

IT UNIVERSITY OF COPENHAGEN

# HOW DO U.S. CONGRESS MEMBERS ADVERTISE CLIMATE CHANGE ON FACEBOOK?

Laurenz Aisenpreis and Gustav Gyrst

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Laurenz Aisenpreis and Gustav Gyrst

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Supervisor: Vedran Sekara

## ABSTRACT

Ensuring transparency and integrity in the political communication on climate change has arguably never been more important than today. Yet we know little about *how* the U.S. congress members talk about the issue of *climate change* on Facebook. To that end, we use Facebook’s Ad Library to collect 19,176 climate-related advertisements that have been issued by the U.S. Congress members since mid-2018. Here we show that Democrats talk substantially more about climate change than Republicans, as their advertisements compose 99.7% of all climate-related advertisements. In particular, we find that the communication is driven by a small set of Democratic politicians. 72% of all impressions generated can be attributed to the top 10 climate advertisers. Interestingly, we find a significant difference in the average amount of impressions generated per dollar spent between the two parties. Republicans generate on average 188% more impressions with their climate ads. Furthermore, we find that, unlike Democrats, the Republicans generate relatively more impressions in an older audience. Our results demonstrate the peculiarities of climate-related advertisements of U.S. congress members and reveal differences in advertising characteristics between the two U.S. parties.

We anticipate our work to be a starting point for further studies about climate-related advertisements on Facebook. We suggest analyzing the *content* of ads as we find indications of a political divide in the communicated messages between Democrats and Republicans. We further advocate conducting inter-platform studies and including other political actors in order to increase the representativeness of our analysis.

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# 1 | INTRODUCTION

Climate change is considered one of the, if not the, greatest challenge of our time (IPCC, 2021; Watts et al., 2018; United Nations, 2021). At the same time, despite the large consensus in research about the causes of climate change (IPCC, 2021), it is a complex issue, which urgency science has lacked to convey (Sarewitz, 2011). It demands behavioral change today, and collaboration on a supranational level. But unfortunately, the benefits of such actions first pay off long after any politicians' term in office. Nevertheless, recent elections in Scandinavia, Britain, and Germany have made it clear that a strong stance in favor of fighting climate change has become vital for any party independent of the political ideology (Gabbatis, 2019; Holstein, 2019; Kallestrup and Eller, 2019; Berlingske, 2021; ZEIT, 2021). Meanwhile, in the U.S. we have seen a less unison picture across the political spectrum. This became exceedingly clear when former president Trump openly stated his disbelief in climate change and withdrew from the Paris Agreement (McGrath, 2020). The U.S., being the largest economy in the world, plays an important role in participating in fighting climate change, but a political divide on the topic still appears to be present in the country (MacInnis and Krosnick, 2020; Griswold, 2021; Williams et al., 2015). Thus, it is necessary that politicians act jointly to successfully fight climate change.

However, climate change is a complex issue. As Tversky and Kahneman (1974) have highlighted, the complexity of an issue hinders people from making objective and rational decisions. It is thus of uttermost importance to present climate change in a comprehensible and accessible manner to the general public. While journals and scientific papers can be too complex for the public to understand, traditional media<sup>1</sup> may oversimplify the issue (Cody et al., 2015) and lack to persuade its audience. This is where social media as a new platform of communication comes into play. Social media creates a space where a diverse set of people can share content and opinions, and where sender and receiver can have direct communication. It is a place where exposure to the same topic can come from a multitude of sources at different points in time<sup>2</sup>. Interestingly, peer attitudes have been found to have a substantial impact on individual perception of climate change (Kahan et al., 2012), which makes social media an important forum for driving change in opinion on climate change. In the past years, social media has rapidly emerged, and become a new way for the public to share opinions, interact, and engage with the issue of climate change in a positive way (Mavrodieva et al., 2019). 86% of Americans consume news on their smartphone, computer, or tablet (Shearer, 2021). In addition, approximately 48% receive their news on social media platforms (Walker and Matsa, 2021).

The use of social media has found its way from the public to political campaigns, marking an important phase in the evolution of new media. In particular, since the remarkable and pioneering digital campaign by Barack Obama's team in the 2008 presidential elections, social media (and in particular Facebook) has become a prevalent tool in politics (Owen, 2019). Parties and politicians nowadays spend extensive amounts of money on social media campaigns. Political online advertising spendings more than quadrupled from 2018 to 2020 and political actors spent \$2.3 billion on Facebook and Google alone in 2019 and 2020 (TechForCampaigns, 2020).

One might ask what led to this tremendous growth and recognition of social media for political communication. Notably, it has fundamentally changed traditional political activities and enabled political actors to publicly express their opinion,

<sup>1</sup> "One-to-many" communication (e.g., newspapers, television, radio).

<sup>2</sup> E.g., your best friend from school, a news company, and a celebrity might post about the same topic or share the same news.

reach different or broader networks (Tarai et al., 2015; Nott, 2020), and engage with their audience in new ways (Kearney, 2017). In particular, it has changed how political campaigns are conducted, allowing politicians to micro-target<sup>3</sup> potential voters and frame their messaging strategically (Sahly et al., 2019).

On the one hand, political actors can respond to the priorities of potential voters, evaluate the engagement, and embed feedback and insights from online campaigns to optimize their political strategies (Enns-Jedenastik et al., 2021). On the other hand, recipients of political communication can be influenced, and potentially learn from political content they are exposed to (Bode, 2015). Thereby, consumers of political content can reduce information gaps and foster their political opinions. Hoewe and Peacock (2020) state that the effect of social media on users' political opinions depends on variables such as the attitudes before media exposure or levels of trust in media content.

In spite of the relevancy of social media, we still know little about how political communication about climate change is characterized on social media platforms. Pearce et al. (2019) mapped out recent social media studies on climate change. They found that Twitter largely dominates the scene for climate change-related research on social media with 24 out of 59 papers published from 2015-2018 that were based on Twitter's data. Pearce et al. (2019) further found that there is a gap in research on climate change on Facebook, despite it being the largest social media platform in terms of users (Statista, 2021c). Additionally, in the U.S., Facebook is the preferred channel for people to get their news with nearly a third of American adults receiving their news through the platform (Walker and Matsa, 2021).

Most existing literature on climate change on social media is focused on debates about climate science, and less on political discussions on how to deal with it (Pearce et al., 2019; Sarewitz, 2011). It thus becomes a relevant perspective to look at Facebook advertisements by policymakers to gain a better understanding of how the ones responsible for the future of a country address the issue of climate change. Given this socio-political context, our main research focus is to study *Facebook advertisements of U.S. politicians*<sup>4</sup>. In particular, we focus on U.S. Congress members and leverage Facebook's Ad Library API<sup>5</sup> data to gain insights into their advertisement activities. We set this scope given; 1) the important role the world's leading economy, the United States, plays in fighting climate change, 2) that Facebook is the largest social media platform in terms of users (Statista, 2021c) but yet among the least studied, and 3) Congress is the legislative branch of the U.S., with the power to shape the future of the country (The White House, 2021a).

The rest of the paper is organized as follows. In chapter 2, we thematize the state-of-the-art research which is relevant for our work. In chapter 3, we describe our process to generate a comprehensive data set containing advertisements of the U.S. Congress members. In chapter 4, we summarize the results of our analysis and present our findings. In chapter 5, we review the approach and discuss limitations as well as potential extensions of our work.

<sup>3</sup> Microtargeting is a type of online advertising that uses data to identify the preferences of individuals to influence their actions.

<sup>4</sup> Throughout this paper, we use the term Facebook as an umbrella term for all Meta's platforms (i.e., Facebook, Instagram, WhatsApp, Messenger). We sometimes refer to the platform Facebook in particular.

<sup>5</sup> Facebook's Ad Library API documentation can be accessed at: <https://www.facebook.com/ads/library/api>



## 2 | STATE OF THE ART

In section 1 of this paper, we established how social media has become an important medium for spreading news and shaping opinions, and thus an interesting medium for researchers to examine the gap between the scientific and public opinion on climate change. In particular, we saw that, first, there is a lack of literature on climate change research on the largest social media platform in the world, Facebook. This is likely related to Facebook's closed company policy on data sharing. Unlike Twitter, Facebook has not had an API for researchers to investigate the content on their platform until the release of the Ad Library API. However, this API is limited to the paid content on the platform classified as political by Facebook itself (The White House, 2021b). Additionally, to gain access to the API, a registration process needs to be completed.

Secondly, we saw that most climate change research is focused on debates on social media about climate science and less on the political discussion on what should be done to solve the issue (Pearce et al., 2019). Specifically, we find that there is a lack of literature addressing how policymakers communicate about climate change in particular on Facebook.

On the one hand, there exists a body of literature with a focus on climate change on the social media platform Twitter, but not on Facebook. On the other hand, there exists research conducted with Facebook data, which focuses on other domains of public relevance, such as immigration and COVID-19. In the following, we outline first climate change-related research on Twitter and secondly similar research conducted with Facebook data that covers domains other than climate change.

The existing literature on climate change on Twitter falls into three main categories: publics (i.e., users' knowledge and views on the topic), themes (i.e., studies based on thematic data sets such as hashtags or keywords), and professional communications (i.e., climate scientists communication on social media) (Pearce et al., 2019). Cody et al. (2015) used a sentiment measurement tool<sup>1</sup> to analyze how Twitter users respond to different climate change news, events, and natural disasters. They find that climate change topics related to natural disasters, climate bills, and oil-drilling decrease happiness, while other subjects such as climate rallies increase happiness. Cody et al. (2015) highlights how Twitter as a social media platform serves as a valuable tool to spread awareness of climate change as they find that the voice of activists has a larger presence online than skeptics and deniers.

Yu et al. (2021) have challenged this conclusion. They suggest that while it is possible for vocal activists to share their view and spread climate change awareness on Twitter, activists need to find trusted voices to convey the message, persuade the skeptics, and activate neutral voices. This especially becomes relevant as social media platforms have been known to create echo chambers and homogeneity in what a user is exposed to in the news feed. Williams et al. (2015) found evidence for this hypothesis by revealing high polarization on the topic of climate change among users on Twitter. In particular, the users with strong opinions on the topic (i.e., skeptics and activists) were found to be the most vocal. Furthermore, they found that users were segregated into like-minded communities. Taking Williams et al. (2015) findings into consideration, it arguably further underscores Yu et al. (2021)'s emphasis on getting the right voices: namely, politicians to speak up and address the issue. The study of Yu et al. (2021) reveals an interesting finding on how U.S. politicians talk about climate change: while Democrats speak more up about climate change than their counterparts, who even tend to deny climate change

<sup>1</sup> Hedonometer, available at: <https://hedonometer.org>

(McCright and Dunlap, 2011), neither party speak up about climate change based on the risks that it imposes on society. Yu et al. (2021) find that the likelihood of a democratic politician tweeting about climate change is associated with the existing public opinion, but not the risks of climate change that the given constituency is faced with. Thus they present empirical evidence to support the *riding the wave* theory, as presented by Ansolabehere and Iyengar (1994). The theory suggests that political campaigns are more successful when following the topics that are currently in the interest of the public. This implies that the definition of a political agenda is a bottom-up process in which political actors respond to the priorities of potential voters (Klüver and Sagarzazu, 2016).

