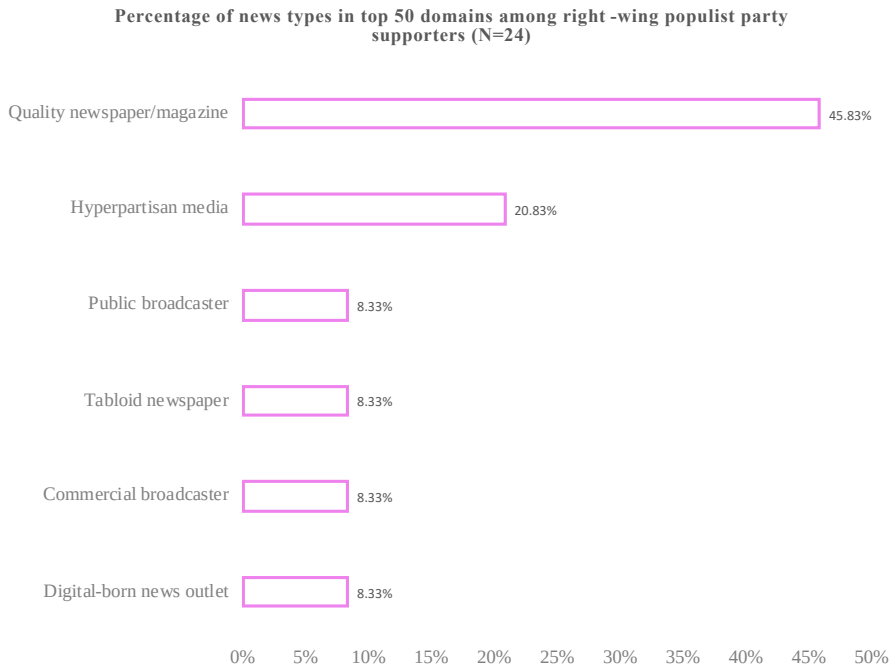
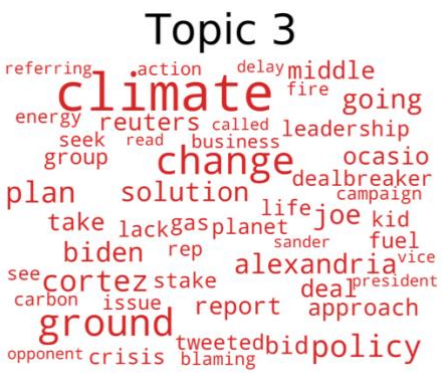


Figure 18 Percentage of non-news and news types in top 50 domains visited by right-wing populist party supporters

Energy industry & climate justice



Climate politics & party polarisation



Climate science & Changing nature



Participation in Environmental action

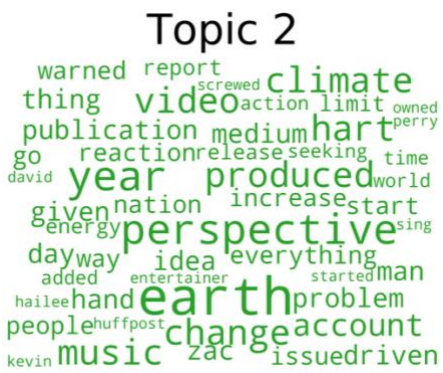


Figure 19 Word cloud of top 50 keywords with the highest probability in each topic in the topic modelling result of English-language climate news content visited by supporters of left-wing populist parties

Changing nature & agriculture | Politics & climate policy | Energy industry & economics | Climate activism & Greta Thunberg

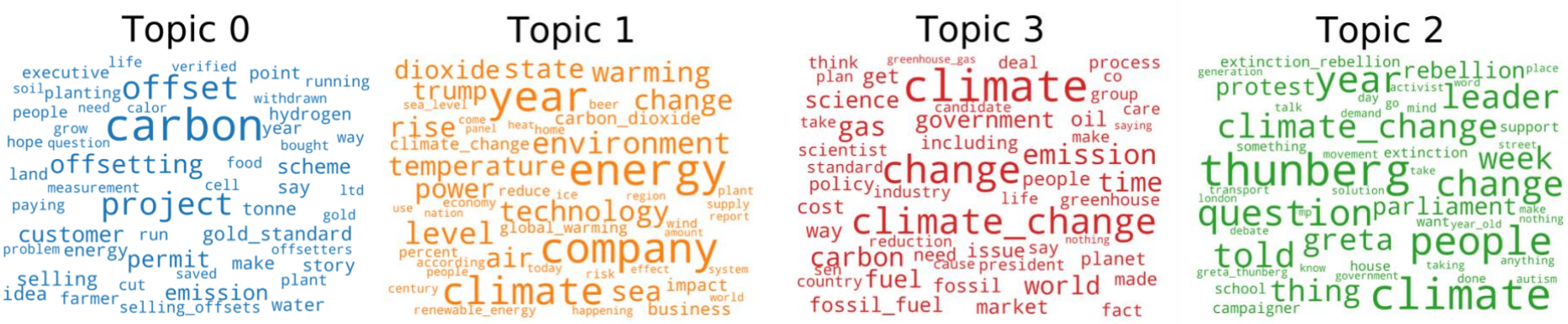


Figure 20 Word cloud of top 50 keywords with the highest probability in each topic in the topic modelling result of English-language climate news content visited by non-supporters of populist parties

Climate politics & Protest

Climate activism & Greta Thunberg

Climate policy& Sustainability

Climate politics & party polarisation

Energy industry & international relations



Figure 21 Word cloud of top 50 keywords with the highest probability in each topic in the topic modelling result of English-language climate news content visited by supporters of right-wing populist parties

Appendix A Summary tables of survey data analysis

Table A 1 Wordings of survey questions on attitudes toward climate issues and attitudes toward climate policies

Attitudes toward climate issues	**Climate attitudes: economic growth or environmental protection*** 0. Priority should be given to economic growth and job creation, even if the environment suffers somewhat 10. Environmental protection should be given priority, even if it slows economic growth and jobs are lost
	Climate attitudes: climate change causes nature or human 1. Entirely by natural processes 3. About equally by natural processes and human activity 5. Entirely by human activity
	Attitude toward expert opinions 0. When we think about what is happening with the world's climate, science doesn't help very much 10. People need the help of scientific experts to understand complicated things like climate change
	Climate attitudes: Personal responsibility 0. Not at all. 10. A great deal
Attitudes toward climate policies	**Attitudes towards climate policies: increasing taxes on fossil fuels, such as oil, gas and coal** 1. Strongly against 5. Strongly in favour
	Attitudes towards climate policies: subsidizing renewable energy such as wind and solar power 1. Strongly against 5. Strongly in favour
	Attitudes towards climate policies: imposing a law banning the sale of the least energy efficient household appliances 1. Strongly against 5. Strongly in favour

* The original variable was reversely coded so that higher scores indicate stronger support for climate change issues.

