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Tim Scharks

Threatening Messages in Climate Change Communication

Tim Scharks

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Reading Committee:

Ann Bostrom, Chair

Alison Cullen

Craig Thomas

Program Authorized to Offer Degree:

Evans School of Public Policy and Governance

University of Washington

Abstract

Threatening Messages in Climate Change Communication

Timothy Evan Scharks

Chair of the Supervisory Committee:
Professor Ann Bostrom
Daniel J. Evans School of Public Policy and Governance

Climate change will have disastrous consequences if left unchecked. Climate change communication represents a means to encourage conservation behavior and support for climate mitigation policies. One oft-discussed but little studied form of communication is to present a threat in an effort to persuade; such threatening messages are often called fear appeals. This dissertation applies a popular model of fear appeals, the Extended Parallel Process Model, to examine threatening messages in climate change communication. The first chapter examines the use of threats and efficacy messages in The *New York Times, The Times* (London), and *The Economist* (UK Edition). It finds about half of all ads contained a mention of a threat, but, different from many other studies of persuasive public communications, threats were frequently paired with efficacy messages. Significant differences between periodicals and between the US and UK are

also found. The second chapter presents an experiment where right-leaning US respondents who viewed climate change fear appeals exhibited *psychological reactance*, a combination of anger and counterarguments in response to a perceived threat to freedom. Reactance served to suppress support for mitigation policy: right-leaning respondents who experienced reactance decreased their support for policy more than those who viewed a control ad and those who did not experience reactance. Reactance also suppressed donation behavior to both liberal and conservative causes. Finally, a third chapter examines the role of psychological distance (how closely climate change is perceived) and collective efficacy (the belief everyone can work together) on mitigation policy support in a climate change fear appeal. The experiment showed evidence that left-leaning respondents increased their policy support with closer psychological distance (an image of an American city vs. a city in the Philippines). Further, right-leaning respondents experienced a "boomerang" effect: ads with a collective efficacy message decreased mitigation policy support among right-leaning respondents. This dissertation has several policy implications: threatening ads have been used in English-language print media, they may serve to polarize audiences further by moving right-leaning readers farther away from mitigation policy support, and the psychologically distant portrayal of climate impacts may also affect support for mitigation policy.

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DEDICATION

Ian and Noa-you have been on Earth for the number of years and half the number of years I've been in grad school.

INTRODUCTION

Climate change, if left unchecked, will have disastrous consequences (IPCC, 2014). A central challenge to mitigating this risk is democratic support for policy solutions limiting greenhouse gas emissions and other causes. These solutions are perceived by some as costing a country its economic competitiveness, disrupting personal consumption choices like those around commuting and housing, and otherwise upsetting the status quo. Climate change communications can inform publics of both the risks presented by climate change and policies that contribute to it, as well as policy options for mitigation. One risk communication strategy is for interested parties, including environmental organizations, to use advertisements in public communication campaigns for attitude and behavior change (Atkin & Rice, 2013). When governments use ads as a policy tool the strategy is called a public information campaign (Weiss & Tschirhart, 1994). Whether created by governments or other organizations, the potential for these ads to influence individual behavior and policy support makes them an important topic of study in public policy.

One theoretically promising approach is for ads to attempt to persuade the public by generating fear of an impending threat. Such threatening communications are called *fear appeals* because they attempt "to influence or persuade through the threat of impending danger or harm" (Maddux & Rogers, 1983:469). While risk communication researchers and professionals agree that emotional (or at least affective) responses play a key role in the communication of risk for decision making, they remain deeply divided over the specific application of fear-inducing messages in climate change communication. Some dismiss the use of fear as entirely counterproductive to motivating engagement and change (Hulme, 2008; O'Neill & Nicholson-Cole, 2009). Others acknowledge the potential for fear appeals to be effective while

simultaneously cautioning their use in climate change communications (Maibach, Roser-Renouf, & Leiserowitz, 2008; Moser, 2007a; Patchen, 2010). Still others embrace the use of fear appeals as an effective lever against ignorance and apathy (Cismaru, Cismaru, Ono, & Nelson, 2011; Meijnders, Midden, & Wilke, 2001; Roeser, 2012).