As emphasized at the beginning of this section, Facebook has not been a frequently used source for research on communication about the issue of climate change. Nevertheless, different studies have highlighted the importance that Facebook plays as a medium for political actors and in particular how Facebook's Ad Library API can be used to draw relevant conclusions about political advertisements. Political operators embed feedback and insights from online campaigns to optimize their political strategies and respond to the public opinion in *real-time* (Enns-Jedenastik et al., 2021). As Enns-Jedenastik et al. (2021) have shown by investigating Facebook posts of political actors in Austria during the 2017 parliamentary election, parties do adjust their topic strategies based on user engagement and feedback gathered from their Facebook posts. Thus, popularity metrics, such as *likes* on Facebook, are indicators of perceived relevance and perception of topics in the public opinion in regards to political issues (Porten-Che   et al., 2018). Moreover, research has found a positive relationship between user engagement and election results (Heredia et al., 2017). In particular, in recent times, researchers have studied data that was made available via Facebook's Ad Library API to gain new perspectives on the impact of political communication on this medium. The study by Edelson et al. (2019) was one of the first to present an analysis of the Ad Library and aimed to understand targeting strategies used by advertisers. They also analyzed the quality of the ad sponsor transparency and point out how advertisers can "intentionally or accidentally" bypass the political advertising archive. Other studies have taken further steps and analyzed the effects of political online advertising by combining Facebook's Ad Library data with additional data sources (Medina Serrano et al., 2020; Capozzi et al., 2021). Jamison et al. (2020) investigated vaccination-related advertising prior to SARS-CoV-2. They found that anti-vaccine advertisers were successful in publishing advertisements with low costs but high user impressions. Their research revealed how Facebook's advertising mechanisms can be effectively used to undermine trust in an important topic of public health. Studies like the work of Jamison et al. (2020), Mejova and Kalimeri (2020), and Capozzi et al. (2021) have gone in-depth with investigating political messages on Facebook. Those studies are an example of how researching Facebook's Ad Library API data can be used to answer a variety of relevant questions about the content and stance of political messages on controversial topics such as vaccination, COVID-19, and immigration. As part of their studies, those researchers were able to reveal, for instance, the driving forces behind a political topic, how the narratives and emotions of political messages can be characterized, and whether cases of misinformation about the issues were present.

Our work aims to transfer established methodologies that have been conducted successfully with Facebook's Ad Library API to the domain of climate change. Consequently bridging an important gap in the existing literature, namely studying political communication about climate change on Facebook's platforms. In particular, we focus on analyzing relevant metrics such as spend, impressions, geographic, and demographic coverage of the advertisements. Thereby we derive important conclusions about how the U.S. Congress members talk about climate change. However, looking at the semantics of political advertisements is beyond the scope of this paper.

## 3 | METHODOLOGY

Collecting Facebook advertisements using the Ad Library API requires users to follow a multi-step registration process. Most importantly, a Facebook account is required and one's identity needs to be confirmed by Facebook (Facebook, 2021d). After one has gained access to the Ad Library API and registered as a Facebook Developer, an *App* needs to be created. It is important to note, that Apps themselves can have different permissions and features, that can be requested. We mention that because having an App with access to the metadata and content of public Facebook pages would have eased our data collection process. However, Facebook requires these Apps to be verified as a business, which is a more complicated process (Facebook, 2021c).

### 3.1 DATA COLLECTION

As a prerequisite for our following analysis, we used Facebook's Ad Library API to collect all political advertisements issued by the currently serving U.S. Congress members. Facebook's API allows one to query data by specifying the *page IDs* of the desired Facebook pages. Thus, to generate a comprehensive data set in an efficient and automated manner, we needed to overcome two major hurdles:

1. Find the Facebook pages of U.S. Congress members<sup>1</sup>
2. Find the *page IDs* of those Facebook pages

To tackle these challenges we proceeded in three steps. As a first step, we used a publicly available data set (Tauberer et al., 2021) that lists the current members of U.S. Congress<sup>2</sup> and includes further information such as party affiliation and their social media accounts.

Secondly, we downloaded the Facebook Ad Library report for the United States reaching back to May 2018 (Facebook, 2021a). This report contains the page names and most importantly the *page IDs* of all advertisers who have issued a political advertisement on Facebook.

As the last step, we were able to complement the first data set with the correct *page IDs* that were contained in the Ad Library report.

Conducting this in an efficient yet error-free manner proved to be more difficult than previously expected. We, therefore, implemented a

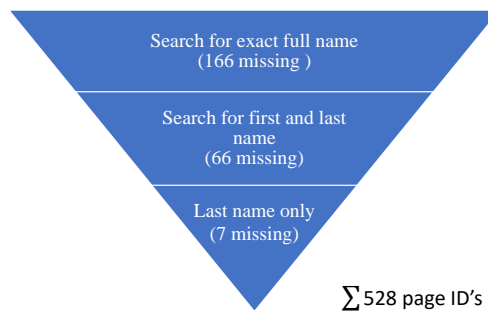


Figure 1: Three-level process to receive the *page IDs* of politicians' Facebook pages. The total of 528 *page IDs* are prior to the manual revision.

<sup>1</sup> Members of Congress have several official Facebook pages in some cases (e.g., "U.S. Senator Bernie Sanders" and "Bernie Sanders"). However, they do not necessarily run ads on all of them.

<sup>2</sup> In fact, the data set lists 538 members of Congress and not the precise number of 535 currently serving members. The length is somewhat arbitrary, because members that left Congress may not be updated immediately.

three-level process as depicted in Figure 1. First, we searched the Ad Library report for the full name of the Congress member. This resulted in 369 page IDs. However, pages for politicians with differing names, nicknames, or middle names, as for instance "Bernard Sanders" known as "Bernie Sanders", were not matched in our first search.

We thus filtered the remaining set of missing Congress members by searching for page names including both first AND last names of the politicians (i.e., excluding middle names and suffixes such as jr.). This resulted in an additional 100 page IDs. Lastly, we filtered by last name alone on the remaining 66 politicians which reduced the set of missing page IDs to 7. With each of these steps, we could further reduce the set of missing pages. However, the results became less precise.

The entire set of U.S. Congress members was revised manually and faulty page IDs were deleted. We found that a substantial number of politicians have more than one ad account. Our approach was to take the page ID with the highest total spend according to the Ad Library report. For example, a politician could have a general account and one specific to a campaign (e.g., "Congressman French Hill" and "French Hill for Arkansas"). There also exist support group pages (e.g., "Friends of Derek Kilmer"), that are not official pages of the politician. In a manual revision of the data set, we filtered these pages out and replaced them with the page IDs corresponding to official Facebook pages. We also encountered cases of Facebook pages that were against the given politician<sup>3</sup> which was corrected in the manual revision. During the manual revision, we removed and altered several Facebook page IDs. Overall, we were able to collect the page IDs of 520 Congress members. The remaining 15 Congress members missing from the data set did not have a Facebook advertisement account linked to their official Facebook page according to the Ad Library report.

With this list of politicians and their Facebook page IDs, we were able to run queries to collect 602,546 advertisements in total. Even though Facebook officially announced that the labeling of political advertisements started in May 2018 and is not backdated (TechCrunch, 2021), our data set contains advertisements prior to this date. For the temporal analyses in section 4.1 and 4.2.2, we decided to exclude those advertisements that were issued before the official release. These advertisements only count 692 but would affect the readability of the visualizations.

## 3.2 DATA PREPROCESSING

After the data collection, the next logical steps were to clean and preprocess the results. The relevant attributes in the Ad Library API are depicted in Table 1. Each advertisement was complemented with a timestamp, an unique identifier, the name of the corresponding Facebook page, and its page ID.

Since both *spend* and *impressions*<sup>4</sup> were given as a range, we decided to enrich our data set by adding the lower bound, average, and upper bound of the ranges for each advertisement that indicate a *closed range*<sup>5</sup>. Advertisements with a spend of *less than 100* and impressions of *less than 1.000* had no lower bound given. We decided to set the lower bound of these ranges to 0 as no further indication by Facebook was given, and it could be the case that no impressions were generated by an advertisement. Likewise, advertisements with spend and impressions of *more than 100,000* and 1 million respectively, were less precise due to a lack of an upper bound. In those cases, we take the known closed endpoint as the average.

<sup>3</sup> E.g., for Thom Tillis, the total ad spend was higher on pages like "Corrupt Thom Tillis" or "Defeat Thom Tillis", than on his official Facebook ad page.

<sup>4</sup> Impressions measure how often advertisements were displayed on the screen of the audience. If an advertisement is shown to someone two different times in a day, it counts as two impressions. The definition can be found at: <https://www.facebook.com/business/help/675615482516035>

<sup>5</sup> Closed ranges comprise the advertisements with a defined lower and upper bound (e.g., \$100-\$499).

Attribute	Description
ad_creative_body	The text displayed in the ad.
spend	Showing the amount of money spent running the ad, specified in dollars. The spend is reported as a range.
impressions	Showing the number of times the ad created an impression. The impressions are reported as a range.
delivery_by_region	Regional distribution of people reached by the ad. Provided as a percentage score for each region.
demographic_distribution	The demographic distribution of people reached by the ad. Specifying age range and gender.

**Table 1:** A set of the attributes relevant for our work that we received from Facebook’s Ad Library API.

Additionally, we calculated the *impressions per dollar spent* for each advertisement, and conducted two-sample z-tests (significance level 5%) to compare the *average spend per advertisement* and *average impressions per dollar spent* between Republicans and Democrats. The results are depicted in Table A.2.2 in the appendix and will be further described in section 4.

Of the 602,546 advertisements that we collected, we also investigated whether cases of undefined values were present. The number of undefined values for certain attributes in our data set are listed in Table 2. The most significant lack of information was present for the attributes *demographic\_distribution* and *delivery\_by\_region*. Advertisements without values for these attributes constituted 23% of our total data set. We find that the missing attributes always co-occur. Further, we find that all advertisements where those attributes are missing have a spend <\$100 and impressions <1 K, indicating that a certain threshold of spend and user interactions has to be reached such that Facebook reveals information about those attributes. We must note that this does not imply that *all* advertisements with spend <\$100 and impressions <1 K have undefined demographic and geographic distribution. Our data set contains 463,402 advertisements that fall within this category of low spend and low impressions.

Advertisements that did not contain a descriptive text (*ad\_creative\_body*) or bylines<sup>6</sup> were also present but occurred less frequently. Those attributes were not in the focus of our research, thus we decided to not treat them separately.

Facebook’s Ad Library API provides demographic and geographic data in columns in the form of a list of dictionaries. For the *demographic\_distribution*, each dictionary contains the keys "percentage", "gender", and "age" reflecting the demographic data for one segment (e.g., "percentage": 0.23, "gender": female, and "age": "18-24"). For the *delivery\_by\_region*, each dictionary contains the keys "percentage" and "region", where the region corresponds to an U.S. state. The percentage of each given segment in the data was weighted with the impressions the given ad had. As a result, for the demographic data we get the distribution of impressions for each gender and age group. For the geographic data, we receive the distribution of impressions per region.

**Table 2:** Number of undefined values for selected attributes. The percentage refers to the total data set.

Attribute	Undefined Values
ad_creative_body	4,487 (0,07%)
delivery_by_region	139,144 (23%)
demographic_distribution	139,144 (23%)
bylines	1,732 (0,03%)

<sup>6</sup> Bylines refer to information about the funding entity.

### 3.3 DATA FILTERING

In order to determine which advertisements were about climate change, we decided to apply a keyword filtering that previous research studies have suggested (Cody et al., 2015; Yu et al., 2021). In particular, we chose to filter the collected advertisements according to a *query* suggested by Yu et al. (2021). This query had been applied by the researchers to determine Tweets about climate change and thus we found it to be relevant for the aims of our study. The query consists of several words related to climate change linked by logical operators: "*climate OR (global AND warming) NOT (business climate OR economic climate OR biz climate OR tax climate OR regulatory climate)*".

Applying this query to our data set resulted in 19,176 advertisements related to climate change, spanning over a time frame from March 2018 to November 2021. In total, 153 unique Facebook page IDs of politicians were included in this subset. Hence, 367 of the 520 page IDs that are included in the total data set are missing in the climate-related subset. This implies that either those politicians did not issue a climate-related advertisement or their advertisements have not been identified by our filtering method.



## 4 | RESULTS

By analyzing the collected data from Facebook’s Ad Library API, we can evaluate certain metrics and trends about how U.S. Congress members talk about climate change in their Facebook advertisements. In this context, we specifically emphasize the following three research questions:

1. Who are the politicians driving the topic of climate change with Facebook advertisements?
2. How do the temporal dynamics and characteristics of advertisements by Democrats and Republicans compare?
3. How is their audience characterized in terms of demographic and geographic distribution?

### 4.1 CHARACTERIZING THE TOTAL DATA SET

To understand what is particular about climate-related advertisements, we take the general advertisements into consideration first. In the following, we describe the total data set for all advertisements issued by U.S. Congress members.