Table A 2 Descriptive data of political attitudes variables

Variables	Frequencies (% of valid N)	N
Country		
France	1508 (15.7%)	
Germany	1924 (20.0%)	
Italy	1494 (15.5%)	9625
Spain	1681 (17.5%)	
UK	1508 (15.7%)	
USA	1510 (15.7%)	
Age	Mean (SD): 46.44 (14.69)	9601
Gender		
Female	5462 (57.0%)	9587
Male	4125 (43.0%)	
Education		
Low education	1237 (13.2%)	9377
Intermediate education	4468 (47.6%)	
High education	3672 (39.2%)	
Religion		
Yes	4404 (47.1%)	9346
No	4942 (52.9%)	
Region		
Urban	7606 (79.2%)	9604
Rural	1998 (20.8%)	
Income		
Low	3165 (34.8%)	9084
Intermediate	3320 (36.5%)	
High	2599 (28.6%)	
Right wing		
No	8146 (84.6%)	9625
Yes	1479 (15.4%)	
Left wing		
No	8537 (88.7%)	9625
Yes	1088 (11.3%)	
Left-right learning (0-10)		
0. Far left	Mean (SD): 5.88 (2.53)	9416
10. Far right		
Political interest (1-4)		
1. Highly disinterested	Mean (SD): 2.77 (0.89)	9612
4. Highly interested		

Table A 3 The coding of right- and left-wing populist parties in the survey

Country	Right-wing	Left-wing	Party/politician name	N	%
France		●	Gilets Jaunes*	84	5.57%
		●	La France Insoumise	96	6.37%
	●		Rassemblement National	198	13.13%
Germany		●	Linke	187	9.72%
	●		AfD	194	10.08%
Italy		●	Movimento 5 Stelle*	356	23.83%
	●		Forza Italia	64	4.28%
	●		Fratelli d'Italia	57	3.82%
	●		Lega	334	22.36%
Spain		●	Podemos	230	13.68%
	●		VOX	108	6.42%
UK	●		Brexit Party	126	8.36%
	●		UKIP	50	3.32%
USA		●	Bernie Sanders	135	8.95%
	●		Donald Trump	348	23.05%

Note: The coding of populist parties is based on PopuList. However, we coded the 5 Star Movement in Italy as left-wing populist party and coded supporters Gilets Jaunes as left-wing populists.

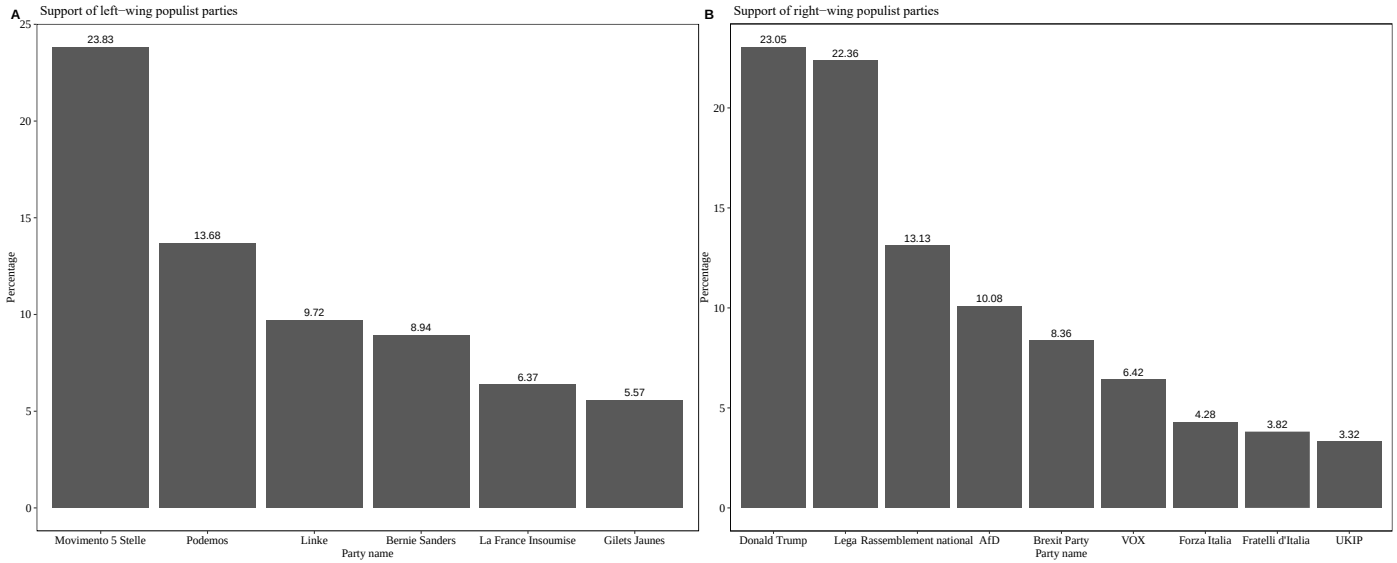


Figure A 1 Percentage of panellists within each country who support left-wing (A) and right-wing(B) populist parties

Appendix B Sample size in survey and web-tracking data analysis

Table B 1 Summary statistics of full web-tracking dataset, web-tracking dataset on climate change, and survey

Country	Web-tracking dataset (Full)			Web-tracking dataset (Climate websites only)						Survey
	# of domains	**# of panellists**	**# of visits**	**# of climate website domains**	**% of climate website domains in all domains**	**# of panellist visited climate websites**	**% of panellists visited climate websites**	**# of visits to climate websites visits**	**% of visits to climate websites in all website visits**	**# of panellists participated in the survey**
Spain	128516	1650	23430689	103	0.080%	139	8.42%	886	0.004%	1681
France	134515	1460	34916378	92	0.068%	101	6.92%	501	0.001%	1508
Germany	119485	1702	23536781	123	0.103%	186	10.93%	1527	0.006%	1924
Italy	128586	1453	29352411	136	0.106%	188	12.94%	1530	0.005%	1494
UK	116892	1097	23671389	182	0.156%	207	18.87%	2512	0.011%	1508
US	166031	1396	34126655	193	0.116%	235	16.83%	2683	0.008%	1510
Total	794025	8758	169034303	829	0.104%	1056	12.06%	9639	0.006%	9625

Appendix C Summary tables for climate websites and content analysis

Table C 1 Keywords used to identify climate-related website visits

	English	French	German	Spanish	Italian
Climate denialism	Chemtrial Geoengineering	Chemtrial Geoengineering	Chemtrial Geoengineering	Chemtrial Geoengineering	Chemtrial Geoengineering
Climate change issues	Climate change Global warming	changement climatique le réchauffement climatique	Klimawandel globale Erwärmung/Klimawandel	cambio climático calentamiento global	cambiamento climatico riscaldamento globale
Climate activism	Greta Thunberg Fridays for Future	Greta Thunberg Fridays for Future	Greta Thunberg Fridays for Future	Greta Thunberg Fridays for Future	Greta Thunberg Fridays for Future

Table C 2 Summary statistics of content analysis dataset for climate news websites in English

Political group	Samples for content analysis (LDA topic modelling)	
	# of news articles	# of unique tokens
Non-populists	677	7913
Right-wing populists	93	3204
Left-wing populists	20	922
Total	790	12039

Table C 3 The data cleaning process for topic modelling

Steps	Details
Tokenisation	All text was tokenized into words using the NLTK library in Python.
Removal of punctuation and stop words	English stop words were removed. To identify common word combinations, we used bigrams to label frequently co-occurring pairs of tokens.
Stemming	All tokens were stemmed to root words.
Part-of-Speech (PoS) tagging	In order to further filter out tokens that are not essential to the context of the content, we applied Part-of-Speech (PoS) tagging on all tokens and only included nouns, verbs and adjectives for topic modelling.

