

Mutual Group Polarization in the Blogosphere: Tracking the Hoax Discourse on Climate Change

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A salient tactic used in online communication about anthropogenic climate change is to accuse the opposite side of being untruthful. This hoax discourse identifies one side as deniers of scientific facts and the other side as manufacturing false alarm. We study the hoax discourse on climate change in the English-speaking blogosphere as a disruptive discursive practice. The study uses automated, qualitative, and quantitative content analysis as well as network analysis to identify the main patterns of the hoax discourse, drawing on a sample of almost 50,000 blog posts related to climate change published online for one year, from May 14, 2016, to May 14, 2017. The study shows that hoax discourses are a salient feature of online debates. They engage both mainstream voices and contrarians in mutual accusations. Accusations of untruthfulness are rarely voiced in a way that identifies concrete lies and liars; instead, they form part of broad attacks designed to vilify the other group. The discourse does not directly address the other side of the debate. It does not constitute a deliberation, but rather serves to affirm one's social group identity and exacerbate mutual group polarization.

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Although climate scientists widely agree that anthropogenic global warming (AGW) poses a serious risk to humankind and nature, there are persistent public debates about the existence of climate change, whether it is anthropogenic and whether it constitutes a problem. The extreme position is expressed in the title of U.S. Senator James Inhofe's (2012) book *The Greatest Hoax: How the Global Warming Conspiracy Threatens Your Future*. Here, we move beyond the mere denial that AGW exists to examine what we call hoax discourses: discursive practices of doubting the other side's truthfulness and calling other people liars and their claims lies. The hoax discourse on climate change comprises both allegations that AGW is a hoax and that contrarians willfully deny the facts; both sides in the debate call each other liars.

We explore the role of hoax discourses in the blogosphere. The study does not aim to determine whether someone is a liar. Given the scientific consensus around the basic facts of AGW, Donald Trump, James Inhofe, and other figures from the contrarian camp are clearly wrong about the facts. Yet it is hard to know whether they deliberately lie or whether their denial of climate change is rooted in deep self-deception. Although we may avoid calling everyone who challenges the reality of climate change a liar, it is appropriate to call them deniers. The negative connotation of this term is justified, as getting the basic facts right is arguably a duty of democratic citizenship, especially for those who hold public office. Nevertheless, labeling a person or group a denier makes it difficult to engage in a dialogue with them. We therefore describe actors who consistently spread doubt about climate change as contrarians, as suggested by O'Neill and Boykoff (2010), and those who follow the scientific view on AGW as mainstreamers.

Hoax discourses as discursive practices deserve the attention of communication scholars because they have a strong impact on public debates. They disrupt the communicative process: If the other side cannot be trusted or their claims are regarded as purposefully false, further communication with them is fruitless. Communication loses what Jürgen Habermas (2006b) calls its "epistemic dimension." If a discourse is characterized by mutual allegations of lying, communication has reached a dead end. Such an outcome is all the more tragic if it hinders progress on a pressing global issue such as climate change. A study of the hoax discourse on climate change is therefore a painful but useful exploration of a polarized political debate on the verge of reaching such a dead end. Its analysis fills a gap in the current research and provides insights into how we got there—in hopes that these observations may inspire ideas about how to get out of there.

The abundant research on climate communication (for an overview, see, e.g., Schäfer, 2015; Schäfer et al., 2016; and the more than 100 contributions in the communications part of the *Oxford Research Encyclopedia on Climate Science*, Nisbet et al., 2017) lacks a systematic study on the blogosphere that maps the structures of the hoax discourse on climate change. One side of the hoax discourse has been studied more closely: the contrarians and their strategic spread of denial of anthropogenic climate change. Researchers have explored denial as a political strategy (Dunlap & McCright, 2015; Hellsten & Vasileiadou, 2015) and in mass media coverage and commentary (Brüggemann & Engesser, 2017; Elsasser & Dunlap, 2013; Feldman, Hart, & Milosevic, 2015; Kaiser & Rhomberg, 2016; Painter & Ashe, 2012; Schmid-Petri, Adam, Schmucki, & Häussler, 2015); most studies have focused on user comments (Collins & Nerlich, 2015; Walter & Brüggemann,

2018) or on Twitter (Cody, Reagan, Mitchell, Dodds, & Danforth, 2015; Jang & Hart, 2015), and only few on blogs (e.g., Elgesem, Steskal, & Diakopoulos, 2015).

We explore the role of the hoax discourse in public communication about climate change using the English-speaking blogosphere as a case study. This is an extreme case: Hoax discourses are likely to be fairly intense because of the polarization of the debate on climate change and the presence of well-organized actors who deny AGW in the English-speaking blogosphere. Although a study of the whole universe of blogs on climate change is not feasible, we explore a diverse and broad sample of almost 50,000 blog posts.

Hoax Discourses as Disruptive Discursive Practices

We define hoax discourses as “communication that entails calling into question the truthfulness of someone else.” This type of criticism can take at least three forms: (1) Willful ignorance: The other is criticized for his or her lack of knowledge of facts that should be well known to those who are interested in the subject. (2) Withholding information: The opponent is criticized for not considering all the facts they know. (3) Lying: The opponent makes a claim they believe to be false with the intention of convincing the target audience that it is true (e.g., Mahon, 2016). Philosophers have criticized and refined this classical definition of lying (e.g., Bok, 1999), but it is sufficient for our purposes.

To assess the role of hoax discourses in public communication, we draw on the distinction among three dimensions of communication (Brüggemann & Wessler, 2014): Communication may be used to deliberate to reach a common understanding through an open exchange of arguments, it may be used strategically to influence other people, and it may be used ritually to construct one’s own and collective identities. Most speech acts are likely to entail all three features, but one dimension may be more relevant in explaining communication than the other two.