First, we inspect who are the main advertisers present in the *total* data set. Out of the 520 Congress members, 264 are Democrats (50.7%), 254 are Republicans (48.8%) and 2 are Independent<sup>1</sup> (0.5%). Out of the total advertisements, 481.144 (80%) are linked to Democrats (As aforementioned, we count Bernie Sanders as a Democrat) and 121.402 (20%) belong to the Republicans. Figure 2 depicts the top 10 advertisers by total spend and impressions. To aggregate the total spend and impressions for each politician we took the sum of the average spend and impressions of their respective advertisements. The top 10 advertisers by spend are dominated by Democrats ( $n_D = 7$ ), with only two Republicans among top advertisers. When looking at the top politicians by impressions, the Republican candidate Ted Cruz appears among the top 10, even though he is not among the top spenders.

It is important to mention here, that the *independent* Congress member, Bernie Sanders is leading by spend on Facebook advertisements with a total of almost \$20 million and with more than 800 million impressions. Given the relevancy of this politician for our research, we believe that the loss of information of excluding Bernie Sanders would be too substantial. Hence, when analyzing spend, impressions, as well as demographic and geographic distributions by party, we attribute the advertisements of Bernie Sanders to the Democratic party. We support our decision by the fact that Bernie Sanders caucuses with the Democratic party ([Ballotpedia, 2021](#)) and was running as a Democratic presidential candidate in both 2016 and 2020<sup>2</sup> presidential elections.

<sup>1</sup> Senator Bernie Sanders and Senator Angus King.

<sup>2</sup> Bernie Sanders ended his presidential campaign in April 2020.

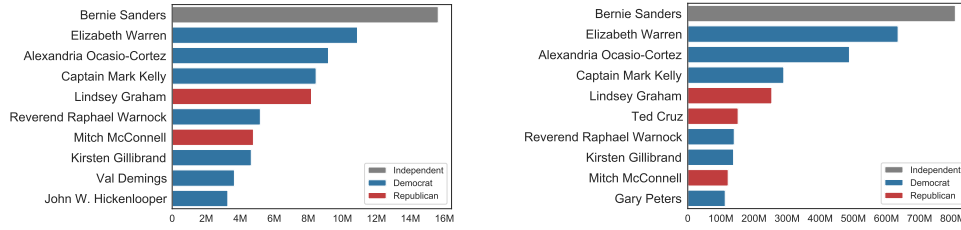
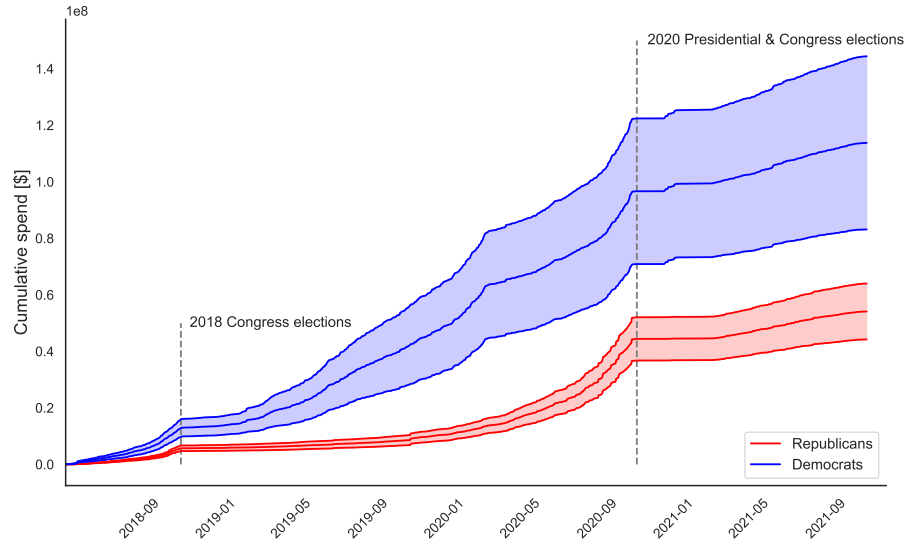


Figure 2: Top 10 advertisers of the total data set sorted by spend [\$] (left) and impressions (right).

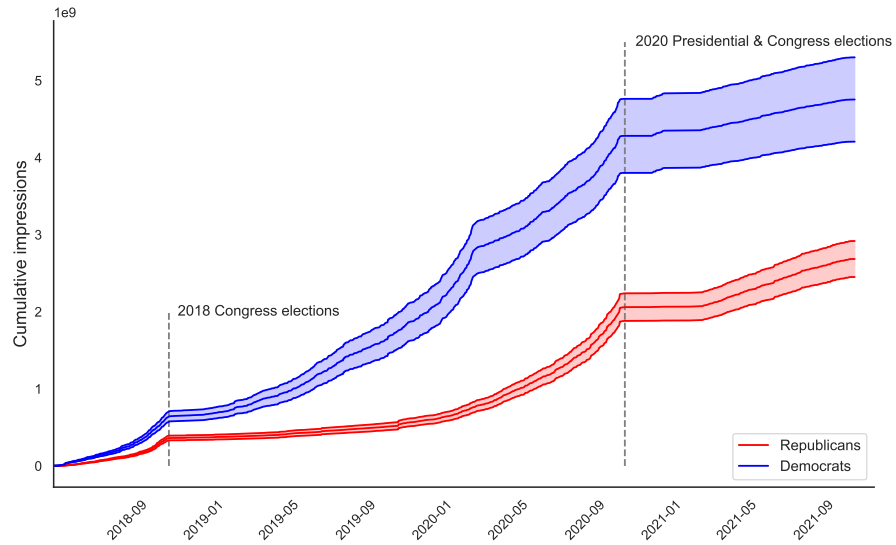
Second, we investigate the temporal dynamics of the advertisement spendings and impressions of U.S. Congress members for the advertisements in our total data set. The graphs (Figure 3 and 4) depict spend and impressions as a range, because of the way how Facebook presents those attributes. We calculated the lower, average, and upper bounds as described in section 3.2. Figure 3 shows the cumulative spend for each party. We find that in the months before the 2020 presidential and Congress elections, both parties invested heavily in Facebook advertisements as it can be seen by the steepness of the curve. In particular, the curve of Republican spend resembles a heavy-tailed distribution. This is due to Republican advertisements being unequally distributed. Republicans issued a great majority of their advertisements starting from the beginning of 2020 until the presidential and Congress elections that same year. Conversely, Figure 3 shows that Democrats have invested more continuously in Facebook advertisements throughout the time frame of this analysis. In total, the cumulative spend of the Democrats tops the Republicans by more than \$60 million. Similarly, as it can be seen in Figure 4, Democrats generated a total of 4.7 billion impressions compared to 2.6 billion impressions by Republicans.

Democrats spend on average \$236 for their advertisements and Republicans \$445 (see Table A.2.2 in the appendix). The result of the z-test was statistically significant ( $z = -35.96$ ,  $p < 0.001$ ) and suggests that Republicans spend almost twice as much on average for their advertisements. A z-test for the *average number of impressions per dollar spent* indicated that Republicans generate significantly more impressions per dollar spent ( $z = -108.33$ ,  $p < 0.001$ ) than their counterparts. Republicans generate on average 47 impressions per dollar spent, which is 56% more than the Democrats generate (30). It appears that Republicans seem to be better able to navigate Facebook advertisements into user impressions. In other words, Republicans seem to receive more attention for the money they spend.





**Figure 3:** Cumulative spend [\$] of total Facebook ads of U.S. Congress members by political party since the launch of Facebook’s Ad Library API. Note, that for each party the lower, average, and upper bounds of the spend range are depicted in the graph. Number of advertisements: Democrats ( $n_D=481.144$ ), Republicans ( $n_R=121.402$ )



**Figure 4:** Cumulative impressions of total Facebook ads of U.S. Congress members by political party since the launch of Facebook’s Ad Library API. Note, that for each party the lower, average, and upper bounds of the impression range are depicted in the graph. Number of advertisements: Democrats ( $n_D=481.144$ ), Republicans ( $n_R=121.402$ )

## 4.2 CLIMATE-RELATED ADVERTISEMENTS

Next, we turn to the advertisements that are related to climate change. As mentioned in section 3.3, the subset of climate advertisements only accounts for 3% ( $n_C=19,176$ ) of all advertisements and contains ads of 153 (29%) Congress members. This implies that either a large fraction of politicians do not talk about the issue of climate change, or have not been captured by our filtering approach, as described in section 3.3. The majority of climate-related advertisements generated low impressions and were inexpensive (Table 3). In fact, 96% of advertisements cost less than \$500 and 86% of the advertisements generated impressions below 5,000. However, there were 8 cases of advertisements that had more than 1 million impressions, while no advertisement cost more than \$100,000.

We further compare the distribution of ad spend and impressions to the set of all advertisements ( $n_{all}=602,546$ ) as it can be seen Table A.2.1 in the appendix. In contrast to the climate-related advertisements, only 76.3% of all advertisements cost less than \$100 and 91.6% less than \$500. Moreover, there is a substantial difference in impressions between climate-related advertisements and all advertisements. The latter has 54.4% of advertisements with less than 1,000 impressions compared to 67% for climate-advertisements, which corresponds to an absolute difference of 12.6 percentage points. Therefore, climate-related advertisements appear to generate fewer impressions with more advertisements being in the low-spend ranges than the overall advertisements. We outline this difference in more detail when looking at the temporal dynamics of climate advertisements in section 4.2.2.

**Table 3:** Distribution of climate advertisements in ranges of impressions (top) and spend (bottom).

Climate ads ( $n_C=19,176$ )	
<i>Total Impressions</i>	
<1 K	12909 (67%)
1-5 K	3681 (19%)
5-10 K	953 (5%)
10-50 K	1251 (7%)
50-100 K	199 (1%)
100-500 K	160 (0,08%)
500 K- 1 M	15 (0,008%)
>1 M	8 (0,004%)
<i>Spend</i>	
<\$100	16455 (86%)
\$100-\$499	1940 (10%)
\$500-\$999	372 (2%)
\$1000-\$5000	339 (2%)
\$5000-\$10,000	35 (0,2%)
\$10,000-\$50,000	34 (0,2%)
\$50,000-\$100,000	1 (0,005%)
>\$100,000	0 (0%)

### 4.2.1 Politicians Driving the Topic of Climate Change

Out of the 153 Congress members that are contained in the set of climate advertisements, 13 are Republicans (8%) and 140 are Democrats (92%). In Figure 5 we show that the top 10 climate advertisers differ from the top 10 overall advertisers most importantly in the regard, that no Republican politician is among the leading climate advertisers. As we consider Bernie Sanders a Democrat, all of the top 10 politicians belong to the Democratic party.

All of the top 10 politicians according to spend also appear in the top 10 according to impressions, however in a different order. While Bernie Sanders for instance ranks third by spending, he is the politician with the highest number of impressions. Interestingly, the top 10 climate advertisers account for 72% of the impressions of climate advertisements.

Out of those politicians that advertise about climate change, the proportion of climate-related advertisements to all other advertisements of those politicians is generally small. As it can be seen in Figure A.1.1 in the appendix, only 15% of the

politicians that talk about climate change have a share of climate ads of more than 10%. This reveals that only a small share of politicians emphasize the topic.

Thus we can infer from our findings that the topic of climate change on Facebook is driven by a small set of Democrats.

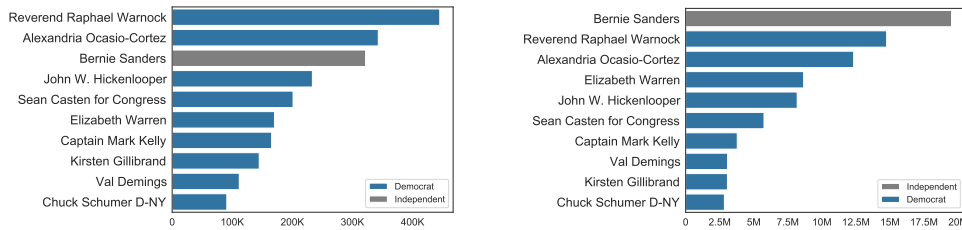


Figure 5: Top 10 climate advertisers sorted by spend [\$] (left) and impressions (right).