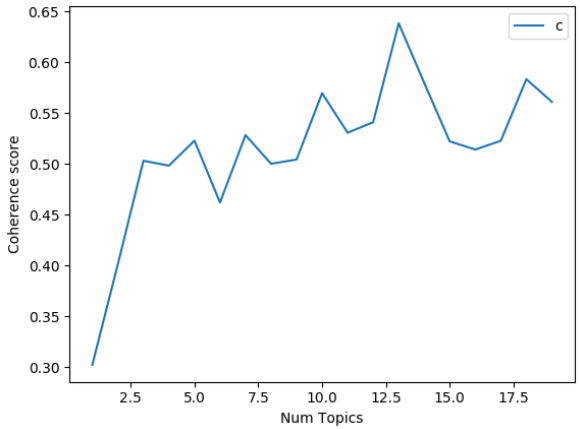


Figure C 1 Coherence scores for models with different number of topics: Climate news content consumed by supporters of left-wing populist parties

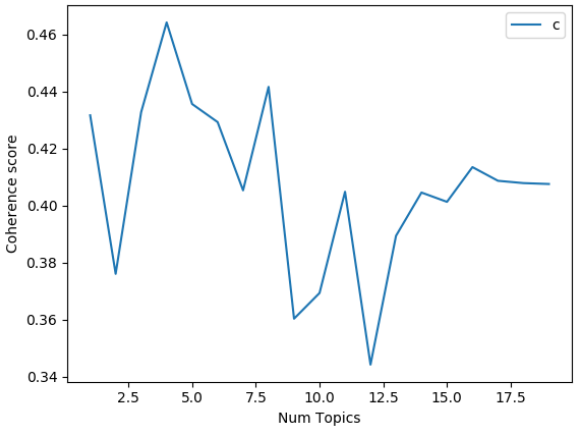


Figure C 2 Coherence scores for models with different number of topics: Climate news content consumed by non-supporters of populist parties

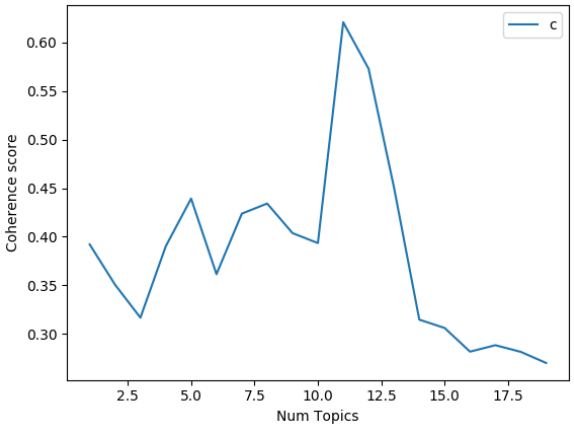


Figure C 3 Coherence scores for models with different number of topics: Climate news content consumed by supporters of right-wing populist parties

Choice of the number of topics for each topic model:

For non-supporters of populist parties, we chose the number of topics that yields the highest coherence score. However, for the topic models for supporters of left-wing populist parties and supporters of right-wing populist parties, the numbers of topics that have the optimal coherence score is around 13 and 11 respectively, which led to the repetition of the same keywords in multiple topics. Therefore, we chose number of topics as four for content visited by supporters of left-wing populist parties and five for supporters of right-wing populist parties, which ensured a high coherence score (human interpretability) while avoiding the repetition of same keywords in different topics.

Appendix D Ordinal regression models

Table D 1 Summary statistics for ordinal regression models of attitudes towards climate change issues

Variables	(1) Prioritise environment over economic growth							(2) Climate change caused mainly by human than by nature						
	Coef. (B)	Std.	Z	*p*	Exp (95% CI) Lower	Exp (95% CI) Upper	Odds Ratio	Coef. (B)	Std.	Z	*p*	Exp (95% CI) Lower	Exp (95% CI) Upper	Odds Ratio
Right wing Yes	-0.311	0.064	-4.835	**0.000**	0.733	0.646	0.831	-0.430	0.069	-6.237	**0.000**	0.651	0.569	0.745
Left wing Yes	-0.059	0.067	-0.875	0.382	0.943	0.827	1.075	0.012	0.071	0.164	0.870	1.012	0.880	1.163
Left-right leaning	-0.155	0.010	-15.800	**0.000**	0.857	0.840	0.873	-0.130	0.010	-12.747	**0.000**	0.878	0.860	0.895
Political interest	0.092	0.025	3.724	**0.000**	1.096	1.045	1.151	0.037	0.027	1.402	0.161	1.038	0.985	1.093
Age	0.001	0.001	0.843	0.399	1.001	0.998	1.004	-0.006	0.002	-3.941	**0.000**	0.994	0.991	0.997
Gender Female	-0.030	0.042	-0.702	0.483	0.971	0.893	1.055	-0.012	0.045	-0.274	0.784	0.988	0.904	1.079
Religion No	0.320	0.042	7.547	**0.000**	1.377	1.267	1.496	0.152	0.045	3.360	**0.001**	1.164	1.065	1.272
Region Rural	0.141	0.050	2.793	**0.005**	1.151	1.043	1.270	0.075	0.054	1.395	0.163	1.078	0.970	1.199
Education Intermediate	0.285	0.066	4.304	**0.000**	1.330	1.168	1.514	0.149	0.071	2.103	**0.035**	1.161	1.010	1.334
Education High	0.439	0.071	6.189	**0.000**	1.551	1.350	1.782	0.220	0.076	2.918	**0.004**	1.247	1.075	1.446
Income Intermediate	0.016	0.048	0.336	0.737	1.016	0.924	1.118	0.043	0.052	0.822	0.411	1.044	0.942	1.156
Income High	0.065	0.054	1.217	0.224	1.067	0.961	1.185	0.072	0.057	1.265	0.206	1.075	0.961	1.202
Country Germany	0.161	0.071	2.256	0.024	1.174	1.021	1.350	0.048	0.077	0.627	0.531	1.049	0.903	1.219
Country Italy	0.185	0.073	2.539	0.011	1.204	1.043	1.389	0.440	0.079	5.587	0.000	1.553	1.331	1.812
Country Spain	0.266	0.072	3.700	0.000	1.305	1.133	1.502	0.512	0.077	6.627	0.000	1.668	1.434	1.941
Country UK	0.133	0.072	1.851	0.064	1.143	0.992	1.316	-0.125	0.078	-1.604	0.109	0.883	0.758	1.028
Country USA	0.079	0.072	1.088	0.277	1.082	0.939	1.247	-0.549	0.077	-7.133	0.000	0.577	0.496	0.671
N				7567							7591			
McFadden's R^2				0.0194							0.0398			
Residual Deviance				33196.98							18387.51			
AIC				33250.98							18429.51			

Note: **No** is the reference category for right-wing. **Male** is the reference category for gender. **Yes** is the reference category for religion. **Urban** is the reference category for region. **Low** is the reference category for education. **Low** is the reference category for income level. We created dummy variables to control for country variances, with France as reference category. Significant (p<.05) political and demographic coefficients are highlighted in bold.