Hoax Discourses as Part of Deliberation

Jürgen Habermas (1987, 1989, 2006b) has extensively written about the deliberative dimension of communication and is the founder of this perspective on the public sphere (Wessler, 2018). His theory of communicative action assumes that three preconditions enable communication to arrive at a rational consensus: (1) agreement about truth (i.e., the facts relevant to the question at hand), (2) agreement about the relevant norms, and (3) trust in the truthfulness of the other. If questions about facts and norms arise, speakers can discuss them based on an open exchange of arguments and evidence. Yet discursive practices can seldom overcome doubts about the integrity of an opponent (Habermas, 1987). Habermas (1987, p. 41) notes that trust can only be rebuilt in the long term through the experience of consistent words, evidence and actions, or by resorting to other trusted sources (Habermas, 1984, p. 111). Habermas did not address the role of hoax discourses in the process of deliberation, or what can (or should) be done about them.

Actors and institutions that are trusted to establish the truth and generate a consensus about the relevant facts can help defuse hoax discourses. In her famous essay on truth and politics, Hannah Arendt (1967) stresses the importance of universities and journalism as institutions that can establish “what is” by putting facts into context. Hoax discourses that call science and journalism into question are therefore

particularly damaging to the public sphere, as they target the very institutions that help to navigate reproaches of untruthfulness.

We argue that hoax discourses are disruptive as they exclude certain interlocutors and statements from the field of legitimate deliberation and hamper the integrative role of discourse. From a deliberative perspective on communication, one can also argue that hoax discourses may not only disrupt rational opinion formation but also enhance the integrity of a deliberation if they expose actual liars and lies. Furthermore, a specific reproach that exposes lies by providing evidence is more helpful for deliberation than broad allegations that discredit collectives or institutions. Therefore, although it is disruptive, some hoax discourses might not only be justified but also be a necessary precondition for the functioning of the deliberative public sphere.

***Beyond Deliberation:
The Strategic and Ritual Dimensions of Hoax Discourses***

Habermas does not help us to fully understand the phenomenon of hoax discourses, as they might not only serve as deliberations but also be employed for strategic or ritual purposes. It might be that from the outset, one side of the conversation has no intention of arriving at a common understanding based on a fair exchange of arguments. Instead, they might strategically use hoax discourses to poison the debate: "Suspicion of others' motives destroys the communicative basis—rather than confronting the arguments of one's opponent, his motives are discredited, repudiating his role as a legitimate partner in discussion" (Peters, 2008, p. 60).

Finally, calling other opinions lies and people holding those opinions liars may also serve the purpose of ritual identity construction. Following identity theory, one positions oneself more firmly within a group by agreeing with the group's dominant public opinions and by attributing negative aspects to out-groups (for an overview of the approach, see Tajfel & Turner, 1986; in the context of attitudes toward climate change, see Fielding & Hornsey, 2016). Denying climate change has become part of conservative group identity in the U.S. (Hoffman, 2015). Calling out-groups liars and their beliefs lies is a communicative practice that identity theory would interpret as a way to upgrade one's own group status by comparing it favorably with a presumably inferior out-group. Past research has shown that groups tend to assign negative characteristics to out-groups in abstract ways, while internal criticism tends to be more concretely addressed to individuals (Maass, Salvi, Arcuri, & Semin, 1989). Assigning negative labels to an out-group would be an instrument for strengthening one's own group identity against a (supposedly inferior) other (Moncrieffe & Eyben, 2007). In the hoax discourse, negative labels such as "deniers" or "alarmist" may serve this purpose. The frequent use of these labels would thus indicate that the hoax discourse is being employed for rituals of identity construction.

To sum up the theoretical argument, hoax discourses can be viewed as disruptive practices that may nevertheless enhance deliberation if they expose untruthfulness and/or concrete attempts to distort communication. Yet hoax discourses may also strategically and deliberately undermine deliberation by casting doubts about other actors and institutions. Finally, hoax discourses may be primarily motivated by attempts to construct one's social group identity.

Empirical Research on the Climate Hoax Debate in the Blogosphere

The negative impact of fake news, post-truth, and alternative facts (i.e., lying) on the possibilities for a rational discourse has recently received considerable attention (Allcott & Gentzkow, 2017; Davis, 2017; McIntyre, 2015, 2018). However, our focus—the role of discourse related to accusations of lying—is often overlooked.

Past research has clearly reconstructed the roots of the political denial of AGW. Contrarian voices can be traced back to a political campaign initiated by the coal and oil industry to avoid state regulation targeted at reducing greenhouse gas emissions. The campaign moved from direct lobbying to indirect measures, such as funding think tanks that finance “experts” to deny climate change. It started off as a national campaign in the U.S. and has evolved into a transnational network of climate change denial (Dunlap & McCright, 2015; Hellsten & Vasileiadou, 2015; Oreskes & Conway, 2010). Thus, the hoax discourse was strategically initiated to discredit climate science. Past research has also clearly shown that companies like Exxon deliberately deceived the public: Internal documents clearly acknowledged AGW as a fact, while public advertorials expressed doubt (Supran & Oreskes, 2017).

Content analyses of traditional media, mostly newspapers, have revealed a shift from a (falsely) balanced coverage that contrasts scientific views with contrarian views in a neutral way—thus misrepresenting the state of global climate science (Boykoff & Boykoff, 2004)—toward more interpretive journalism that puts contrarian views into context (Brüggemann & Engesser, 2017). This “weight-of-evidence” reporting (Dunwoody, 2005) still strongly emphasizes the “climate science versus denial” debate. Journalists do not produce this kind of coverage because they are uncertain about the facts, but because this conflict narrative is well established, easy to follow, and newsworthy (Brüggemann & Engesser, 2017). This highlights another reason why journalists (and other communicators) spread hoax discourses: such debates are entertaining and can mobilize audiences.

The discussion surrounding AGW in the blogosphere is particularly aggressive and highly polarized (Elgesem et al., 2015, p. 182ff; Schäfer, 2012, p. 529). Past studies of denial in the blogosphere and social media platforms support the basic assumptions of the “echo chamber” metaphor: Digital networks often evolve among people with similar attitudes toward climate change (Williams, McMurray, Kurz, & Hugo Lambert, 2015). The community of contrarians is smaller, but more closely linked than the mainstream community of bloggers who accept the scientific consensus on AGW (Elgesem et al., 2015). Contrarian blogs focus on criticizing climate science instead of debating the political questions and values associated with AGW (Sharman, 2014). Findings from the climate change debate on social media also show that words like “fraud,” “lie,” and “lies” are more strongly associated with contrarian than with mainstream discourses (Cody et al., 2015; Jang & Hart, 2015). Analyzing English-language blog posts during the United Nations Climate Conference in Paris, Elgesem (2017) finds strong evidence of polarization in the patterns of the linking practices and content of the posts published by contrarian and mainstream bloggers. Bloggers in both groups link predominantly to sources that share their own view, but while most contrarian bloggers concentrate on criticizing the mainstream position, mainstream bloggers pay very little attention to the other side.