But to what extent have fear appeals been used in climate change ads? Despite ongoing debates about their use, we don’t really know. Little work has described the landscape of climate change ads even so far as to quantify their nature and frequency. Analyses of environmental advertising in popular magazines have either not identified climate change ads (Easterling, Kenworthy, & Nemzoff, 1996) or found so few to make comparison difficult (Bortree, Ahern, Dou, & Smith, 2012). The literature has assessed specific climate change campaigns (e.g. Cismaru, Cismaru, Ono, & Nelson, 2011), used specific climate change ads to derive and illustrate rhetorical points (Manzo, 2010a, 2010b), mentioned climate change ads in passing while discussing marketing strategies more generally (e.g. Corner & Randall, 2011), or discussed marketing approaches more abstractly, but without reference to extant campaigns (Maibach et al., 2008). Climate change ads have appeared in print media since the 1980s, yet our understanding of even their basic characteristics is limited (Linder, 2006). There has not yet been any systematic, historical review of climate change advertising. The first chapter of this dissertation fills this gap through a content analysis of leading English-language print media. The study applies a leading theory of fear appeals, the Extended Parallel Process Model, or EPPM (Witte, 1992), to systematically review climate change ads and assess the prevalence and attributes of threatening messages as well as other EPPM components.

Chapter 2 examines the oft-mentioned but also untested possibility that climate change fear appeals may generate other reactions than fear, including anger. Anger has been linked to

unintended, counterproductive effects such as denial, derogation, and, perhaps most perversely, a "boomerang" effect in the opposite direction from that intended by the message. Boomerang effects in climate change communication have been observed with increased social distance (Hart & Nisbet, 2011), conditions of high threat and low efficacy (Feinberg & Willer, 2011), and national security frames (Myers, Nisbet, Maibach, & Leiserowitz, 2012). This chapter is principally concerned with examining if and under what conditions a climate change fear appeal might evoke *reactance*--a psychological phenomenon of backlash against a perceived attempt to limit one's freedom, including limiting one's freedom of choice through persuasion (Burgoon, Alvaro, Grandpre, & Voulodakis, 2002). The chapter also concerns itself with the negative effects that reactance may have on climate change beliefs, policy support, and donation behavior.

Finally, can fear appeals be effective in climate change communications? Calls for empirical research on climate change communications include calls for empirical tests of fear appeals (Maibach et al., 2008; O'Neill & Nicholson-Cole, 2009; Visschers et al., 2012), but these have gone mostly unanswered (Meijnders et al., 2001 is a notable exception). Chapter 3 applies the EPPM to climate change fear appeals to examine the role of psychological distance and different types of efficacy messages on policy support. An experimental study assesses the effects of changing the psychological distance of the threat from near to more distant and increasing self- and collective efficacy. These are important factors differentiating climate change threats from personal health threats, where fear appeals have been most often studied. Psychological distance may interfere with threat and efficacy perceptions essential to a fear appeal's success, but increasing collective efficacy may counteract that effect.

Chapter 1. THREATENING MESSAGES IN CLIMATE CHANGE ADVERTISING IN THE ENGLISH-LANGUAGE PRESTIGE PRESS, 1980-2009

Abstract

Research to date on climate change communication in the public sphere has focused largely on print journalism, with recent extensions to broadcast journalism. But paid advertisements, common to most media, have been largely ignored. This research applies a popular model of fear appeals, the Extended Parallel Process Model, to climate-change relevant advertising from the English language prestige press from 1980 to 2009 to estimate the frequency of threats and efficacy messages. Nearly half of climate-change relevant ads in *The New York Times*, *The Times* (London), and *The Economist* (UK Edition) contained messages about the severity of the threat from climate change. The frequency of threat severity messages declined over the study period. In contrast to previous studies of threat and efficacy information in risk communications, efficacy messages were often paired with threats. Response efficacy messages were most frequently matched with threats, but self-efficacy also occurred with threat severity in nearly two-thirds of ads. Examining ads for negative response efficacy—statements that discourage support for or belief in climate change mitigation—reveals a stark trans-Atlantic divide, with US corporations and think tanks playing a significant role in advertising negative response efficacy messages.