#### 4.2.2 Temporal Dynamics of Climate Advertisements – Democrats vs. Republicans

Further, we examine the differences between the two political parties. In particular, we look at the metrics spend, impressions, geographic reach, and demographic coverage. The difference in the distribution of climate-related advertisements among Democrats and Republicans is even more significant than for the total data set. While 19,107 (99.6%) of the advertisements belong to Democrats, only 69 (0.04%) are attributed to Republicans.

Both Figure 6 and 7 depict significant differences between Democrats<sup>3</sup> and Republicans. While Democrats have a cumulative spend of more than \$3 million since mid-2018, Republicans spend \$21,000 on climate-related advertisements, revealing a difference of more than two orders of magnitude. The difference in impressions draws a similar picture. Democrats have generated a cumulative amount of 112 million impressions. At the same time, Republicans have generated a total of 1,17 million impressions.

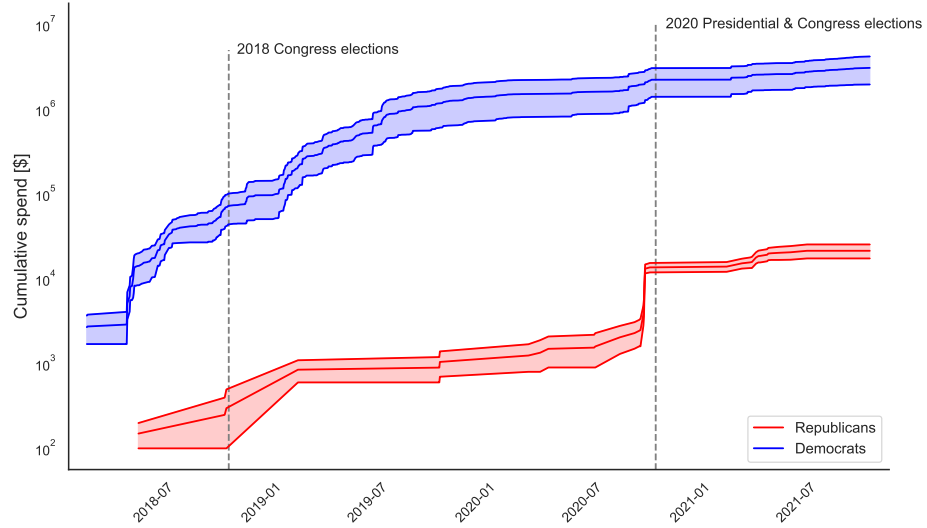
We observe a steep jump in Republican spend and impressions in Figure 6 and 7 in the months prior to the 2020 residential and Congress elections. This is because Republicans spent more than half of their total cumulative spend within this two-month period. However, we emphasize that the difference in spend is small due to the logarithmic scale of the graph.

Next we look at the *average spend per advertisement* and *average number of impressions generated per dollar spent* (see Table A.2.2 in the appendix), to infer indications about differences in how the two parties advertise and how their advertisements perform. We did not find a significant difference in the average spend per advertisements between Democrats and Republicans ( $z = -1.23$ ,  $p = 0.22$ ). Democrats spend on average \$161 per climate advertisement, whereas Republicans spend \$310.

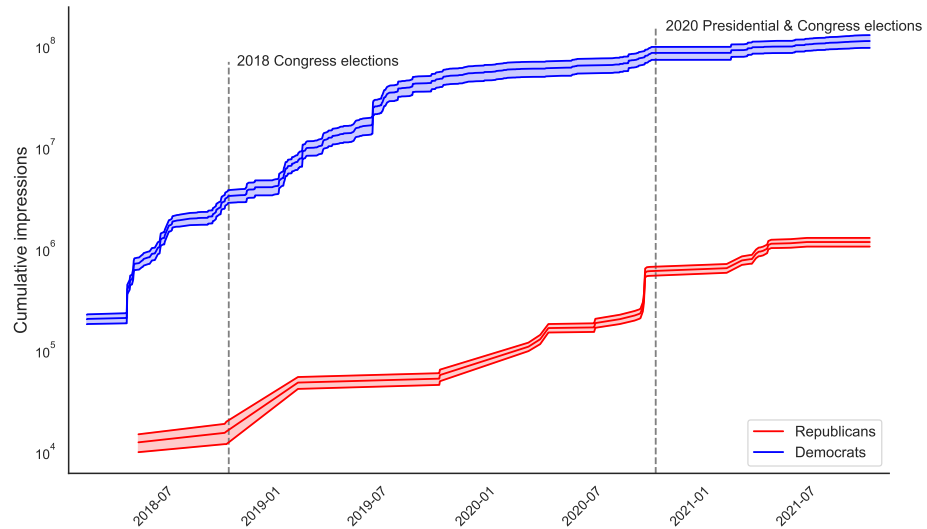
However, we find a significant difference in *average impressions per dollar spent* between the two parties ( $z = -10.98$ ,  $p < 0.001$ ). Republicans generated on average 72 impressions per dollar spent compared to 25 for the Democrats. In other words, we find that Republicans generate 188% more impressions per dollar spent than Democrats for climate-related advertisements.

To sum up, Republicans appear to be more successful with climate-related advertisements compared to all advertisements, and most importantly *outperform* their counterparts when it comes to climate advertisements. This might be an indication that there are other factors than the money spent which influence the *performance* of an advertisement, such as the content. We will further discuss this in section 5 of this paper.

<sup>3</sup> As mentioned before, we count Bernie Sanders as a Democrat.



**Figure 6:** Cumulative spend [\$] of climate-related Facebook ads of U.S. Congress members by political party since the launch of Facebook’s Ad Library API. Note, that for each party the lower, average, and upper bounds of the spend range are depicted in the graph, and logarithmic scaling is used. Number of advertisements: Democrats ( $n_D=19.107$ ), Republicans ( $n_R=69$ )

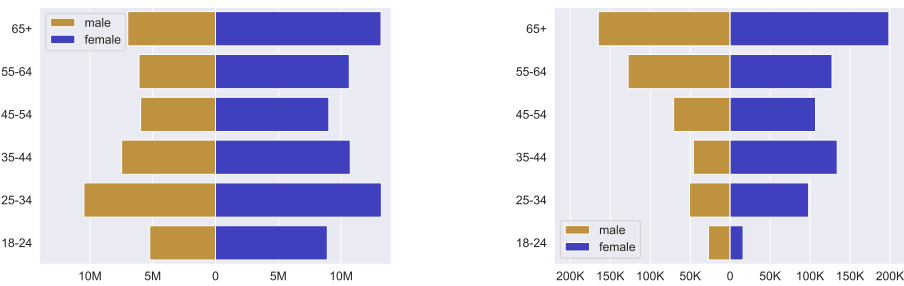


**Figure 7:** Cumulative impressions of climate-related Facebook ads of U.S. Congress members by political party since the launch of Facebook’s Ad Library API. Note, that for each party the lower, average, and upper bounds of the impression range are depicted in the graph, and logarithmic scaling is used. Number of advertisements: Democrats ( $n_D=19.107$ ), Republicans ( $n_R=69$ )

### 4.2.3 Audience Demographics and Geographic Distribution

In the following, we focus on the set of advertisements with defined demographic and geographic information, that is 13,466 climate-related advertisements and 463,402 advertisements overall.

In Figure 8 we see that climate-advertisements run by Democrats tend to have a younger audience in comparison to their counterparts. In particular, 25-34 year-olds. Whereas the Republicans have an older audience (i.e., older than 55). The demographic data for Democrats reflect an hour-glass shaped distribution, with a higher fraction of users in the segments 25-34 and +65. For the Republicans the distribution takes the shape of a reverse pyramid as shown in Figure 8. A similar pattern is reflected in the demographic distribution of all advertisements (Figure A.1.5 in appendix). Thus, climate-related advertisements do not have any special characteristics compared to all advertisements. A general trait for demographic distributions of the advertisements is that there are more female than male impressions. This could be explained by the overall distribution of Facebook<sup>4</sup> users which is predominantly female (Statista, 2021a,b). Likewise, approximately twice as many women tend to get their news through Facebook than men (Walker and Matsa, 2021). An interesting finding is that both parties tend to have a high fraction of their impressions in the older segments (i.e., 65+). This is despite that the older segment of 65+ only accounts for about 5% of Facebook users (Statista, 2021a).



**Figure 8:** Demographic distribution of climate-related advertisements by Democrats (left) and Republicans (right) measured by number of impressions. Note, that the plots do not have the same range, as it would greatly affect the readability of the Republican distribution.

In Figure 9 we present the normalized distribution<sup>5</sup> of all advertisements and climate-related advertisements for the Democrats. When looking at the climate advertisements for the Democrats in Figure 9b, we find that mainly coastal and metropolitan areas<sup>6</sup> have more climate ads. But interestingly, Colorado has the highest quantity of ads in relation to population size. This could be explained by Colorado Senator John W. Hickenlooper being among the top spenders with the most impressions on climate change advertisements (see Figure 5 for reference).

When looking at the distribution of climate-related advertisements for the Republicans in Figure 10b we find Oregon, Texas, North Carolina, North Dakota, and Pennsylvania to be the states with the most impressions. Interestingly, North Dakota and Texas are also the biggest oil-producing states in the US (EIA, 2020).

A noteworthy character of the data is that several swing states are among the states with most climate change-related ads. For the Democrats, this counts Iowa,

<sup>4</sup> And other Meta platforms.

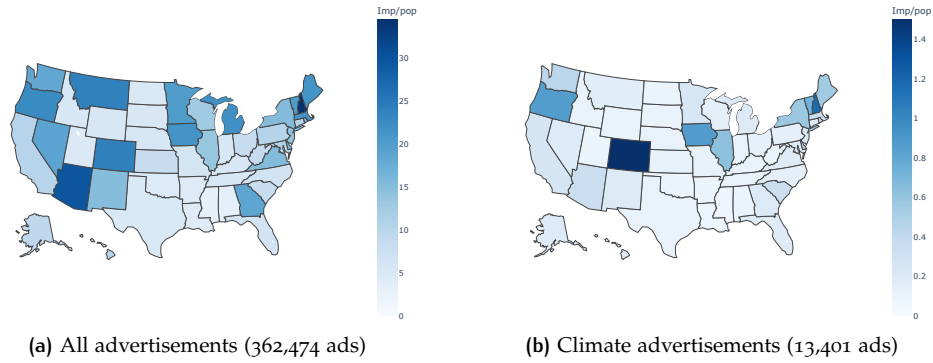
<sup>5</sup> We normalized our data set with respect to the population count in the given state. The population data was retrieved from the CORGIS Dataset Project (Whitcomb et al., 2021).

<sup>6</sup> New York, Maine, Vermont, New Hampshire, Oregon, Illinois, and Iowa.

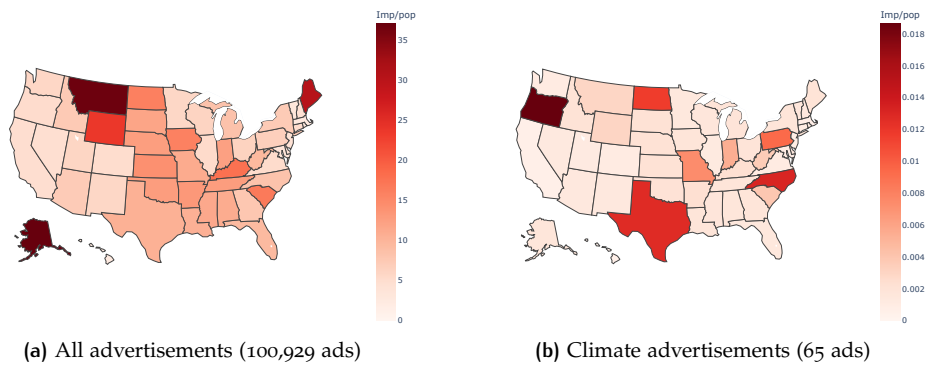
Colorado, and New Hampshire. For the Republicans: Pennsylvania and North Carolina (World Population Review, 2021).