Some studies have explored climate change denial and some have focused on debates in the blogosphere, but to our knowledge our study is the first to analyze the hoax discourse. Thus, our first research question is:

RQ1: How salient is the hoax discourse in the English-speaking blogosphere?

The more interesting gaps in past research relate to the types of accusations and whether they evolve around specific lies and liars (indicating their use as part of deliberation), or whether each side simply makes general claims that the other side as a collective is untruthful (indicating their use as a strategy or ritual). Our second research question explores this issue:

RQ2: How are hoax reproaches put forth?

Finally, previous studies have been unable to clearly establish whether both contrarians and mainstreamers employ hoax discourses. Consequently, it is also unclear whether (and how) hoax discourses differ between the two camps. Nor has past research examined who the accusers and accused in the hoax discourse are: Are journalists, scientists, politicians, or private individuals involved in these discourses? If scientists and journalists are the primary targets, this could be seen as strategic attacks on these institutions. We will thus systematically compare both contrarian and mainstream as well as different professional actor types.

RQ3: What role do different actor groups play in the hoax discourse?

Answering these research questions allows us to draw broader conclusions about the deliberative, strategic, or ritual role of hoax discourses in the debate.

Method

Studying the blogosphere raises several challenges related to sampling and handling big data while simultaneously producing an analysis that goes deep enough to answer our research questions. We tackle this task by combining automated, quantitative, and qualitative forms of content analysis. For the automated part, topic modeling will help us sample relevant articles from the vast universe of blog posts. As of the explorative approach, qualitative analysis inductively derives the categories for the subsequent standardized, quantitative analysis.

We searched for blog posts published between May 14, 2016, and May 14, 2017 (encompassing the time frame of the U.S. presidential election campaign and the first 100 days of Donald Trump's presidency), via the API of the company Twingly, which offers paid access to its repository of blog posts. Twingly uses the Wikipedia definition of blogs: "a frequently updated web page with articles published in reverse chronological order." This definition obviously does not uniquely identify blog posts. Twingly therefore uses several additional heuristics to classify blogs. For example, pages published on known blog platforms such as blogpost.com and

wordpress.com are included. Although Twingly’s database does not cover the entire blogosphere, it follows more than 2 million different English-speaking blogs.¹

From this database, we obtained 570,498 blog posts containing at least one of two terms—“climate change” and/or “global warming.” We narrowed the focus to posts that were actively engaged in the discussion of climate change in three steps. First, to find posts that focused on climate change, we selected those that mentioned one of the two terms at least twice. Second, from this set, we selected posts from blogs that had at least two posts that satisfied the first criterion. Including posts from blogs that contributed to the discussion on climate change more than once helped us focus on blogs that reflected a certain level of engagement with the issue. Third, to include blog posts with a certain visibility in the discussion, we selected posts from blogs that had least one in-link from other blogs. We ended up with a set of 48,140 blog posts about climate change.

We next created a subset of posts that contained accusations of untruthfulness in the blogosphere about climate change by searching the full set of posts for words typically used to articulate distrust in truthfulness. We used a set of 17 terms, derived from reading the diverse blog posts to identify accusations of untruthfulness, displayed in Table 1.

Table 1. Terms to Identify Hoax Discourses.

lie	propaganda
liar	myth
lying	conspiracy
lied	warmist
hoax	alarmist
fraud	denial
scam	denier
fake	debunk
swindle	

The terms in the first column point to accusations of lying (willfully misrepresenting the facts), but those in the second column are more ambiguous and partly also may point to accusations of willful ignorance or willfully ignoring known facts. To capture blog posts that were clearly concerned with accusations of untruthfulness, we selected posts that included at least two occurrences of the terms from the list above, resulting in a subset of 7,265 blog posts (Blei, 2012).

In the next step, we used the implementation of the Latent Dirichlet Allocation method in the R package Mallet to undertake a topic modeling of these posts. The output from this method is a model of the corpus in which the probability of the occurrence of each topic in each document is estimated and, for each topic, the probability of each word in the corpus. The user has to provide the number of topics as input to the modeling

¹ <https://developer.twingly.com/resources/sources/>

(Blei, 2012). Experimenting with different numbers of topics, we found that running the algorithm with 25 topics resulted in a model with good interpretability. We identified eight topics that were particularly relevant to the hoax discourse. To qualitatively validate the automated modeling, we manually inspected eight groups of documents, where the documents in each group contained one of the topics with high probability. We selected 400 posts for the quantitative content analysis: For each of the selected topics we picked the posts that contained the topic with a probability higher than 0.3 and chose the 50 blog posts with the highest authority score (i.e., those published by the blogs with the highest number of in-links from all the blogs in Twingly's database).² We had to exclude 74 posts from the initial 400 blog posts as the hoax terms were mentioned without a connection to climate change. The 326 remaining posts comprised $n = 565$ accusations of untruthfulness related to climate change, which are the basis of the quantitative analysis.

We translated our research interest into five major dimensions: (1) accuser, (2) belief of the accuser (contrarian vs. mainstream), (3) accused, (4) type of accusation, and (5) justification of the accusation. For each dimension, the qualitative content analysis (following the approach of Schreier, 2012) identified meaningful categories, definitions, and anchor definitions that served as the basis for the coding book of the subsequent quantitative analysis.

To assess the reliability of the quantitative coding scheme, we carried out a reliability test using 20% of the overall sample size. The coding proved to be reliable based on an intercoder reliability test scoring a Krippendorff's alpha of $\alpha = 0.80$ (min. $\alpha = 0.74$, max. $\alpha = 0.89$; Krippendorff, 2004).