Table D 2 Full results of ordinal regression models of attitudes towards climate change issues

Variables	(3) Trust climate experts							(4) Take personal responsibility in tackling climate change						
	Coef. (B)	Std.	Z	*p*	Exp (95% CI) Lower	Exp (95% CI) Upper	Odds Ratio	Coef. (B)	Std.	Z	*p*	Exp (95% CI) Upper	Exp (95% CI) Upper	Odds Ratio
Right wing Yes	-0.383	0.064	-6.001	**0.000**	0.682	0.602	0.773	-0.496	0.065	-7.631	**0.000**	0.609	0.536	0.692
Left wing Yes	0.080	0.067	1.198	0.231	1.083	0.950	1.235	0.078	0.065	1.188	0.235	1.081	0.951	1.228
Left-right leaning	-0.088	0.010	-9.079	**0.000**	0.916	0.899	0.934	-0.072	0.010	-7.484	**0.000**	0.931	0.913	0.948
Political interest	0.398	0.025	15.640	**0.000**	1.489	1.417	1.565	0.366	0.025	14.434	**0.000**	1.442	1.372	1.516
Age	0.000	0.001	0.176	0.860	1.000	0.997	1.003	0.005	0.001	3.552	**0.000**	1.005	1.002	1.008
Gender Female	-0.008	0.043	-0.198	0.843	0.992	0.912	1.078	0.304	0.043	7.146	**0.000**	1.355	1.247	1.473
Religion No	0.136	0.043	3.190	**0.001**	1.145	1.054	1.245	-0.027	0.042	-0.650	0.516	0.973	0.896	1.057
Region Rural	-0.026	0.050	-0.521	0.602	0.974	0.882	1.075	0.044	0.050	0.882	0.378	1.045	0.947	1.154
Education Intermediate	0.101	0.067	1.516	0.129	1.107	0.971	1.262	0.122	0.067	1.815	0.070	1.130	0.990	1.289
Education High	0.302	0.071	4.230	**0.000**	1.352	1.176	1.555	0.224	0.072	3.133	**0.002**	1.251	1.088	1.440
Income Intermediate	0.061	0.049	1.240	0.215	1.063	0.965	1.170	0.019	0.049	0.385	0.700	1.019	0.926	1.121
Income High	0.113	0.054	2.101	**0.036**	1.119	1.008	1.244	0.066	0.054	1.228	0.219	1.068	0.962	1.186
Country Germany	0.529	0.071	7.399	0.000	1.697	1.475	1.952	-0.349	0.071	-4.886	0.000	0.705	0.613	0.811
Country Italy	0.786	0.073	10.733	0.000	2.194	1.901	2.532	-0.008	0.072	-0.113	0.910	0.992	0.861	1.143
Country Spain	1.039	0.073	14.218	0.000	2.827	2.450	3.263	0.058	0.072	0.796	0.426	1.059	0.919	1.221
Country UK	0.608	0.073	8.354	0.000	1.836	1.592	2.118	-0.389	0.073	-5.344	0.000	0.678	0.588	0.782
Country USA	0.630	0.073	8.599	0.000	1.878	1.627	2.168	-0.623	0.073	-8.496	0.000	0.536	0.465	0.619
N	7575							7597						
McFadden's R^2	0.0269							0.0221						
Residual Deviance	30418.71							30643.06						
AIC	30472.71							30697.06						

Note: **No** is the reference category for right-wing. **Male** is the reference category for gender. **Yes** is the reference category for religion. **Urban** is the reference category for region. **Low** is the reference category for education. **Low** is the reference category for income level. We created dummy variables to control for country variances, with France as reference category. Significant (p<.05) political and demographic coefficients are highlighted in bold.

Table D 3 Full results of ordinal regression models of attitudes towards climate change policies

Variables	(5) Climate policies: increase taxes on fossil fuels							(6) Climate policies: subsidise renewable energy						
	Coef. (B)	Std.	Z	*p*	Exp (95% CI) Lower	Exp (95% CI) Upper	Odds Ratio	Coef. (B)	Std.	Z	*p*	Exp (95% CI) Lower	Exp (95% CI) Upper	Odds Ratio
Right wing Yes	-0.726	0.066	-10.937	**0.000**	0.484	0.425	0.551	-0.393	0.067	-5.839	**0.000**	0.675	0.592	0.770
Left wing Yes	-0.116	0.068	-1.698	0.090	0.891	0.779	1.018	0.156	0.071	2.195	**0.028**	1.169	1.017	1.343
Left-right leaning	-0.108	0.010	-11.030	**0.000**	0.898	0.881	0.915	-0.113	0.010	-11.219	**0.000**	0.893	0.876	0.911
Political interest	0.260	0.025	10.235	**0.000**	1.297	1.234	1.363	0.321	0.026	12.263	**0.000**	1.378	1.309	1.450
Age	-0.006	0.002	-3.876	**0.000**	0.994	0.991	0.997	0.003	0.002	1.857	0.063	1.003	1.000	1.006
Gender Female	-0.009	0.043	-0.203	0.839	0.991	0.911	1.079	-0.025	0.045	-0.564	0.573	0.975	0.894	1.064
Religion No	0.198	0.043	4.603	**0.000**	1.219	1.121	1.327	0.158	0.044	3.567	**0.000**	1.171	1.074	1.277
Region Rural	-0.220	0.051	-4.301	**0.000**	0.802	0.726	0.887	0.079	0.053	1.491	0.136	1.082	0.975	1.201
Education Intermediate	0.079	0.067	1.181	0.238	1.082	0.949	1.235	0.251	0.069	3.618	**0.000**	1.285	1.122	1.472
Education High	0.349	0.072	4.846	**0.000**	1.418	1.231	1.633	0.361	0.074	4.852	**0.000**	1.435	1.240	1.660
Income Intermediate	0.015	0.050	0.293	0.769	1.015	0.921	1.118	0.024	0.051	0.464	0.642	1.024	0.927	1.132
Income High	0.243	0.055	4.444	**0.000**	1.275	1.146	1.420	0.100	0.056	1.769	0.077	1.105	0.989	1.234
Country Germany	0.486	0.073	6.629	0.000	1.626	1.408	1.877	0.288	0.075	3.859	0.000	1.333	1.152	1.543
Country Italy	0.545	0.075	7.313	0.000	1.725	1.491	1.997	0.458	0.076	6.046	0.000	1.580	1.363	1.833
Country Spain	0.414	0.074	5.623	0.000	1.513	1.310	1.748	0.932	0.078	11.941	0.000	2.539	2.179	2.959
Country UK	0.610	0.074	8.224	0.000	1.841	1.592	2.129	0.017	0.075	0.228	0.820	1.017	0.878	1.178
Country USA	0.483	0.074	6.503	0.000	1.621	1.401	1.875	-0.237	0.075	-3.153	0.002	0.789	0.681	0.914
N	7573							7568						
McFadden's R^2	0.0354							0.0447						
Residual Deviance	22802.95							19679.98						
AIC	22844.95							19721.98						

Note: **No** is the reference category for right-wing. **Male** is the reference category for gender. **Yes** is the reference category for religion. **Urban** is the reference category for region. **Low** is the reference category for education. **Low** is the reference category for income level. We created dummy variables to control for country variances, with France as reference category. Significant (p<.05) political and demographic coefficients are highlighted in bold.