When we look at the geographical distribution for all advertisements (Figure 9a and 10a) we see a different picture. The coastal areas - in particular the west-coast states and the northern east-coast states - are to an even larger extent dominated by the Democrats, while the south and mid-west are dominated by the Republicans.

Unlike for the demographic distribution, we see a difference in the geographic distribution of climate advertisements audience when compared to the overall ad distribution.



**Figure 9:** Geographic distribution of advertisements for Democrats. (a) represents the set of all advertisements. (b) shows the the set of climate advertisements. The impressions per state are normalized by the respective population size. Note, that a) and b) do not have the same ranges.



**Figure 10:** Geographic distribution of advertisements for Republicans. (a) represents the set of all advertisements. (b) shows the the set of climate advertisements. The impressions per state are normalized by the respective population size. Note, that a) and b) do not have the same ranges.

## 5 | DISCUSSION

To our knowledge, this is the first academic inquiry to use Facebook's Ad Library API to study advertisements focused on the issue of climate change. While this work describes in particular how U.S. Congress members talk about the topic since the release of Facebook's API in mid-2018, it introduces also broader questions of Facebook's advertising transparency and the relevance of debating a topic of global importance on the largest social media platform (Statista, 2021c). At the time of our data collection, we found almost 20,000 climate-related advertisements of U.S. Congress members, that have generated about 100 million impressions and totaled in a spend of more than \$3 million. Undoubtedly, the potential research possibilities presented by this data are rich and diverse.

However, we must point out four main limitations inherent in the collected data and our approach. First, both spend and impressions are reported as range values instead of being specified as a precise number, which introduces a factor of inaccuracy.

A second shortcoming is that Facebook does not reveal any information about the intended targeting of the advertisers. This is not satisfying given the elaborated ways of how advertisers can target their audiences on Facebook. Having this information at hand would allow us to investigate *to whom* politicians want to speak about climate change and eventually allow us to draw more relevant conclusions about the rationale behind their advertising strategies. Additionally, it could help us to distinguish from the bias that "algorithmic inference" (Thorson et al., 2021) is introducing to advertisements on Facebook. We must emphasize that Facebook has released a data set (Facebook, 2021b) that includes targeting information of all of the political advertisements that were run in the 90 day period, preceding the U.S. elections on November 3rd, 2020. While this information is relevant and insightful, it raises the question of why Facebook is not revealing targeting specifications for all political advertisements. It remains unclear as to what extent targeting has been conducted (*micro-targeting*) or whether custom audiences have been defined by the advertisers (Dommert and Power, 2019). We find that even though this might imply revealing campaign strategies of political actors to competitors, the gain on transparency for research would be immense.

Third, our keyword filter relies on the terms that Yu et al. (2021) found most effective for Twitter, and might not be as precise on Facebook's platforms. The quality of the adopted keyword filtering has not been tested in this new context of Facebook. Thus, there is a chance that non-climate-related ads have been comprised in our data set or other climate-related advertisements were not identified as such. Likewise, the keywords filtering is limited to the textual data (section 3.3) and does not include media content for instance.

Lastly, in order to determine the performance and effectiveness of an advertisement, *impressions* is the only metric available in the data from Facebook's Ad Library API<sup>1</sup>. Unfortunately, Facebook does not include metrics such as engagement, click-through rate, and relevance score, that are otherwise available on Facebook's Ad Manager (Facebook Ad Manager, 2021). Those metrics would allow us to better quantify how *successful* politicians advertise on Facebook.

Despite those limitations, our work reveals interesting results about climate-related advertisements of U.S. Congress members in general and suggests differences in advertising between Republicans and Democrats in particular. Our find-

<sup>1</sup> Measuring user engagement is a common practice in digital marketing to evaluate the success of advertisements (Medina Serrano et al., 2020)



ings show that Democrats noticeably dominate online advertisements about climate change on Facebook, supporting the results of [Yu et al. \(2021\)](#) that Democrats tweet more about climate change. In fact, there is a substantial difference, as Republicans that talk about climate change are almost non-existent in our data set (0.04% of all climate advertisements). While this imbalance reduces the validity of general conclusions about advertising strategies, it still indicates the perceived relevance that each party and its potential voters ascribe to the topic of climate change.

All of the politicians that talk *most* about climate change can be associated with the Democratic party. The top 10 politicians that talk about climate change make up for 72% of all climate-related advertisements. In general, we find that a higher proportion of climate advertisements falls within the categories of low spend (<\$100) and low impressions (<1 K) compared to advertisements in general.

It is surprising that Republicans not only generate higher average impressions per dollar than Democrats when looking at the overall advertisements, but also outperform their counterpart when specifically looking at the climate-related advertisements. When manually revising the advertisements of the Republicans, we found several cases of politicians being clearly against climate measures and some even denying climate change, calling global warming a "theory" (Figure ??). These examples do not only indicate a political divide of opinions between Democrats and Republicans, but also suggest a potential explanation for the difference in average impressions per dollar spent between the two parties. Advertisements that contain polarizing, extreme and divisive content generate more attention on Facebook's platform ([Bakir and McStay, 2018](#)). We must note here, that these findings are not representative due to the limited amount of Republican advertisements, and further examples need to be collected. We also emphasize that the analysis of the textual content of advertisements was out the of scope of our research.

Looking at the demographic distribution, we see that Republicans have more impressions in the older segments, while Democrats have a high share of impressions in younger segments. We must emphasize that there are no peculiarities for climate advertisements compared to general advertisements. We find it interesting, that there is no particular difference, although the topic of climate change appears to matter more to younger generations ([Tosin Thompson, 2021](#)). The geographic distribution suggests that Democrats' climate advertisements are primarily viewed in metropolitan and coastal areas, with the exception of Colorado, where most impressions are with respect to the population size. For the Republicans, the states with the largest oil productions in the U.S. (Texas and North Dakota) are among the states with the most normalized impressions. We do see a close resemblance between the geographical distribution of advertisements and which party is currently representing the respective states in Congress (see Figure A.1.6 in the appendix). Similar to demographics, the geographic distributions are not significantly different between climate-related ads and general ads.

As mentioned before, the lack of information about the targeting strategies is a limitation of our study. We can solely interpret the distributions of users reached as a proxy of the targeting strategies applied by the politicians. This could distort the picture, given the immeasurable bias that Facebook's algorithm introduces ([Washington Post, 2021](#)).

Overall, this study has presented new insights and limitations of Facebook's Ad Library when exploring how U.S. politicians talk about climate change. Given our work, we present three open research challenges that remain to be addressed and could build upon our initial findings.

The first challenge refers to the analysis of the *content* of the advertisements. While it was outside of the scope of this research project to apply techniques of Natural Language Processing or focus on non-textual data (i.e., image/video content) as suggested by [Pearce et al. \(2019\)](#), there exist exciting opportunities for future directions of research to do so. In fact, it would allow one to analyze which narratives and emotions were used, or whether cases of misinformation about climate change



were present in the political advertisements. We find promising indications that suggest the relevancy of such studies. As an example, one could study whether there exists a significant correlation between the content of Republican climate advertisements (Figure A.1.4) and their superior performance in impressions per dollar, that our findings indicate.

A second challenge is given by the relatively small amount of Republican advertisements. If one would want to make general statements about the political divide in the U.S. in regard to climate change on social media, our data must be enriched by additional external sources. Even though Facebook and other services owned by Meta, are major social media platforms, there exist still other relevant communication platforms such as Twitter and Google. This suggests conducting inter-platform studies to increase the coverage of relevant information channels.

The third challenge relates to the scope of who is included in our data set. While our paper is limited to the current U.S. Congress members, it would be interesting to include a broader set of politicians (e.g., local politicians such as mayors, and governors), and include NGOs and other active voices in the climate debate in further research. It could likewise be appealing to change the geographical scope of the research and look at other countries than the U.S..

Despite many limitations of Facebook's Ad Library and the scope of our work, the collected data and conducted methodology still present novel insights about the advertising characteristics of U.S. politicians on the topic of climate change. The main finding of our study is the extent to which the amount and frequency that Republicans and Democrats talk about the topic differ. Since Republicans barely mention the topic, there exists a gap of several orders of magnitude in spending and impressions of Facebook advertisements about climate change. Thus, we were able to complement the findings of Yu et al. (2021) and reveal that, not only on Twitter but also on Facebook, Democrats communicate about climate change more often. This is particularly important as future research can further evaluate the political divide caused by the topic among the two political parties, and study the question *how* politicians talk about the issue of climate change in more detail.

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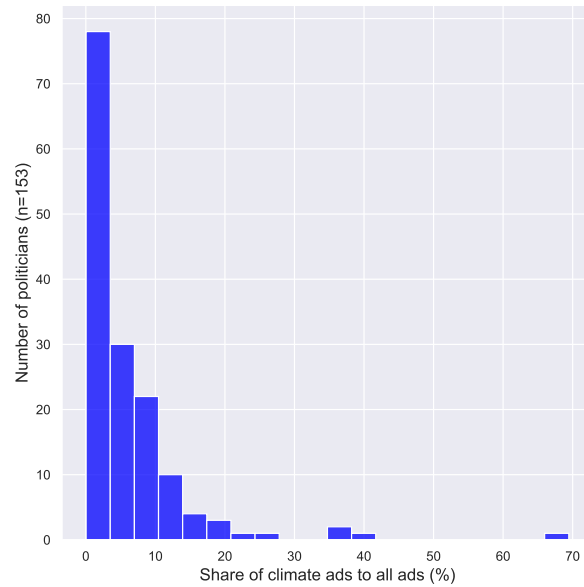
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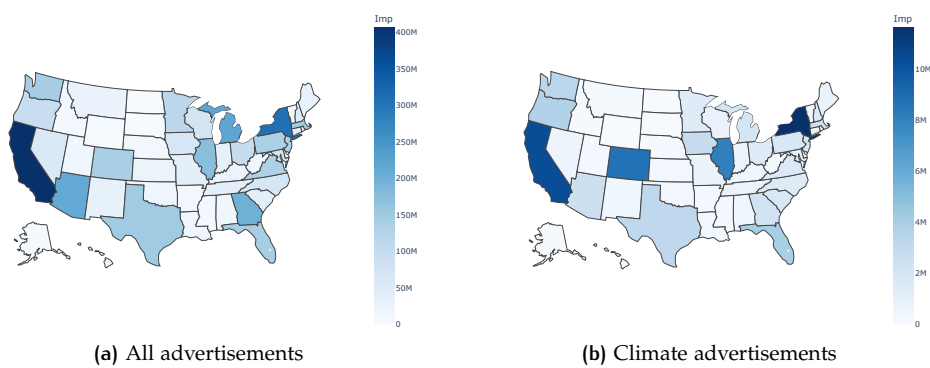
# A | APPENDIX

## A.1 FIGURES



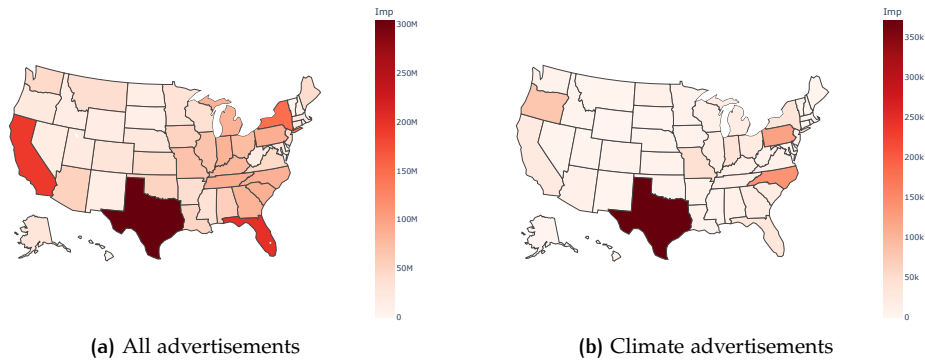
**Figure A.1.1:** This graph depicts the ratio of climate advertisements versus overall advertisements of those politicians ( $n_p=153$ ) that had advertisements included in the climate data set. It indicates how those politicians that *do* talk about climate change, emphasize the topic in their advertisements.