Findings and Discussion

Salience of the Hoax Terms

RQ1 explores the salience of the hoax discourse in the climate change debate. From the full sample of 48,140 blog posts on the climate change debate, a considerable 29% (14,044) of posts contained one or more of the hoax terms listed in Table 1, and 15% (7,265) contained two or more of the terms. Apparently, the hoax discourse plays a considerable role in the debate: roughly every seventh blog post on climate change addresses the issue.

To explore how hoax reproaches are put forth (RQ2), the frequency analysis in Table 2 reports the most frequently cited hoax terms in a subsample of the 294 blog posts that were content analyzed manually and could clearly be classified as contrarian or mainstream posts. The results show that "denial" and "denier" were the most popular among the mainstreamers, whereas the contrarians use "alarmist" and "fraud" most frequently. This reveals a dominant pattern in the debate. Both sides use negative labels: one side cries "denier" and the other "alarmist." Yet both contrarians and mainstreamers use both terms to some extent, suggesting that both sides launch counterarguments against criticism from the other side. Other popular terms shared by both camps are "fake," "hoax," "propaganda," and "conspiracy." All of these terms are well suited to making broad accusations of untruthfulness without specifying who is lying about what. Correspondingly, the terms from our list that explicitly refer to concrete lies and liars are relatively unpopular on both sides.

² See <https://developer.twingly.com/resources/ranking/>

Table 2. Frequency of Hoax Terms in the Blog Posts by Contrarians and Mainstreamers.

Hoax Terms	Mentions	Posts
<i>Contrarian Posts (n = 84)</i>		
alarmist	62	22
fraud	44	22
propaganda	36	10
denier	34	18
fake	24	14
conspiracy	18	8
denial	16	14
myth	13	10
hoax	13	10
debunk	11	6
warmist	9	5
lying	7	6
scam	7	7
liar	6	4
a lie	4	3
lied	1	1
liar	0	0
swindle	0	0
<i>Mainstream Posts (n = 210)</i>		
denial	255	95
denier	208	88
conspiracy	105	43
hoax	89	56
fraud	87	42
propaganda	79	24
fake	70	37
myth	51	30
debunk	45	30
alarmist	27	18
scam	17	12
lying	14	13
liar	8	5
lied	7	6
a lie	5	5
warmist	3	3
swindle	1	1
liar	0	0

Note. Sample: $n = 294$ blog posts that could clearly be classified as contrarian (84) or mainstream (210) posts; 32 posts could not be attributed to either camp.

Types of Accusations in the Hoax Debate

To explore hoax reproaches in more depth, the qualitative analysis inductively identified four types of accusations. The first accusation claims, You are wrong about the facts. The second involves explicitly questioning the truthfulness of a speaker. The third accusation assumes that hidden interests are being pursued, and the fourth emphasizes the threat that the false claims pose to some shared good or value. Below, we explore the role of these four types of accusations in the hoax discourse in more detail.

First, we found that 17.2% of the accusations merely criticized someone for being wrong and did not include explicit accusations of untruthfulness (see Figure 1). In this case, according to Habermas, a discourse backed by arguments may help to sort out the true facts. Yet, given the tone and characteristics of the climate debate in the blogosphere, as we will outline below, this discourse is unlikely to succeed, as the interchange displays little mutual respect and does not represent an open exchange of opinions backed by arguments. Rather, distrust is spread by emphasizing the other side's lack of honesty in a number of (mostly indirect) ways.

The largest group of accusations (58.1%) stated a blameworthy disregard of the relevant scientific facts about climate change. Here, labeling plays an important role. Accusations by mainstreamers typically used the label "denier" in their criticism of those who reject the idea of AGW. One journalist commented,

The chairman of the subcommittee, Representative Andy Biggs (R-AZ), is a climate change denier who has said that he does not believe in climate change, and that the federal government should stop regulating and stomping on our economy and freedoms in the name of a discredited theory.

The journalist calls the politician a "denier" who does "not believe" in climate change. The author of the post does not directly accuse the politician of lying. However, the implicit message is that the politician's rejection of climate change is a blameworthy disregard of the facts. This might very well be an accurate characterization of the politician's view, but the term "denier" implies willful ignorance and ultimately dismisses him from being a serious participant in the debate.

Contrarians often use the label "alarmist" to characterize the scientific mainstream, as this blogger does:

Sometimes climate alarmists brag that they can perfectly describe the past—by using a model and adjusting some parameters. In most cases, this success is nothing else than data-fitting and it must be obvious to any intelligent person that it's data-fitting.

Here, the blogger is likewise not bluntly accusing climate scientists of lying. Rather, the accusation is that they are not reporting their findings in a methodologically appropriate and honest way. The quotation also shows how the term alarmist is loaded with negative connotations: The person "brags" and is supposed to lack intelligence, which precludes them from being serious participants in the debate.

In a substantial share of cases (15.9%), the accuser depicts their opponent's position on climate change as part of a political strategy to harm cherished social goods and values. One blogger warns about a leftist strategy to destroy the energy infrastructure:

Obama is gone but there's no reason to think others whom we'll call "Warmists" will not continue the drum beat, trumpeting "climate change," wanting to herd the sheep into Taxageddon in the form of a "carbon tax" while destroying the energy infrastructure—all the while getting rich (Gore) (and his ilk) and/or expanding their power base (others of Obama's ilk) by exploiting people's fears.

This is also an example of assertions of untruthfulness about the other's motives: Those who say they are concerned about climate change are suspected of having a hidden political agenda or being interested in acquiring research funds. The accusation is not that they are lying, but instead that they are dishonest about their motives for supporting measures to mitigate climate change. Again, like the use of the term "denier" or "alarmist," the term "warmist" labels the accused as untruthful and dismisses them as an equal partner in the discourse. We found that 8.7% of the accusations doubted the motives of others. This also serves as a reproach from mainstreamers directed at the contrarians. According to one journalist:

Those who'd have us do nothing about climate change are motivated by a mixture of free-market ideology, vested interest and a visceral dislike of all things "green."