Table D 4 Full results of ordinal regression models of attitudes towards climate change policies

Variables	(7) Climate policies: ban least efficient appliances						
	Coef. (B)	Std.	Z	*p*	Exp (95% CI) Lower	Exp (95% CI) Upper	Odds Ratio
Right wing Yes	-0.356	0.067	-5.331	**0.000**	0.700	0.614	0.798
Left wing Yes	0.071	0.069	1.040	0.298	1.074	0.939	1.229
Left-right leaning	-0.068	0.010	-6.929	**0.000**	0.934	0.917	0.953
Political interest	0.182	0.026	7.097	**0.000**	1.200	1.141	1.262
Age	0.003	0.002	1.847	0.065	1.003	1.000	1.006
Gender Female	0.098	0.044	2.242	**0.025**	1.103	1.012	1.202
Religion No	0.175	0.044	4.016	**0.000**	1.192	1.094	1.298
Region Rural	-0.099	0.052	-1.911	0.056	0.905	0.818	1.003
Education Intermediate	0.096	0.068	1.411	0.158	1.101	0.963	1.258
Education High	0.216	0.073	2.970	**0.003**	1.242	1.076	1.432
Income Intermediate	0.161	0.050	3.206	**0.001**	1.175	1.065	1.297
Income High	0.251	0.055	4.549	**0.000**	1.285	1.153	1.432
Country Germany	0.329	0.074	4.441	0.000	1.390	1.202	1.607
Country Italy	0.281	0.075	3.737	0.000	1.325	1.143	1.535
Country Spain	0.290	0.074	3.913	0.000	1.337	1.156	1.546
Country UK	0.027	0.075	0.355	0.722	1.027	0.887	1.189
Country USA	-0.731	0.075	-9.726	0.000	0.482	0.416	0.558
N				7567			
McFadden's R^2				0.028			
Residual Deviance				21110.35			
AIC				21152.35			

Note: **No** is the reference category for right-wing. **Male** is the reference category for gender. **Yes** is the reference category for religion. **Urban** is the reference category for region. **Low** is the reference category for education. **Low** is the reference category for income level.

Appendix E Coding of domains among all three groups of panellists

Table E 1 Top 50 climate-related websites visited by left-wing populist party supporters

Rank	Domains	News/Non-news	News (type)	Non-news (type)	Rank	Domains	News/Non-news	News (type)	Non-news (type)
1	google.com	Non-news		Search engine	26	dezeen.com	Non-news		Entertainment & Lifestyle
2	elle.com	News	Quality newspaper/magazine		*27*	nytimes.com	News	Quality newspaper/magazine	
3	google.it	Non-news		Search engine	*28*	t-online.de	Non-news		Web portal
4	facebook.com	Non-news		Social media	*29*	washingtonpost.com	News	Quality newspaper/magazine	
5	popsci.com	News	Quality newspaper/magazine		*30*	bild.de	News	Tabloid newspaper	
6	entertainow.com	Non-news		Entertainment & Lifestyle	*31*	civey.com	Non-news		Marketing
7	bing.com	Non-news		Search engine	*32*	fridaysforfuture.de	Non-news		Climate activism
8	change.org	Non-news		Petition website	*33*	ilprimatonazionale.it	News	Hyperpartisan media	
9	twitter.com	Non-news		Social media	*34*	liberation.fr	News	Quality newspaper/magazine	
10	foodrevolution.org	Non-news		Sustainable living	*35*	windstream.net	Non-news		Web portal
11	facciabuco.com	Non-news		Social media	*36*	ademe.fr	Non-news		Climate-related organization
12	merkur.de	News	Quality newspaper/magazine		*37*	bbc.co.uk	News	Public broadcaster	
13	wikipedia.org	Non-news		Encyclopaedia	*38*	dailybreak.com	Non-news		Entertainment & Lifestyle
14	repubblica.it	News	Quality newspaper/magazine		*39*	mediaset.it	News	Commercial broadcaster	
15	gmx.net	Non-news		Web portal	*40*	qoqotte.com	Non-news		Marketing
16	msn.com	Non-news		Web portal	*41*	scientificamerican.com	News	Quality newspaper/magazine	
17	rollingstone.com	Non-news		Entertainment & Lifestyle	*42*	bbc.com	News	Public broadcaster	
18	yahoo.com	Non-news		Search engine	*43*	creval.it	Non-news		Marketing
19	youtube.com	Non-news		Social media	*44*	gentside.com	Non-news		Entertainment & Lifestyle
20	welt.de	News	Quality newspaper/magazine		*45*	huffingtonpost.fr	News	Digital-born news outlet	
21	campact.de	Non-news		Petition website	*46*	ilfattoquotidiano.it	News	Quality newspaper/magazine	
22	klamm.de	Non-news		Web portal	*47*	lasicilia.it	News	Quality newspaper/magazine	
23	leggilo.org	News	Hyperpartisan media		*48*	lercio.it	News	Digital-born news outlet	
24	lifegate.it	Non-news		Entertainment & Lifestyle	*49*	maxisciences.com	Non-news		Science website
25	spiegel.de	News	Quality newspaper/magazine		*50*	nationalgeographic.com	News	Quality newspaper/magazine	

Table E 2 Top 50 climate-related websites visited by non-supporters of populist parties

Rank	Domains	News/Non-news	News (type)	Non-news (type)	Rank	Domains	News/Non-news	News (type)	Non-news (type)
1	google.com	Non-news		Search engine	26	dailykos.com	News	Hyperpartisan media	
2	care2.com	Non-news		Petition website	27	ecosia.org	Non-news		Sustainable living
3	bing.com	Non-news		Search engine	28	nationalgeographic.com	News	Quality newspaper/magazine	
4	msn.com	Non-news		Web portal	29	nrdc.org	Non-news		Climate-related organization
5	google.it	Non-news		Search engine	30	ted.com	Non-news		Science website
6	metoffice.gov.uk	Non-news		Government website	31	who.int	Non-news		Climate-related organization
7	popsci.com	News	Quality newspaper/magazine		32	blogspot.com	Non-news		Web portal
8	entertainow.com	Non-news		Entertainment & Lifestyle	33	t-online.de	Non-news		Web portal
9	bbc.com	News	Public broadcaster		34	climatechange2013.org	Non-news		Climate-related organization
10	change.org	Non-news		Petition website	35	38degrees.org.uk	Non-news		Climate activism
11	wikipedia.org	Non-news		Encyclopaedia	36	inews.co.uk	News	Quality newspaper/magazine	
12	twitter.com	Non-news		Social media	37	windstream.net	Non-news		Web portal
13	facebook.com	Non-news		Social media	38	yahoo.com	Non-news		Search engine
14	theguardian.com	News	Quality newspaper/magazine		39	cnbc.com	News	Commercial broadcaster	
15	theccc.org.uk	Non-news		Climate-related organization	40	proxer.me	Non-news		Entertainment & Lifestyle
16	bewegung.jetzt	Non-news		Petition website	41	warwickdc.gov.uk	Non-news		Government website
17	gov.scot	Non-news		Government website	42	cnn.com	News	Commercial broadcaster	
18	bbc.co.uk	News	Public broadcaster		43	gransnet.com	Non-news		Social media
19	viewsbank.com	Non-news		Marketing	44	repubblica.it	News	Quality newspaper/magazine	
20	friendsoftheearth.uk	Non-news		Climate activism	45	sharepoint.com	Non-news		Web portal
21	thehill.com	News	Quality newspaper/magazine		46	welt.de	News	Quality newspaper/magazine	
22	inkling.com	Non-news		Online learning	47	www.gov.uk	Non-news		Government website
23	independent.co.uk	News	Quality newspaper/magazine		48	livescience.com	Non-news		Science website
24	ucsusa.org	Non-news		Climate-related organization	49	bild.de	News	Tabloid newspaper	
25	spiegel.de	News	Quality newspaper/magazine		50	climatelondon.org	Non-news		Climate-related organization