### Democrats



**Figure A.1.2:** Raw data for geographic distribution for Democrats measured in impressions. (a) represents all advertisements (b) represents climate advertisements. Note, that a) and b) do not have the same ranges.

## Republicans



**Figure A.1.3:** Raw data for geographic distribution for Republicans measured in impressions. (a) represents all advertisements (b) represents climate advertisements. Note, that a) and b) do not have the same ranges.




**Steve Daines**  
 Sponsored • Paid for by STEVE DAINES FOR MONTANA

🇺🇸🔪 Joe Biden's war on Made-in-America energy trades American energy jobs for climate change ideology and global warming theories. We've got to stop this now 🇺🇸



[HTTPS://WWW.STEVEDAINES.COM/AMERICAN-JOBS/DEFEND-AMERICAN-ENERGY](https://www.stevedaines.com/american-jobs/defend-american-energy)  
 Stop Biden's war on Made-in-America energy.

Learn More

---


**Kevin Cramer**  
 Sponsored • Paid for by CRAMER FOR SENATE

Joe Biden and his Green New Deal gang care more about how "farting cows" are contributing to climate change than feeding hungry people. Join Senator Cramer and stand for American jobs, American food production, and America's environment. Please donate today!



SECURE.WINRED.COM  
 NOT AFFILIATED WITH FACEBOOK  
 DONATE TODAY!  
 Stand with Senator Cramer

Donate now

---


**Jim Banks**  
 Sponsored • Paid for by JIM BANKS FOR CONGRESS, INC.

If Joe Biden is trying to pick up votes in the Midwest, I am not sure why he'd tell anyone about his radical and dangerous environmental plan. At the risk of sounding dramatic—if enacted as drafted, the plan would end life as we know it in northeast Indiana.

The plan would:

- Outlaw coal and natural gas
- Ban oil and gas production on federal lands and offshore
- Mandate zero-emission cars
- Apply aggressive new building standards and codes
- Create a new Environmental Justice department that would arrest people for polluting
- Delete millions of jobs in the energy sector and many more in the industries that depend on it... in the middle of a pandemic

Your car, your house, even your dishwasher won't be up to code in Joe Biden's America. Maybe even the company you work for.

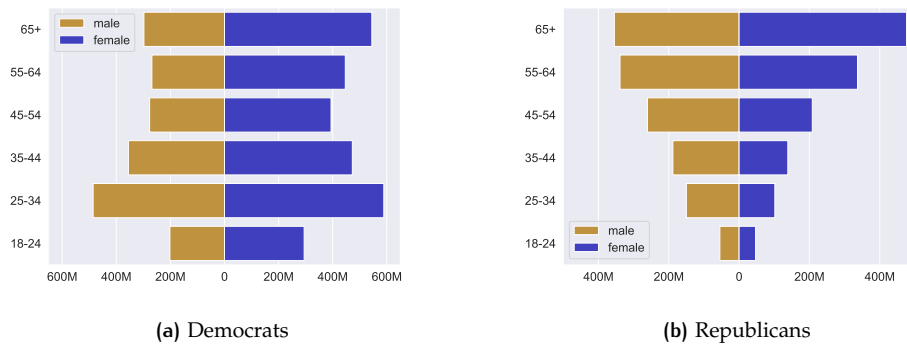
It's almost as if this plan was produced by someone who's only lived in elite, coastal cities... whoops! It was. Turns out Alexandria Ocasio-Cortez is co-chair of the Biden campaign's climate task force. She shares the role with... Bernie Sanders.

No wonder a union worker recently told the Washington Examiner: "[Joe Biden] scares me now."

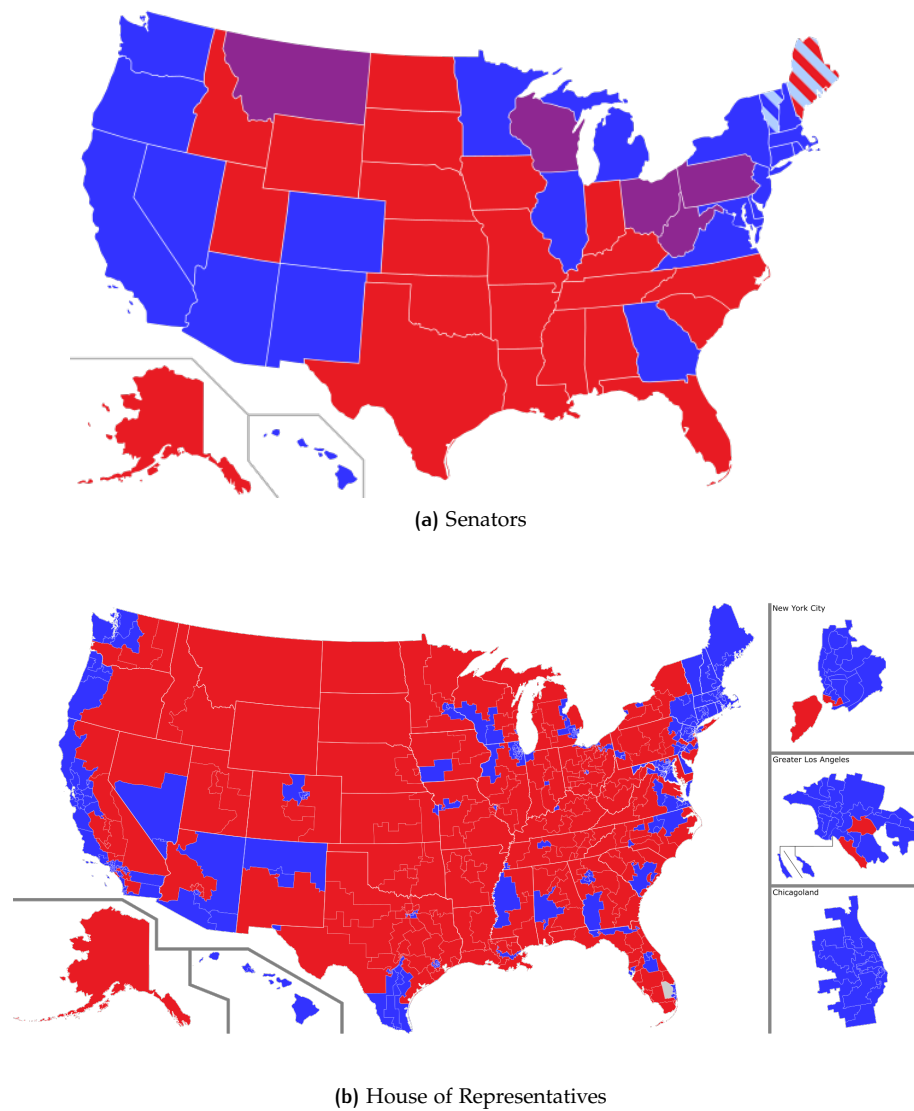
Figure A.1.4: Selected examples of Republican advertisements that were marked as climate-related in our data set, and include provocative or radical content against certain climate change measures.



## Demographic Distributions - All Advertisements



**Figure A.1.5:** Demographic distribution of all advertisements by (a) Democrats and (b) Republicans measured by number of impressions.



**Figure A.1.6:** 117th United States Congress Senators and House of Representatives. Democrats: blue, Republicans: red, Both: purple, and Republicans or Democrats with Independent: stripes. These pictures are taken from the Wikipedia page about U.S. Congress, and comply with the copyright terms. Accessed on December 11th 2021 [https://en.wikipedia.org/wiki/117th\\_United\\_States\\_Congress](https://en.wikipedia.org/wiki/117th_United_States_Congress)

## A.2 TABLES

All advertisements (n=602546)	
<i>Total Impressions</i>	
<1 K	327902 (54,4%)
1-5 K	132851 (22,0%)
5-10 K	44388 (7,4%)
10-50 K	67685 (11,2%)
50-100 K	14838 (2,5%)
100-500 K	13009 (2,2%)
500 K- 1 M	1273 (0,2%)
>1 M	600 (0,1%)
<i>Spend</i>	
<\$100	460325 (76,3%)
\$100-\$499	92230 (15,3%)
\$500-\$999	22347 (3,7%)
\$1000-\$5000	23027 (3,8%)
\$5000-\$10,000	2852 (0,47%)
\$10,000-\$50,000	1649 (0,27%)
\$50,000-\$100,000	95 (0,015%)
>\$100,000	21 (0,003%)

Table A.2.1: Distribution of all advertisements in ranges of (top) impressions and (bottom) spend.

	Democrats	Republicans	<i>z</i>	<i>p</i>
<b>Overall ads</b>				
Average Spend	\$236	\$445	-35.96	<b>&lt;0.001</b>
Average Impressions per Dollar	30	47	-108.33	<b>&lt;0.001</b>
<b>Climate-related ads</b>				
Average Spend	\$161	\$310	-1.23	0.22
Average Impressions per Dollar	25	72	-10.98	<b>&lt;0.001</b>

Table A.2.2: Average spend and average impressions per dollar spent for overall ads ( $n_A=602,546$ ) and climate-related ads ( $n_C=19176$ ) for both Democrats and Republicans. The *z* and *p* values of the two-sample *z*-tests are reported. Boldface indicates statistical significance ( $p<0.05$ ).

**Table A.2.3:** Full list of Democratic and Independent U.S. Congress members in our data set separated by climate and non-climate advertisers.

	Full Name	Page ID	State
<b>Democrats with climate-related ads</b>	Sherrod Brown	6266829799	OH
	Amy Klobuchar	7606381190	MN
	Robert Menendez	6520632191	NJ
	Debbie Stabenow	8408030527	MI
	Jon Tester	6316744206	MT
	Sheldon Whitehouse	10519905140	RI
	Jeff Merkley	496696933682736	OR
	Jeanne Shaheen	6691963292	NH
	Mark R. Warner	181467702005600	VA
	Kirsten E. Gillibrand	6820348410	NY
	Christopher A. Coons	7209432197	DE
	Karen Bass	47918118982	CA
	Michael F. Bennet	57495285387	CO
	Earl Blumenauer	9252726787	OR
	David N. Cicilline	9514417573	RI
	Joe Courtney	6596078916	CT
	Henry Cuellar	248922701788783	TX
	Peter A. DeFazio	7090829369	OR
	Diana DeGette	9068720389	CO
	Theodore E. Deutch	187975486067	FL
	Lloyd Doggett	6433783047	TX
	Michael F. Doyle	174750213023790	PA
	Martin Heinrich	137363449669160	NM
	James A. Himes	7530258205	CT
	Mazie Hirono	13883923426	HI
	Steny H. Hoyer	7845419973	MD
	James R. Langevin	124939484209078	RI
	Rick Larsen	20809300888	WA
	Barbara Lee	176548369099092	CA
	Ben Ray Lujan	13063797831	NM
	Carolyn B. Maloney	7835151610	NY
	Edward J. Markey	303167829786891	MA
	James P. McGovern	7609325759	MA
	Jerrold Nadler	413721418649914	NY
	Nancy Pelosi	1711465445765878	CA
	Ed Perlmutter	7801901317	CO
	Gary C. Peters	6713653788	MI
	Chellie Pingree	7536934917	ME
	David E. Price	8338225975	NC
	Mike Quigley	122732761250977	IL
	Tim Ryan	197908256931216	OH
	Adam B. Schiff	109092142462587	CA
	Kurt Schrader	17146554445	OR
	Charles E. Schumer	828902563856302	NY
	David Scott	159817223047	GA
	Albio Sires	211797415586435	NJ
	Adam Smith	95538659845	WA
	Jackie Speier	99332606976	CA
Continued on Next Page			

**Table A.2.3:** Full list of Democratic and Independent U.S. Congress members in our data set separated by climate and non-climate advertisers.