With this type of accusation, the message is that there is no point in trying to engage the opponent in a rational discussion about climate change, because interests and ideologies dictate their positions.

Different Actors Making Different Accusations

Exploring what role different actor groups play in the hoax discourse (RQ3), we take the professional backgrounds of various actors involved in the debate into account (see Figure 1). The qualitative content analysis identified six relevant actor groups: journalists (persons working for and publishing with news organizations and media outlets), scientists (individuals who are currently employed as researchers at a university or other research facilities), politicians, economic actors (lobbyists and representatives of industries or companies), civil society, and bloggers, narrowly defined as private individuals publishing "a log of personal thoughts and Web links, a mixture of diary forms around what is happening in a person's life, and reports and comments on what is happening on the Web and the world out there" (Lovink, 2008, p. 3).

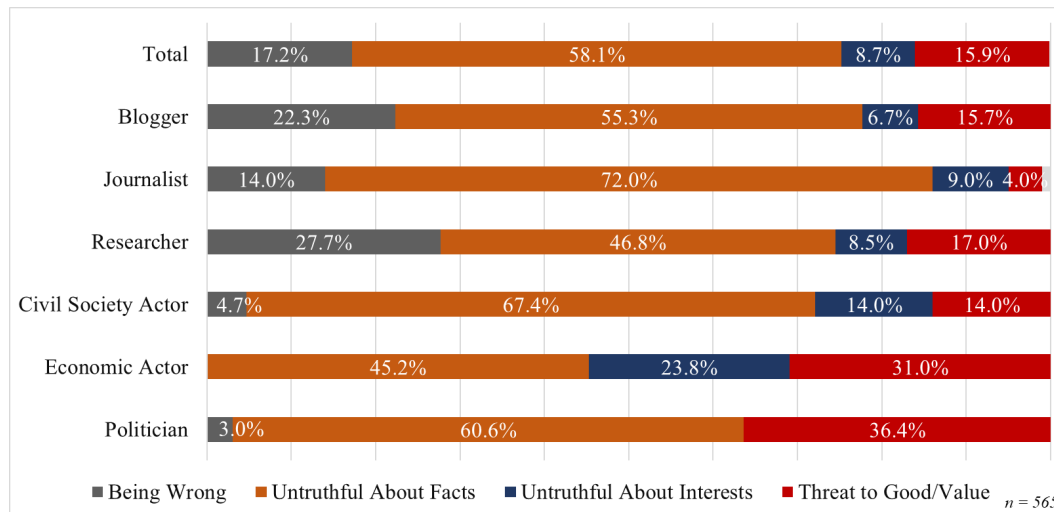


Figure 1. Accuser and type of accusation.
The figure represents n = 565 accusations coded in 326 blog posts.

The quantitative content analysis of 565 accusations revealed that different actors put forward different types of accusations. However, there were no substantial differences between mainstreamers and contrarians. This is why our discussion will focus on the differences between professional types of actors. "Being untruthful about facts" is the most frequent type of accusation across all actor groups (see Figure 1). "Being wrong" is mainly voiced by scientists and bloggers and is used the least by politicians and civil society. It seems that the hoax discourse with allegations of being untruthful and not just wrong is situated in the sphere of advocacy dominated by political actors. This points to the strategic use of the hoax discourse to mobilize for a political cause. Being a "threat to some good or value," not surprisingly, is an accusation lodged by economic actors and politicians. Economic actors also accuse their opponents of "being untruthful about interests." Actors in the advocacy sphere (civil society, politicians, economic actors) are less involved in claims that someone is wrong, and instead tend to accuse someone of not being truthful.

The Use of Arguments by Different Actors

Providing arguments is central to discursive debates. We define arguments as reasons given for or against a matter under discussion. Our data show that actors provide arguments in approximately 60% of all hoax accusations. Scientific arguments are provided most frequently (22.2%), followed by political arguments (17.6%). Again, overall mainstream and contrarian voices did not vary enough to derive substantial conclusions.

Rather surprisingly, journalists provide the least arguments when accusing others in the hoax discourse (in only a third of the cases; see Figure 2), whereas bloggers provide arguments much more often. Journalists generally present evidence to support their claims, but they do not do so when accusing someone of lying in the context of climate change. It may be that they deem it unnecessary to provide reasons. They

address like-minded readers who do not need an explanation as to why saying that climate change does not exist (is not man-made, is not a serious problem) constitutes a denial of the established facts. Another reason might be that journalists refrain from giving arguments because they consider their reporting to be objective facts that do not require further justification.

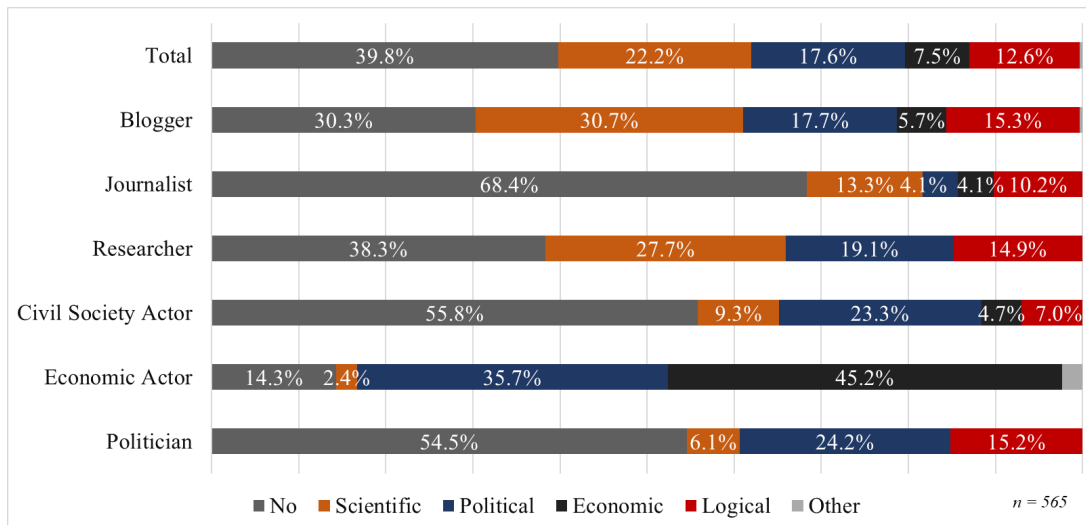


Figure 2. Accuser and type of arguments.
The figure represents n = 565 accusations coded in 326 blog posts.