Table E 3 Top 50 climate-related websites visited by supporters of right-wing populist parties

Rank	Domains	News/Non-news	News (type)	Non-news (type)	Rank	Domains	News/Non-news	News (type)	Non-news (type)
1	google.com	Non-news		Search engine	26	t-online.de	Non-news		Web portal
2	bing.com	Non-news		Search engine	27	axios.com	News	Digital-born news outlet	
3	viewsbank.com	Non-news		Marketing	28	project-syndicate.org	News	Digital-born news outlet	
4	facebook.com	Non-news		Social media	29	twitter.com	Non-news		Social media
5	msn.com	Non-news		Web portal	30	foxnews.com	News	Commercial broadcaster	
6	focus.de	News	Quality newspaper/magazine		31	gmx.net	Non-news		Web portal
7	going-postal.com	News	Hyperpartisan media		32	chilecientifico.com	Non-news		Science website
8	popsci.com	News	Quality newspaper/magazine		33	dailymail.co.uk	News	Tabloid newspaper	
9	entertainow.com	Non-news		Entertainment	34	morgenpost.de	News	Quality newspaper/magazine	
10	welt.de	News	Quality newspaper/magazine		35	wbur.org	News	Public broadcaster	
11	elle.com	News	Quality newspaper/magazine		36	web.de	Non-news		Web portal
12	google.de	Non-news		Search engine	37	westernjournal.com	News	Hyperpartisan media	
13	youtube.com	Non-news		Social media	38	efeverde.com	Non-news		Climate-related organization
14	europapress.es	News	Quality newspaper/magazine		39	rt.com	News	Hyperpartisan media	
15	bbc.co.uk	News	Public broadcaster		40	sky.com	News	Commercial broadcaster	
16	liberoquotidiano.it	News	Quality newspaper/magazine		41	yahoo.com	Non-news		Web portal
17	change.org	Non-news		Petition website	42	dailystar.co.uk	News	Tabloid newspaper	
18	gransnet.com	Non-news		Lifestyle	43	ilgiornale.it	News	Quality newspaper/magazine	
19	dailybreak.com	Non-news		Entertainment	44	obrasweb.mx	Non-news		Climate-related organization
20	google.it	Non-news		Search engine	45	respondent.io	Non-news		Marketing
21	wikipedia.org	Non-news		Encyclopaedia	46	anonymousnews.ru	News	Hyperpartisan media	
22	theguardian.com	News	Quality newspaper/magazine		47	conservativeinstitute.org	News	Hyperpartisan media	
23	naukas.com	Non-news		Science website	48	elpais.com.uy	News	Quality newspaper/magazine	
24	repubblica.it		Quality newspaper/magazine		49	forcechange.com	Non-news		Petition website
25	futurelearn.com	Non-news		Online learning	50	google.fr	Non-news		Search engine

Appendix F Dominant topics, topic themes, topic percent contribution, and 50 most probable keywords in three topic models

Table F 1 Dominant topics, topic themes, percent contributions and 50 most probable keywords of climate-related websites visited by supporters of left-wing populist parties, ranked by decreasing order of probability

Topic	Topic theme	Topic percent contribution	50 most probable keywords
0	Energy industry & climate justice	0.998700023	climate, change, action, company, industry, world, energy, policy, blame, people, care, regulation, carbon, group, need, shame, want, oil, legislation, year, fuel, proposal, gas, work, point, subscription, bag, conversation, movement, image, planet, country, consumer, administration, state, time, fossil, emission, footprint, defense, government, choice, justice, tell, stop, take, save, make, feel, face
3	Climate politics & party polarisation	0.997300029	climate, change, ground, policy, cortez, plan, alexandria, going, joe, biden, solution, report, take, middle, bid, reuters, deal, ocasio, approach, gas, group, fuel, planet, leadership, crisis, kid, dealbreaker, lack, stake, tweeted, life, issue, rep, seek, see, business, energy, carbon, action, blaming, campaign, fire, referring, president, delay, called, read, vice, sander, opponent
1	Climate science & Changing nature	0.996599972	year, ice, temperature, age, number, globe, increase, emitting, sound, grow, contributing, ton, study, greening, suggested, photosynthesis, plant, dioxide, need, carbon, line, look, part, concentration, scientist, team, gore, earth, way, show, time, cut, u, go, world, northern, alpine, canada, carried, desert, graph, kilometre, glacier, lyon, covered, spread, experiment, revealed, shocking, remains
2	Participation in Environmental action	0.994799972	earth, year, perspective, video, produced, hart, music, change, climate, account, hand, problem, day, medium, given, thing, publication, zac, man, driven, idea, everything, reaction, people, increase, warned, nation, start, way, issue, go, report, limit, release, energy, seeking, time, action, world, added, huffpost, david, entertainer, owned, perry, hailee, sing, started, screwed, kevin

Table F 2 Dominant topics, topic themes, percent contributions and 50 most probable keywords of climate-related websites visited by non-supporters of populist parties, ranked by decreasing order of probability

Topic	Topic theme	Topic percent contribution	50 most probable keywords
0	Changing nature & agriculture	0.999	carbon, offset, project, offsetting, permit, customer, emission, scheme, selling, gold standard, idea, say, tonne, energy, water, make, story, point, hydrogen, year, farmer, run, land, executive, planting, selling offsets, plant, running, cut, people, way, hope, food, paying, cell, life, grow, measurement, saved, gold, ltd, offsetters, calor, verified, bought, withdrawn, problem, soil, need, question
1	Politics & climate policy	0.998	energy, company, year, climate, level, environment, technology, sea, warming, change, rise, air, temperature, power, state, dioxide, trump, carbon dioxide, business, impact, climate change, global warming, reduce, percent, renewable energy, wind, home, according, economy, beer, risk, ice, plant, century, supply, sea level, today, people, come, report, happening, world, use, region, heat, system, amount, nation, effect, panel
3	Energy industry & economics	0.995	climate, change, climate change, emission, time, gas, carbon, world, fuel, government, science, get, oil, way, fossil fuel, market, cost, issue, fossil, people, policy, including, planet, made, need, fact, say, process, deal, think, greenhouse, scientist, industry, co, group, president, standard, care, make, sen, life, country, plan, reduction, take, candidate, cause, greenhouse gas, nothing, saying
2	Climate activism & Greta Thunberg	0.948	thunberg, climate, people, year, question, change, told, climate change, leader, week, thing, greta, parliament, protest, rebellion, extinction rebellion, campaigner, school, support, extinction, want, house, something, mind, done, day, go, movement, talk, transport, autism, anything, demand, activist, solution, make, greta thunberg, taking, debate, take, generation, place, know, london, mp, word, street, government, year old, nothing