Full Name	Page ID	State
Paul Tonko	30671144824	NY
Nydia M. Velázquez	110909022379213	NY
Debbie Wasserman Schultz	6444958138	FL
Peter Welch	287477271319818	VT
Ron Wyden	54787697857	OR
Suzanne Bonamici	229108053793264	OR
Suzan K. DelBene	136326264034	WA
Brian Schatz	58080781287	HI
Bill Foster	6196923117	IL
Jared Huffman	344330745672593	CA
Mark Takano	159214207491260	CA
Alan S. Lowenthal	392631677490897	CA
Scott H. Peters	184609361596971	CA
Tammy Duckworth	228132537208218	IL
Elizabeth Warren	38471053686	MA
Angus S. King, Jr.	344010372303511	ME
Ann Kuster	198923770576	NH
Grace Meng	983573491675080	NY
Hakeem S. Jeffries	111824001908	NY
Sean Patrick Maloney	346390085432744	NY
Matt Cartwright	350692761610088	PA
Derek Kilmer	107199049318619	WA
Cory A. Booker	36872302227	NJ
Donald Norcross	591968597559569	NJ
Ted Lieu	167643896656391	CA
Norma J. Torres	324545627570369	CA
Seth Moulton	269499756522301	MA
Debbie Dingell	294879797332635	MI
Margaret Wood Hassan	134535726580904	NH
Catherine Cortez Masto	933921763326425	NV
Tom O'Halleran	1342596452479696	AZ
Ro Khanna	317667194946264	CA
Jimmy Panetta	1667702233477156	CA
Salud O. Carbajal	144410222713433	CA
Lisa Blunt Rochester	1624206881186861	DE
Stephanie N. Murphy	1752716341611327	FL
Val Butler Demings	134498556891640	FL
Charlie Crist	147447783311	FL
Josh Gottheimer	1024984580892392	NJ
Jacky Rosen	462669013928631	NV
Adriano Espaillat	1808068199405179	NY
A. Donald McEachin	299511650083944	VA
Pramila Jayapal	221401431386940	WA
Jimmy Gomez	154054825137425	CA
Joseph D. Morelle	2452029394813890	NY
Greg Stanton	346635392021104	AZ
Josh Harder	1400772006635782	CA
Katie Porter	428821014132730	CA
Mike Levin	388316574835659	CA
Joe Neguse	180252152142614	CO
Jason Crow	280704452367167	CO

Continued on Next Page

**Table A.2.3:** Full list of Democratic and Independent U.S. Congress members in our data set separated by climate and non-climate advertisers.

	Full Name	Page ID	State
	Sean Casten	1934158976830122	IL
	Lauren Underwood	241672016328637	IL
	Sharice Davids	1790258774419239	KS
	Ayanna Pressley	79820371749	MA
	David J. Trone	178602115837123	MD
	Elissa Slotkin	1012679305536045	MI
	Andy Levin	253507715172780	MI
	Haley M. Stevens	648335462024721	MI
	Rashida Tlaib	134597023235240	MI
	Dean Phillips	225507764589310	MN
	Ilhan Omar	780941275347834	MN
	Andy Kim	1413682351987764	NJ
	Tom Malinowski	858210161010020	NJ
	Mikie Sherrill	1156676274461345	NJ
	Susie Lee	868259909915525	NV
	Alexandria Ocasio-Cortez	1316372698453411	NY
	Antonio Delgado	359153387814647	NY
	Chrissy Houlahan	1819973358326612	PA
	Veronica Escobar	261548845154	TX
	Colin Z. Allred	1505244559517282	TX
	Abigail Davis Spanberger	485980975070908	VA
	Jennifer Wexton	191975737491988	VA
	Kim Schrier	1354622541311687	WA
	Mark Kelly	163148530407080	AZ
	John W. Hickenlooper	97493741436	CO
	Sara Jacobs	347844152343949	CA
	Nikema Williams	1957446251204909	GA
	Carolyn Bourdeaux	861706743991799	GA
	Kai Kahele	588113904993568	HI
	Marie Newman	1495042817173727	IL
	Jake Auchincloss	592250887586314	MA
	Cori Bush	1000253160054572	MO
	Teresa Leger Fernandez	301228420816284	NM
	Ritchie Torres	2142236792490640	NY
	Jamaal Bowman	399366360669553	NY
	Mondaire Jones	2382869555319923	NY
	Alex Padilla	471134912978464	CA
	Raphael G. Warnock	109111900634787	GA
	Melanie A. Stansbury	128551641258085	NM
<b>Democrats without climate-related ads</b>			
	Maria Cantwell	9351652533	WA
	Thomas R. Carper	165571920202215	DE
	Robert P. Casey, Jr.	6781166087	PA
	Dianne Feinstein	6314129300	CA
	Richard J. Durbin	6170309302	IL
	Jack Reed	1411485062416786	RI
	Joe Manchin, III	225201434308108	WV
	Tammy Baldwin	7357041101	WI
	Sanford D. Bishop, Jr.	200259660733791	GA
Continued on Next Page			

**Table A.2.3:** Full list of Democratic and Independent U.S. Congress members in our data set separated by climate and non-climate advertisers.

Full Name	Page ID	State
Richard Blumenthal	233344132673	CT
G. K. Butterfield	108864587529774	NC
André Carson	123884330964019	IN
Kathy Castor	1756203764401219	FL
Judy Chu	41228315130	CA
Yvette D. Clarke	208375572621634	NY
Emanuel Cleaver	7954512692	MO
James E. Clyburn	127744320598870	SC
Steve Cohen	6358769182	TN
Gerald E. Connolly	15224565129	VA
Jim Cooper	318714801543186	TN
Jim Costa	704516012940877	CA
Danny K. Davis	109673587226930	IL
Rosa L. DeLauro	6274109770	CT
Anna G. Eshoo	323937814315116	CA
John Garamendi	182567716746	CA
Al Green	224027854297805	TX
Raúl M. Grijalva	7707979947	AZ
Brian Higgins	15087035334	NY
Sheila Jackson Lee	552403241860058	TX
Henry C. "Hank" Johnson, Jr.	115356957005	GA
Marcy Kaptur	173753129419169	OH
William R. Keating	412968318875397	MA
Ron Kind	6396394069	WI
John B. Larson	107556969286867	CT
Patrick J. Leahy	15359195337	VT
Zoe Lofgren	6540213748	CA
Stephen F. Lynch	544559152234818	MA
Doris O. Matsui	6277148057	CA
Betty McCollum	282013615225217	MN
Jerry McNerney	6553468980	CA
Gwen Moore	146490545545796	WI
Christopher Murphy	474444949963480	CT
Patty Murray	131182018871	WA
Grace F. Napolitano	1179140112096711	CA
Richard E. Neal	388547605724	MA
Eleanor Holmes Norton	19575976198	DC
Frank Pallone, Jr.	6517277731	NJ
Bill Pascrell, Jr.	303312929155	NJ
Lucille Roybal-Allard	1702437206742877	CA
C. A. Dutch Ruppersberger	184854668287658	MD
Bobby L. Rush	405814980262805	IL
Gregorio Kilili Camacho Sablan	153423912663	MP
John P. Sarbanes	22429695864	MD
Janice D. Schakowsky	15338600709	IL
Robert C. "Bobby" Scott	106904617757749	VA
Terri Sewell	429681917483068	AL
Brad Sherman	63158229861	CA
Linda T. Sánchez	29921386086	CA
Bennie G. Thompson	1839188776364414	MS
Mike Thompson	112743960260284	CA

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**Table A.2.3:** Full list of Democratic and Independent U.S. Congress members in our data set separated by climate and non-climate advertisers.

Full Name	Page ID	State
Chris Van Hollen	7320486731	MD
Frederica S. Wilson	250056628438648	FL
John A. Yarmuth	18904726924	KY
Dina Titus	301842506513595	NV
Kyrsten Sinema	52563647525	AZ
Ami Bera	528662157146886	CA
Eric Swalwell	281835005264380	CA
Julia Brownley	276544112416355	CA
Tony Cardenas	485493954794945	CA
Raul Ruiz	245244468941114	CA
Juan Vargas	1005557252958353	CA
Lois Frankel	145862215492466	FL
Cheri Bustos	189777861073219	IL
Daniel T. Kildee	175335262547741	MI
Joyce Beatty	329286557095658	OH
Joaquin Castro	219673188073606	TX
Marc A. Veasey	411431975550358	TX
Filemon Vela	392278561514332	TX
Tim Kaine	7656215652	VA
Mark Pocan	436881033058309	WI
Katherine M. Clark	358951317539562	MA
Alma S. Adams	659925804037339	NC
Ruben Gallego	161183970656851	AZ
Mark DeSaulnier	213999292067099	CA
Pete Aguilar	283932788322459	CA
Brenda L. Lawrence	395759603917487	MI
Bonnie Watson Coleman	222190161304871	NJ
Kathleen M. Rice	432815573442336	NY
Brendan F. Boyle	516725565030981	PA
Stacey E. Plaskett	362717827142514	VI
Dwight Evans	895094683900337	PA
Bradley Scott Schneider	401029529980053	IL
Nanette Diaz Barragán	965181706946254	CA
J. Luis Correa	1801742833410767	CA
Al Lawson, Jr.	104784143701	FL
Darren Soto	1798692620212857	FL
Raja Krishnamoorthi	1844412109137727	IL
Anthony Brown	1351415261592848	MD
Jamie Raskin	297987334762	MD
Thomas R. Suozzi	432386793516356	NY
Vicente Gonzalez	206690159663661	TX
Tina Smith	2040270322863853	MN
Conor Lamb	135002490472474	PA
Mary Gay Scanlon	406348549806000	PA
Susan Wild	497741237272262	PA
Ed Case	385494895552183	HI
Steven Horsford	156919911022572	NV
Ann Kirkpatrick	137746666253194	AZ
Jahana Hayes	241247646424302	CT
Lucy McBath	2046092952294722	GA
Michael F. Q. San Nicolas	629062130882339	GU

Continued on Next Page



**Table A.2.3:** Full list of Democratic and Independent U.S. Congress members in our data set separated by climate and non-climate advertisers.

	Full Name	Page ID	State
	Cynthia Axne	306591716448427	IA
	Jesús García	1491458271125644	IL
	Lori Trahan	598408017216304	MA
	Angie Craig	1642386799323957	MN
	Chris Pappas	154510321337994	NH
	Madeleine Dean	143909879708775	PA
	Lizzie Fletcher	374666643098092	TX
	Sylvia R. Garcia	455155254543067	TX
	Elaine G. Luria	180060629247353	VA
	Jared F. Golden	747783932079184	ME
	Kweisi Mfume	110475903727400	MD
	Frank J. Mrvan	644318532586375	IN
	Deborah K. Ross	1508257779494159	NC
	Kathy E. Manning	1341543769290478	NC
	Marilyn Strickland	103987634439727	WA
	Jon Ossoff	1336293769761923	GA
	Troy A. Carter	876319055750124	LA
<b>Independent Politicians</b>			
	Bernard Sanders	124955570892789	VT
	Angus King	344010372303511	ME

**Table A.2.4:** Full list of Republican U.S. Congress members in our data set separated by climate and non-climate advertisers.

	Full Name	Page ID	State
<b>Republicans with climate-related ads</b>			
	Billy Long	225418785297	MO
	Todd Young	405355946226766	IN
	Steve Daines	176789922364429	MT
	Kevin Cramer	251734676525	ND
	Tom Rice	139766499461199	SC
	Jody B. Hice	122571921086301	GA
	Lee M. Zeldin	6817812700	NY
	Jim Banks	119953292796	IN
	Ted Budd	1585291608451100	NC
	Brian K. Fitzpatrick	451835328274640	PA
	Daniel Meuser	265302400637965	PA
	Dan Crenshaw	514167322309353	TX
	Maria Elvira Salazar	666196620070127	FL
	Cliff Bentz	180631442719210	OR
<b>Republicans without climate-related ads</b>			
	John Barrasso	1099779163410386	WY
	Roger F. Wicker	6690879844	MS
Continued on Next Page			

**Table A.2.4:** Full list of Republican U.S. Congress members in our data set separated by climate and non-climate advertisers.