Scientific arguments related to data or academic studies are brought up in only 22% of the allegations, and bloggers raise the issue most frequently (30.7%). The qualitative analysis provides evidence that scientific authorities are not mentioned or quoted to explain or substantiate scientific facts. Rather, their authority is used to strengthen the author's own point of view. This is happening across both camps in the hoax debate. Science is discussed without seriously engaging with studies or scientists. This is exemplified by the following two quotations, the first from a mainstream perspective, the second voiced by a contrarian blogger:

[Senator] Johnson does not accept the science of climate change. His Senate website states, "Man-made global warming remains unsettled science," despite the fact that 97% of scientists agree that recent warming is very likely due to human activities.

Supporters of human-caused climate change say that 98% of scientists agree that climate change is a danger, or some stupendous number like that. It seems strange to me that climate should be the only area of science in which there is almost complete agreement, when it isn't based on anything other than a model.

Both quotations implicitly refer to a meta-study of academic literature resulting in the determination of a 97% agreement among climate scientists about AGW (Cook et al., 2013). However, the blog posts

neither link to nor quote the study, nor explain how the percentage comes about. The contrarian raises doubts based on his personal logic (how can it be?) and on another (factually false) claim about climate science (based solely on a model) and does not back his claims with scientific evidence.

Political arguments—about political ideology, parties, ideas, and agendas—are relatively evenly distributed among the different actor groups, but are more intensively used by politicians and economic actors (see Figure 2). Economic arguments—related to the function, maintenance, and well-being of the economy—play only a minor role and are put forward almost exclusively by economic actors. One may find this surprising, as political and economic interests are arguably behind much of the skepticism of policies intended to protect the climate, but instead of arguing “I do not want to pay for climate protection,” voices in the blogosphere might prefer to discuss the truthfulness of scientists and the soundness of science. This sowing of doubt about the science has been at the heart of the denial campaign since the 1990s (Oreskes & Conway, 2010).

The quantitative analysis reveals that logical arguments related to the validity of an inference (rather than to the facts as established by research) are also relatively frequent (see Figure 2). The following quotation from a contrarian blogger illustrates how these kinds of arguments are common among contrarians rebutting climate researchers:

Climate alarmists love to talk about the North Pole that has seen more warming but they are silent about the South Pole that has basically seen none in the recent 50 years. Even though some alarmist propagandists must believe that it's “very clever” to hide the existence of one of the poles from the laymen. . . . Everyone with the IQ above 65 can see that the asymmetric references to the two poles mean deception. This deception is self-evidently another alarmists’ own goal.

In this excerpt, it might at first seem that a scientific argument is being brought up to support the claim about the South Pole, yet the result is rather a logical argumentation claiming that “AGW cannot exist if one of the earth’s poles is not responding to climate change like the other.” Science and scientists are thus being attacked by arguments that may look “scientific,” but that are simple rhetorical or logical arguments.

The Role of Different Actor Groups in the Debate

As part of exploring who the actors in the hoax discourse are (RQ 3), we analyze “who is accusing whom.” We use network analysis to better understand and visualize³ patterns of accusations. Figure 3 shows the overall network based on accusations. The node size represents the number of times an actor group is being accused by others in the network (weighted in-degree). The size of the label reflects the number of times an actor group accuses others (weighted out-degree). In addition to the six actor groups mentioned above, we added “collective” when one of the camps (e.g., contrarians [deniers], mainstreamers [alarmists]) is being accused.

³ The software Gephi was used for the network visualization.

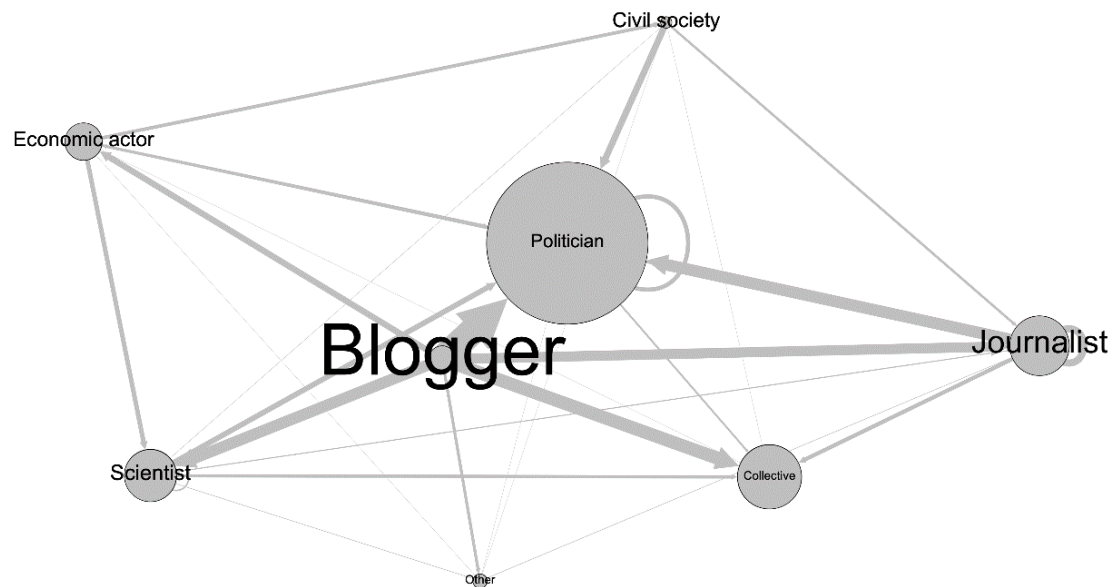


Figure 3. Overall network of accusations in the hoax debate. The network analysis is based on $n = 565$ accusations made in 326 blog posts. The node size reflects the number of times an actor group is being accused (weighted in-degree), whereas the label size reflects how many times an actor group is accusing others (weighted out-degree). The arrow size reflects the number of accusations made by an actor group directed toward another group.