Table F 3 Dominant topics, topic themes, percent contributions and 50 most probable keywords of climate-related websites visited by supporters of right-wing populist parties, ranked by decreasing order of probability

Topic	Topic theme	Topic percent contribution	50 most probable keywords
4	Climate politics & Protest	0.971899986	member, want, tell, city, house, people, left, day, ice, union, read, protester, truth, deal, brexit, sign, time, break, show, given, government, party, today, glacier, get, force, put, minister, hand, plan, number, go, police, week, sea, mp, world, added, become, term, thing, taken, change, site, mr, crisis, fear, demonstration, executive, style
2	Climate activism & Greta Thunberg	0.934199989	rebellion, climate, extinction, planet, extinction rebellion, protest, change, week, climate change, emergency, disruption, thunberg, people, london, bridge, activist, parliament, negotiation, action, cause, waterloo, xr, data, going, year, protester, sky, net, part, make, citizen, greta, warned, focused, khan, yamin, charged, met, progress, done, group, aim, buy, pm, create, connection, needed, community, mass, oxford
3	Climate policy & Sustainability	0.872799993	bottle, plastic, report, group, company, gas, world, emission, plastic bottles, energy, carbon, use, policy, according, greenhouse, action, way, keep, working, life, take, government, risk, effort, recycled, used, fuel, made, food, something, drink, country, threat, called, going, day, committee, investment, economy, reduce, demand, bn, industry, using, spent, pollution, put, brand, control, step
1	Climate politics & party polarisation	0.791400015	climate, change, climate change, lawsuit, year, make, beacon, come, pcffa, brought, fisherman, time, claim, response, journalism, article, park, chance, money, maldives, question, contributing, tree, respond, damage, choice, democrat, argument, coast, fleet, fishing, woman, powered, news, accuracy, look, association, committed, fire, reported, asked, zone, trending, technology, phone, warming, nation, official, part, crop
0	Energy industry & international relations	0.747900009	climate, year, oil, increase, warming, change, global warming, climate change, chevron, make, water, gas, lobbying, tackle, need, production, spending, campaign, paris, world, agreement, support, according, state, talking, system, rise, bp, meet, found, medium, taking, research, ad, measure, warning, increased, listed, china, address, policymakers, supported, branding, exxonmobil, shell, scientist, decade, power, university, finding