Full Name	Page ID	State
Susan M. Collins	419237048158257	ME
John Cornyn	355316521236121	TX
Lindsey Graham	165987503528599	SC
James M. Inhofe	7686808625	OK
Mitch McConnell	259130650776119	KY
James E. Risch	10148632367	ID
Robert B. Aderholt	110557007154443	AL
Gus M. Bilirakis	284624954962951	FL
Marsha Blackburn	143089732792	TN
Roy Blunt	6541047167	MO
John Boozman	314808986017	AR
Kevin Brady	204845412960834	TX
Mo Brooks	105473048278	AL
Vern Buchanan	105464510836	FL
Larry Bucshon	151186089494	IN
Michael C. Burgess	104898837935556	TX
Richard Burr	1596102157365797	NC
Ken Calvert	9157920604	CA
Shelley Moore Capito	492934580740220	WV
John R. Carter	6766783198	TX
Bill Cassidy	80987211775	LA
Steve Chabot	105908984600679	OH
Tom Cole	239866352781313	OK
Mike Crapo	286049384763373	ID
Eric A. "Rick" Crawford	2429204567121956	AR
Mario Diaz-Balart	9312415125	FL
Jeff Duncan	612876695419919	SC
Charles J. "Chuck" Fleischmann	62808739121	TN
Jeff Fortenberry	102247451379798	NE
Virginia Foxx	116487955096504	NC
Bob Gibbs	191159267565100	OH
Paul A. Gosar	148700451434	AZ
Kay Granger	112767930190251	TX
Chuck Grassley	1626709737546995	IA
Sam Graves	258648987534331	MO
H. Morgan Griffith	109504242401933	VA
Brett Guthrie	21836146886	KY
Andy Harris	113771221981233	MD
Vicky Hartzler	113511682005041	MO
Jaime Herrera Beutler	177551525610164	WA
Bill Huizenga	129208720460165	MI
Bill Johnson	208149456389	OH
Ron Johnson	119707748062556	WI
Jim Jordan	7814597100	OH
Mike Kelly	331707031806	PA
Adam Kinzinger	62009756135	IL
James Lankford	151092200743	OK
Robert E. Latta	208525282490982	OH
Mike Lee	203550842430	UT
Frank D. Lucas	288035911228085	OK
Blaine Luetkemeyer	315324541967534	MO

Continued on Next Page

**Table A.2.4:** Full list of Republican U.S. Congress members in our data set separated by climate and non-climate advertisers.

Full Name	Page ID	State
Kevin McCarthy	159964696102	CA
Michael T. McCaul	6355254859	TX
Tom McClintock	11234736860	CA
Patrick T. McHenry	313842111853	NC
David B. McKinley	224723288732	WV
Cathy McMorris Rodgers	15351475322	WA
Devin Nunes	834645469890446	CA
Steven M. Palazzo	186908658003781	MS
Rand Paul	54172246106	KY
Rob Portman	45243961073	OH
Bill Posey	280117065340803	FL
Tom Reed	153594440504	NY
Harold Rogers	1536243343254565	KY
Mike Rogers	6406874733	AL
Marco Rubio	58736997707	FL
Steve Scalise	745304825534862	LA
David Schweikert	157652584384932	AZ
Austin Scott	131177916946914	GA
Tim Scott	349068689306	SC
Richard C. Shelby	108358104117725	AL
Michael K. Simpson	150114079016438	ID
Adrian Smith	5962789983	NE
Christopher H. Smith	6547233882	NJ
John Thune	63002536261	SD
Patrick J. Toomey	89324781720	PA
Michael R. Turner	286532221381219	OH
Fred Upton	68563629337	MI
Tim Walberg	9268326479	MI
Daniel Webster	188572961157305	FL
Joe Wilson	143654793536	SC
Robert J. Wittman	102734125953	VA
Steve Womack	328347723883364	AR
Don Young	1494279480805358	AK
Mark E. Amodei	104187388110503	NV
Thomas Massie	218721288205051	KY
Tom Cotton	224684514243482	AR
Doug LaMalfa	163202650462603	CA
Rodney Davis	334748476594191	IL
Jackie Walorski	282272406201	IN
Andy Barr	129203152966	KY
Ann Wagner	127216280686110	MO
Richard Hudson	229083393820990	NC
Deb Fischer	109592402468562	NE
Brad R. Wenstrup	99990019454	OH
David P. Joyce	277414242013	OH
Markwayne Mullin	150763151677363	OK
Scott Perry	184104508356643	PA
Ted Cruz	69983322463	TX
Randy K. Weber, Sr.	272083892815201	TX
Roger Williams	45066294038	TX
Chris Stewart	172764672811067	UT

Continued on Next Page

**Table A.2.4:** Full list of Republican U.S. Congress members in our data set separated by climate and non-climate advertisers.

Full Name	Page ID	State
Jason Smith	467804929927622	MO
Gary J. Palmer	238609612987036	AL
J. Hill	1374601146109275	AR
Bruce Westerman	521924961194913	AR
Ken Buck	74184744386	CO
Earl L. "Buddy" Carter	1925027940842417	GA
Barry Loudermilk	123276481201934	GA
Rick W. Allen	1548853772019803	GA
Mike Bost	505874336155964	IL
Garret Graves	662684547112113	LA
John R. Moolenaar	620769971337937	MI
Tom Emmer	163101747070769	MN
David Rouzer	119622908096040	NC
Elise M. Stefanik	345378512258813	NY
John Katko	484300471681895	NY
Brian Babin	683901068308643	TX
Dan Newhouse	309501559175104	WA
Glenn Grothman	773301386014306	WI
Alexander Mooney	671413332977763	WV
Dan Sullivan	698400060189827	AK
Joni Ernst	586751814690068	IA
Thom Tillis	375301089246439	NC
Mike Rounds	370185306396534	SD
Ben Sasse	207425149422656	NE
Trent Kelly	855135964527710	MS
Darin LaHood	1404888666493762	IL
Warren Davidson	1671503326464563	OH
James Comer	1888216188065538	KY
John Kennedy	160513344045084	LA
Andy Biggs	183963015310306	AZ
Matt Gaetz	406456986070332	FL
Neal P. Dunn	230276277419636	FL
Brian J. Mast	471928596287830	FL
A. Drew Ferguson IV	389345604744691	GA
Trey Hollingsworth	178051136001622	IN
Roger Marshall	111324359048459	KS
Clay Higgins	581436541959362	LA
Mike Johnson	449202631932231	LA
Jack Bergman	1714470218843866	MI
Don Bacon	101487585033774	NE
Lloyd Smucker	1626954784219531	PA
David Kustoff	1059320777468378	TN
Jodey C. Arrington	257388981136219	TX
Mike Gallagher	533125513515803	WI
Liz Cheney	548407915183371	WY
Ron Estes	1684674575133005	KS
Ralph Norman	315402818913523	SC
John R. Curtis	836444843136055	UT
Cindy Hyde-Smith	179042532903649	MS
Debbie Lesko	590393634664831	AZ
Michael Cloud	228056857335	TX

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**Table A.2.4:** Full list of Republican U.S. Congress members in our data set separated by climate and non-climate advertisers.

Full Name	Page ID	State
Troy Balderson	522923054735947	OH
Kevin Hern	339509270166412	OK
Michael Waltz	252274592332946	FL
W. Gregory Steube	271736323517059	FL
Russ Fulcher	322194751726887	ID
James R. Baird	307049119928367	IN
Greg Pence	868348663497441	IN
Jim Hagedorn	108252177711618	MN
Pete Stauber	148899492344271	MN
Michael Guest	1446823768756602	MS
Kelly Armstrong	809836039361670	ND
Jefferson Van Drew	143729616392084	NJ
Anthony Gonzalez	474676692900828	OH
John Joyce	1054570378014827	PA
Guy Reschenthaler	1955556614754164	PA
William R. Timmons IV	1064897643682844	SC
Dusty Johnson	2099566776755945	SD
Tim Burchett	107330253280356	TN
John Rose	448838595500528	TN
Mark E. Green	175317909284	TN
Van Taylor	340393855322	TX
Lance Gooden	139151419572310	TX
Chip Roy	193628397865385	TX
Ben Cline	48631937877	VA
Bryan Steil	1504873886306347	WI
Carol D. Miller	2204789813171086	WV
Rick Scott	370872766769375	FL
Mike Braun	164203030438398	IN
Josh Hawley	1636216106590985	MO
Mitt Romney	107512540818740	UT
Fred Keller	2222844871168340	PA
Dan Bishop	708346842676287	NC
Gregory F. Murphy	19437978960	NC
Thomas P. Tiffany	48713703067	WI
Mike Garcia	2116141045107743	CA
Chris Jacobs	1482684292028934	NY
Cynthia M. Lummis	369214063089791	WY
Darrell Issa	19463427992	CA
Pete Sessions	22753043010	TX
David G. Valadao	105596689621089	CA
Tommy Tuberville	2225580284361712	AL
Bill Hagerty	656263988182462	TN
Jerry L. Carl	243856543217942	AL
Barry Moore	168857193154545	AL
Jay Obernolte	221690171353068	CA
Young Kim	118502801658228	CA
Michelle Steel	1228396643984955	CA
Lauren Boebert	107698564046392	CO
Kat Cammack	103806957816376	FL
C. Scott Franklin	106168061412748	FL
Byron Donalds	154269528015922	FL

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**Table A.2.4:** Full list of Republican U.S. Congress members in our data set separated by climate and non-climate advertisers.

Full Name	Page ID	State
Carlos A. Gimenez	105624038154155	FL
Andrew S. Clyde	102530561547150	GA
Marjorie Taylor Greene	1809715209318581	GA
Ashley Hinson	894096170667732	IA
Mariannette Miller-Meeks	1802584223384451	IA
Randy Feenstra	1628922377207463	IA
Mary E. Miller	100733324792130	IL
Victoria Spartz	1295279420598401	IN
Tracey Mann	61198206469	KS
Jake LaTurner	572946842722169	KS
Peter Meijer	451900515399684	MI
Lisa C. McClain	105056767589816	MI
Michelle Fischbach	107037332686173	MN
Matthew M. Rosendale	414088715666968	MT
Madison Cawthorn	100233228182981	NC
Yvette Herrell	103774718121881	NM
Andrew R. Garbarino	114371076772585	NY
Nicole Malliotakis	1533092446942704	NY
Stephanie I. Bice	327202261326682	OK
Nancy Mace	628891490457484	SC
Diana Harshbarger	102728205110465	TN
Pat Fallon	105512331492146	TX
August Pfluger	102682681124239	TX
Ronny Jackson	101724361319410	TX
Troy E. Nehls	1431647400421353	TX
Tony Gonzales	2146201085498440	TX
Beth Van Duyne	1558042497785635	TX
Blake D. Moore	103147688330160	UT
Burgess Owens	305643856459460	UT
Bob Good	115883606515801	VA
Scott Fitzgerald	103935277670393	WI
Claudia Tenney	183020072173458	NY
Julia Letlow	101501768597429	LA
Jake Ellzey	512954815727434	TX

**Table A.2.5:** List of U.S. Congress members that were not included in our data set. Those politicians did not have an active Facebook ad account or have never issued an advertisement according to our study.

Full Name	Party	State
<b>Politicians without a page ID</b>		
Benjamin L. Cardin	Democrat	MD
Scott Desjarlais	Republican	TN
Louie Gohmert	Republican	TX
John Hoeven	Republican	ND
Eddie Bernice Johnson	Democrat	TX
Continued on Next Page		

**Table A.2.5:** List of U.S. Congress members that were not included in our data set. Those politicians did not have an active Facebook ad account or have never issued an advertisement according to our study.

Full Name	Party	State
Doug Lamborn	Republican	CO
Gregory W. Meeks	Democrat	NY
Jerry Moran	Republican	KS
Lisa Murkowski	Republican	AK
Glenn Thompson	Republican	PA
Maxine Waters	Democrat	CA
Donald M. Payne, Jr.	Democrat	NJ
Robin L. Kelly	Democrat	IL
Donald S. Beyer, Jr.	Democrat	VA
Aumua Amata Coleman Radewagen	Republican	AS
John H. Rutherford	Republican	FL
Jenniffer González-Colón	Republican	PR