Our results highlight the importance of one core actor group in shaping the overall hoax discourse: private bloggers who have no professional relationship with the topic of climate change. More than half of the accusations in the debate are made by bloggers. Journalists come in second, voicing 20% of the accusations.

The actor groups that are being accused the most are politicians (38.2%), collectives (deniers/alarmists; 15.0%), journalists (14.0%), and researchers (12.2%). Politicians are attacked, denounced, charged, and blamed mainly by bloggers and journalists. Journalists, in turn, are mainly accused by bloggers and other journalists. Scientists are accused by bloggers and economic actors. Bloggers themselves are only accused by other bloggers.

In a next step, we look at the accusations by contrarians (see Figure 4) and mainstreamers (see Figure 5) separately to identify relevant differences.

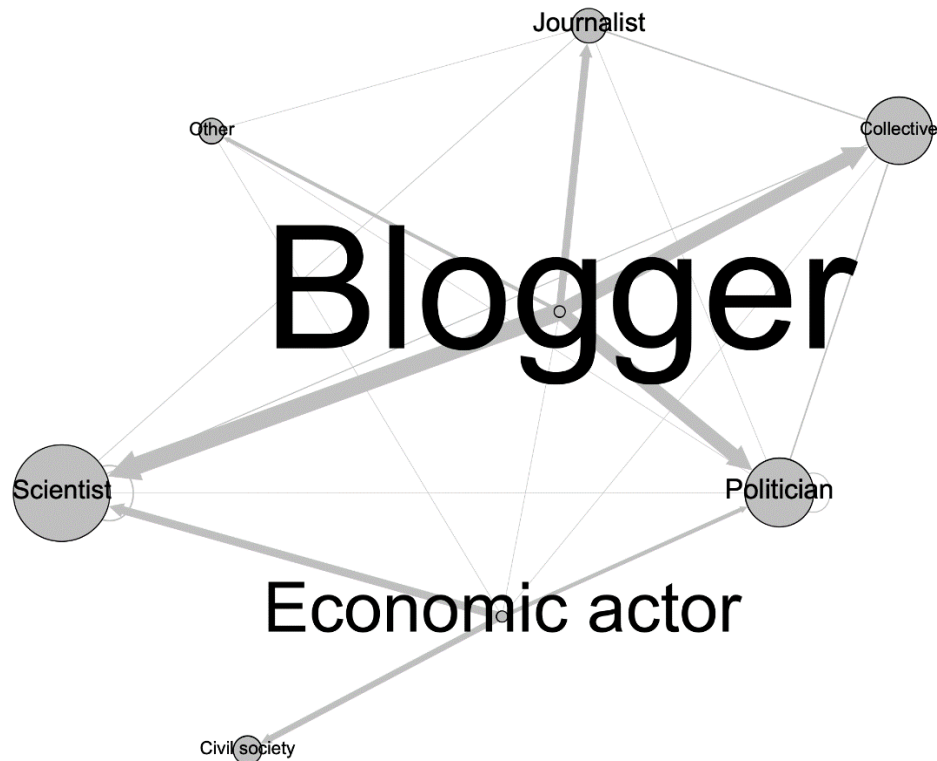


Figure 4. Network of accusations issued by contrarians. The network analysis is based on n = 171 accusations made by contrarians in 326 blog posts.

The network depicted in Figure 4 shows that among the contrarians, it is mostly bloggers (66.7%) and economic actors (22.2%) who accuse others. Accusations directed toward those two groups are nearly absent in the contrarian hoax discourse. Researchers (32.7% of contrarian accusations) receive the most accusations from contrarians, followed by politicians (18.1% of contrarian accusations), and the collective, “the alarmists” (21.5% of contrarian accusations).

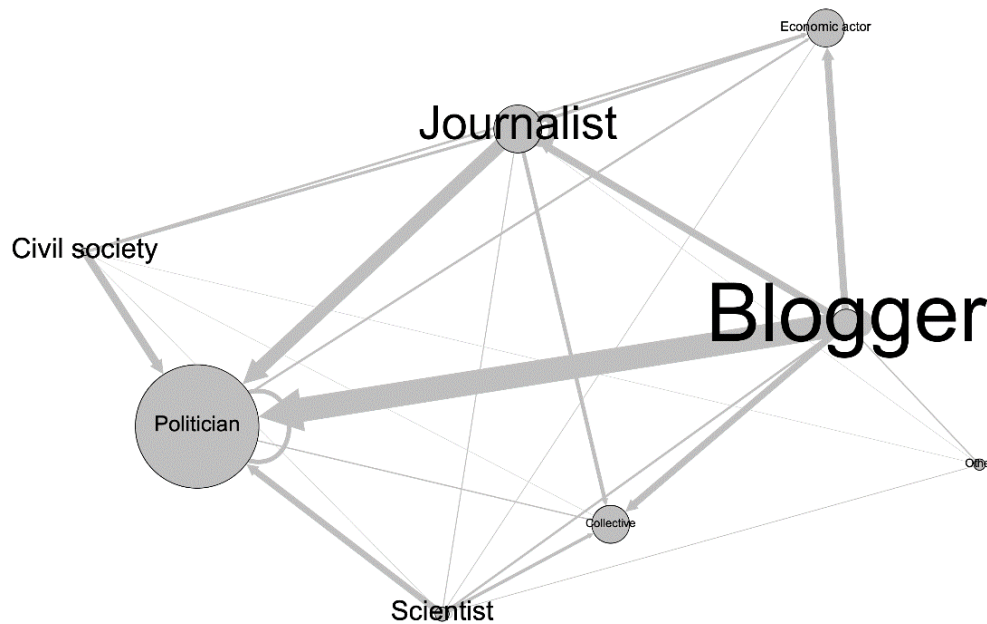


Figure 5. Network of accusations by mainstream speakers. The network analysis is based on $n = 391$ accusations made by mainstreamers in 326 blog posts.