Appendix G Ranking of climate website tags

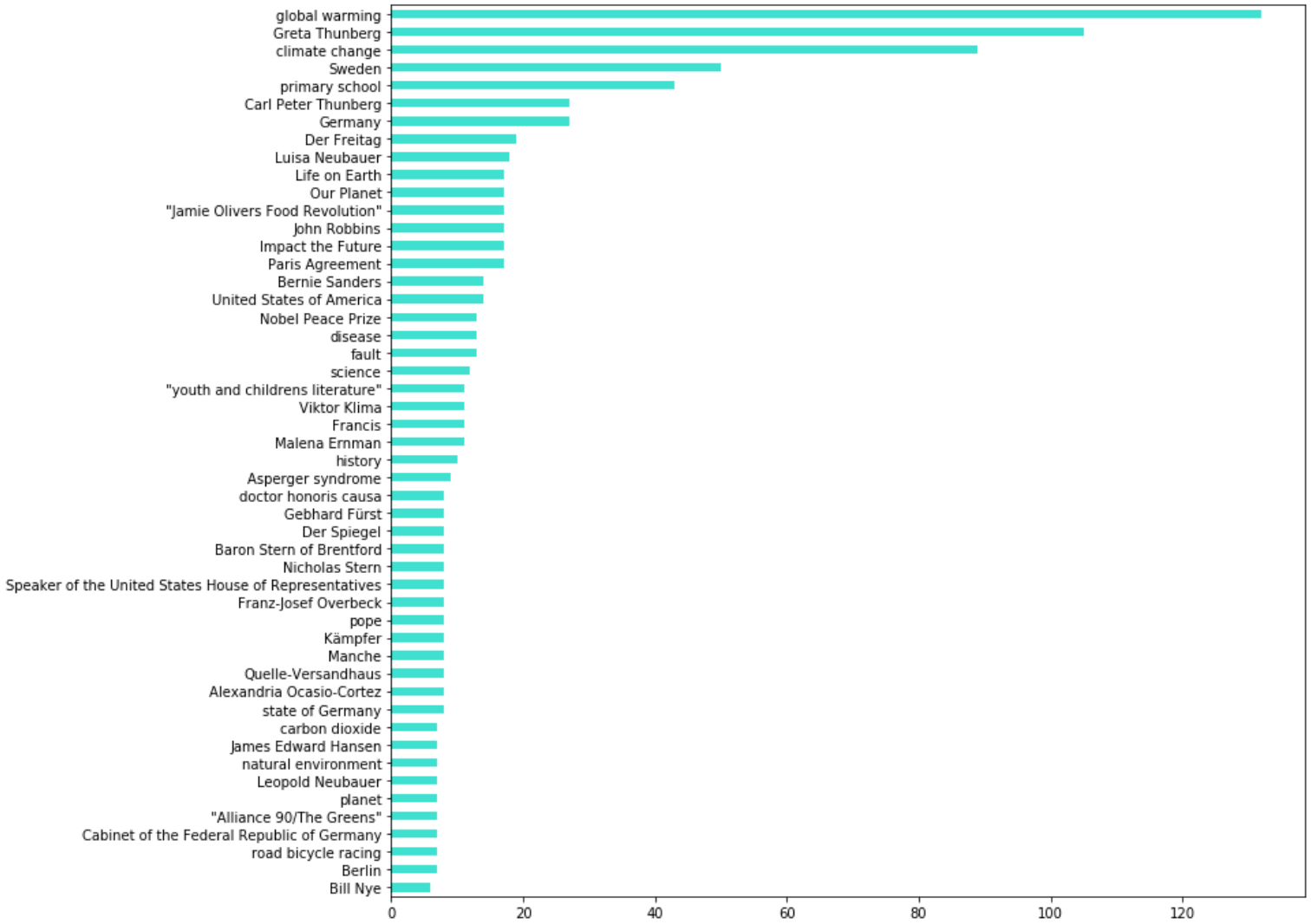


Figure G 1 Top 50 Tags Among Supporters of Left-wing Parties

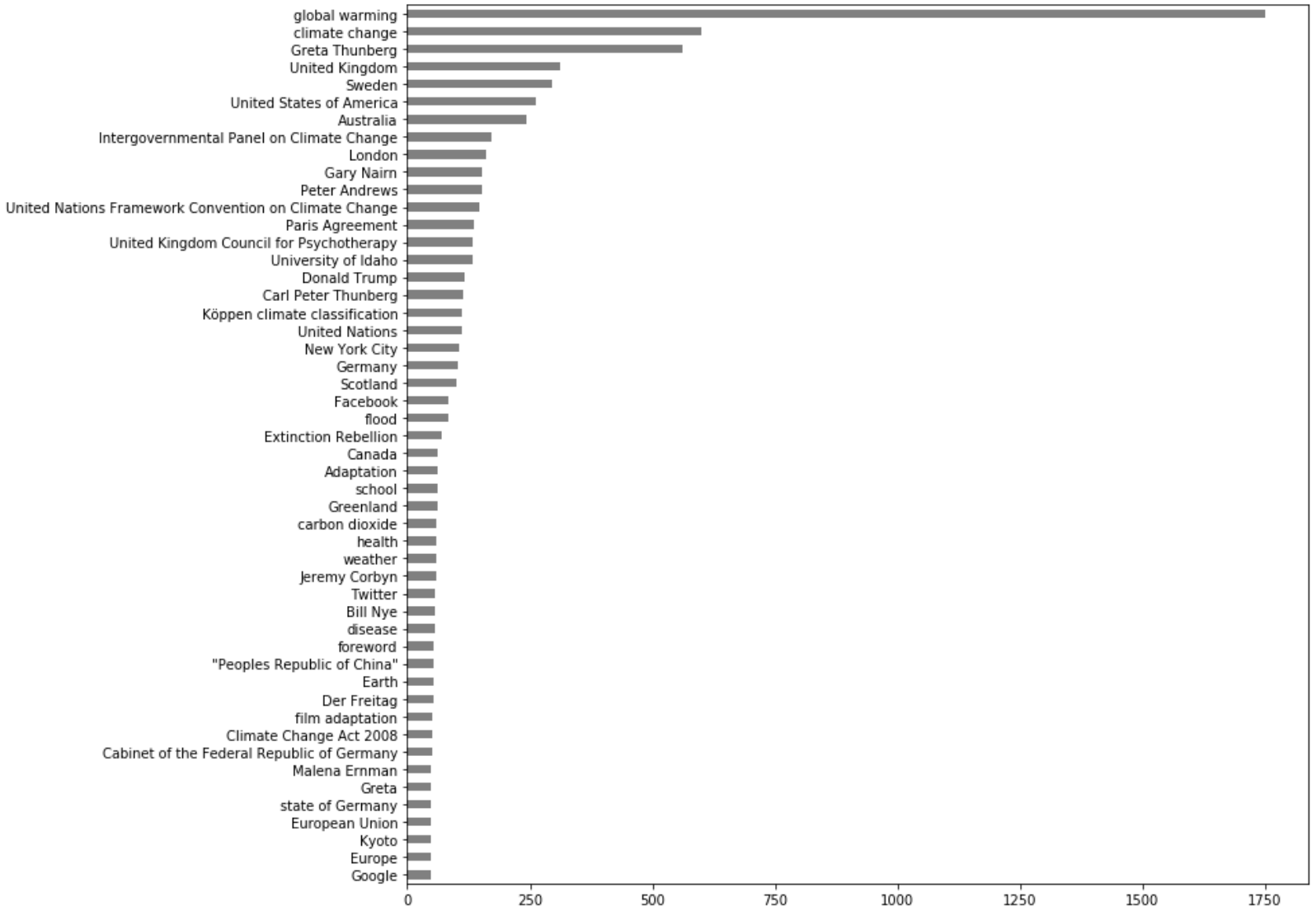


Figure G 2 Top 50 Tags Among Non-supporters of Parties

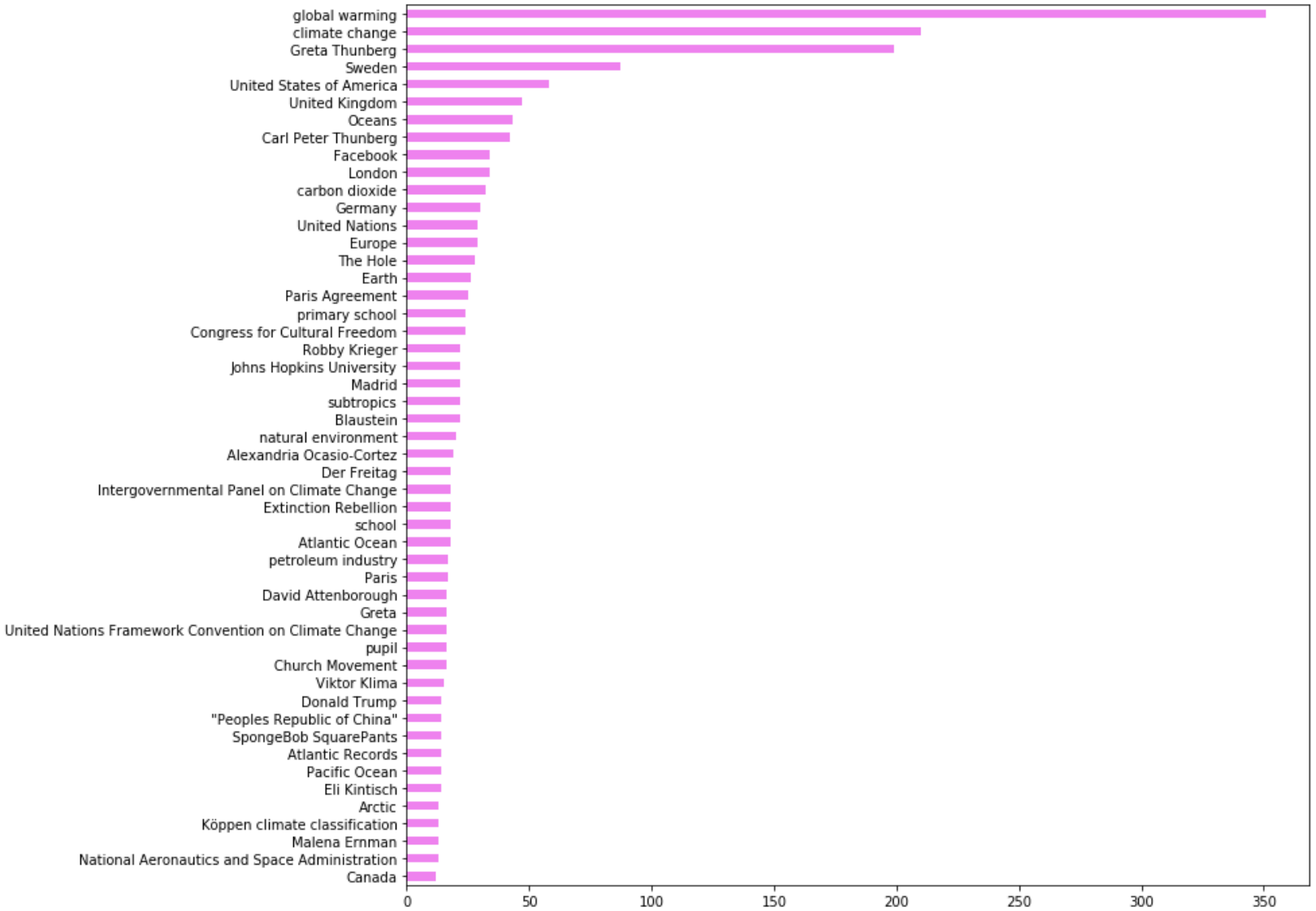


Figure G 3 Top 50 Tags Among Supporters of Right-wing Parties