Among the mainstreamers (see Figure 5), it is again bloggers who voice by far the most accusations (47.2% of mainstream accusations), followed by journalists (23.7% of mainstream accusations). Politicians (45.1% of mainstream accusations) and journalists (16.1% of mainstream accusations) are accused most frequently. Accusations of politicians are typically directed toward individuals, as in the following quotation in which a journalist accuses U.S. Republican Senator Jim Inhofe of willfully ignoring the facts:

When Senator Jim Inhofe brought a snowball to the Senate floor to try and prove global warming was a hoax . . . ; he was not expressing sincere “doubt” about climate science. He was just denying it.

Economic actors and deniers (as a collective) both receive 12.2% of the mainstream accusations. Talk about deniers as a group is omnipresent in the mainstream posts, but they are not always explicitly accused of lying.

Conclusions

We can thus answer our research questions as follows. First, we find that hoax discourses are not merely an academic construct, but are indeed a fairly salient pattern of communication in blog posts on climate change (RQ1). We find that specific accusations of lying directed at concrete actors are rare, whereas

broad and indirect allegations of untruthfulness ("hoax") targeting the respective out-group abound in the use of broad negative labels like "alarmist," "warmist," or "denier."

Second, when looking at how hoax reproaches are issued (RQ2), the analysis identified four patterns of allegations that dominate the debate. The first reproach is simply being wrong: This is not necessarily an indicator of a hoax discourse as such, but empirically, it is a frequent claim that comes with broader allegations of lying associated with our search terms. The second type of reproach dealt with untruthfulness about the facts: Both "deniers" and "alarmists" find each other guilty of not providing a fair and balanced treatment of facts. The third type doubts the truthfulness of the motives of the respective actor, suspecting hidden political, economic, or ideological interests. The fourth type of allegation that occurs in the context of hoax discourses warns about some valued good being damaged by either climate protection or a lack thereof.

Regarding the question of which role the different actor groups play in the hoax discourse (RQ3), we find a complex picture. On the one hand, contrarians and mainstreamers are similar. They use negative labels, articulate broad rather than specific allegations, target the other group rather than specific actors, and refrain from providing reasons why someone is a liar or something is a lie. They reproach each other for being wrong, distorting the facts, and pursuing hidden agendas. The actors vary in both camps, yet private bloggers with no professional expertise related to climate change are the main accusers in the hoax discourse. The use and types of arguments differ between, for example, scientists and politicians.

On the other hand, contrarians and mainstreamers differ in their professional backgrounds and who they attack. The group of contrarian accusers is made up of bloggers and economic actors. They target scientists. The biggest groups among mainstream accusers are bloggers and journalists. They mainly target politicians.

Returning to the distinction among the discursive, strategic, and ritual dimensions of communication, we observe little deliberation designed to reach a common understanding through an open exchange of arguments. Instead, the hoax discourse serves strategic or identity purposes—clearly situating oneself among one's own group, potentially with the intention to mobilize peers against an opposing camp.

The discourse is not identifying concrete instances of lies and liars; it does not give reasons why one thinks that one side is too alarmist or denying well-known facts. This, and the pervasive use of negative collective labels for the other side, indicate that the intended audience of the statements in the blog posts is not those criticized, but primarily the accuser's own ingroup. Most accusations of untruthfulness about climate change are phrased in a way that is designed to dismiss the opponent as a legitimate partner in the discussion (Peters, 2008).

Indeed, it seems that Habermas is rightly skeptical about the blogosphere's discursive potential (Habermas 2006a, 2006b). At least when focusing on the issue of accusations of untruthfulness related to

climate change, the English-speaking blogosphere constitutes a less-than-ideal speech situation for clarifying doubts about facts or truthfulness.

The results of the network analysis are particularly worrying, as they show that the contrarian hoax discourse is directed against scientists and thus attacks science. Science, as a trusted institution, could help to find an agreement on what can be considered facts as opposed to mere speculations. Both contrarians and mainstream bloggers also tend to target journalists, who could help to identify liars and lies. If trust in science and journalism is weakened, society's ability to engage in meaningful discourse on the issue is weakened.

Strategic and ritual communication do belong to political communication in a democracy, as they might be helpful in forming political movements and mobilizing audiences. Yet in the case studied here, important institutions like science and journalism are damaged, and the basic principles of communication (assuming the other generally speaks truthfully about facts and adheres to norms that others can agree on after fair deliberation) are constantly being questioned. Thus, we do not appear to be witnessing legitimate and necessary criticism of social elites, but an attack on democracy.

The damaging elements are the broad allegations targeting entire institutions and groups. This is the disruptive quality of the hoax discourse. A potentially constructive element, from the perspective of deliberative theory, would be to identify concrete lies and liars and justify why their statements are deliberately wrong. Journalists, such as those from *The New York Times* and many other news outlets in the U.S. have done just that with regard to Donald Trump's statements (not only concerning climate change). But we found few comparable instances of this deliberative way of identifying hoaxes in our sample from the blogosphere.

Our findings from the hoax discourses may instead be interpreted as a process of mutual group polarization. The term "group polarization" refers to the process of "groups of like-minded people engaged in discussion with one another will typically end up thinking the same thing they thought before—but in a more extreme form" (Sunstein, 2017, p. 68), which is very likely to happen in the echo chambers of the blogosphere and includes disliking the outgroup. Yet we also know from other studies that contrarians and mainstreamers do follow each other's posts (Elgesem, 2017; Elgesem et al., 2015). Polarization research has shown that being confronted with other people's opinions may lead to polarization, particularly among those who already hold strong opinions (Karlsen, Steen-Johnsen, Wollebæk, & Enjolras, 2017; Lodge & Taber, 2013). Reading the kinds of blog posts included in this study is very likely to lead to more polarized views about the other side in the debate. This kind of hoax discourse contributes to both: the internal affirmation of extreme views and the mutual provocation of more extreme views. Although polarization as such is problematic, it is worsened in the case of climate change, as it hampers society's ability to tackle one of the biggest challenges faced by humanity.

Future studies should further explore mutual group polarization and thus connect the analysis of debates about climate change to the problem of a polarizing society. The role of both journalistic and social media in this process, and the interaction between the two, deserves closer attention.

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