1.1 INTRODUCTION

Climate change will have disastrous consequences if allowed to continue (IPCC, 2014). A central challenge to mitigating this risk is creating democratic support for policy solutions limiting greenhouse gas emissions. Such solutions are perceived by some as either personally or socially

costly, potentially costing a country its economic competitiveness, disrupting personal consumption choices like those around commuting, housing, and leisure activities, and otherwise upsetting the status quo. Accordingly, support for climate change mitigation policy has become politically polarized, especially in the United States (McCright & Dunlap, 2011b).

Increasing public support for mitigation technologies and policy is critical for tackling climate change. A primary obstacle to public support has been public understanding of climate change that deviates from the scientific consensus (Reynolds, Bostrom, Read, & Morgan, 2010). Some have hypothesized that the gap between public and scientific understanding is due in part to the way news media covers climate change. Scholars have found journalists' adherence to the norm of balanced reporting has led to misrepresenting the degree to which scientists agree that climate change is anthropogenic and can be mitigated through policy (Antilla, 2005, 2010; Boykoff & Boykoff, 2004), though reporting appears to have shifted by the mid-2000s to be more consistent with the scientific consensus (Boykoff, 2007; Hiles & Hinnant, 2014). Others have focused on how the media gives voice to skeptical pundits and "experts" questioning climate change and attacking climate science (Boykoff & Olson, 2013; Boykoff, 2013; Elsasser & Dunlap, 2012).

A parallel stream of research has focused on whether, how, and to what degree the media's representation of climate change as catastrophic, irreversible, or otherwise frightening affects public support for climate mitigation policies and actions. Much of this research concludes such messaging is inappropriate for generating public support for climate mitigation (Feinberg & Willer, 2011; Hulme, 2008; O'Neill & Nicholson-Cole, 2009). O'Neill and Nicholson-Cole considered the Extended Parallel Process Model (EPPM) of fear appeals (Witte, 1992) to examine qualitative data, finding threatening or scary messages may have unintended consequences and may not be appropriate for climate change communication. Even when researchers acknowledge

the potential for scary or threatening messages to be effective, they express caution about their use in climate change communications (Maibach et al., 2008; Moser, 2007b; Patchen, 2010).

Two studies have more systematically applied EPPM constructs to US network television (Hart & Feldman, 2014) and newspaper coverage (Feldman, Hart, & Milosevic, 2015). A major finding in both was that efficacy information, a critical component of successful threat communication, was lacking or even negative in much news coverage of climate change.

Findings to date indicate the news media's practices and its framing of climate change can affect public support for climate change policies, with such effects being selectively amplified when they reinforce prior beliefs (Hart, Nisbet, & Myers, 2015). The use of threats to motivate people through fear is particularly contentious. Yet none have examined the role of climate-change relevant advertising in the popular press, including the use of threats in those ads. While journalistic coverage of climate change may be bound to norms of objectivity and balance, advertising is not. Corporations, environmental organizations, and governments all use advertising in attempts to inform and persuade the public on what products to consume, behaviors to adopt, and policies to support.

Little work has described the landscape of climate change ads even so far as to quantify their nature and frequency. Previous analyses of environmental advertising in popular magazines have either not identified climate change ads (Easterling et al., 1996) or found so few as to make comparison difficult (Bortree et al., 2012). The literature has assessed specific climate change campaigns (e.g. Cismaru, Cismaru, Ono, & Nelson, 2011), used specific climate change ads to derive and illustrate rhetorical points (Manzo, 2010a, 2010b), mentioned climate change ads in passing while discussing marketing strategies more generally (e.g. Corner & Randall, 2011), or discussed marketing approaches more abstractly still without reference to extant campaigns

(Maibach et al., 2008). Climate change ads have appeared in print media since the 1980s, yet our understanding of even their basic characteristics is limited (Linder, 2006).

This paper addresses that gap by classifying and analyzing climate change print advertisements in the English-language prestige press from 1980-2009. This paper's primary research question is to examine the extent to which threatening messages have been used in climate change advertisements and whether threats have been consistently paired with efficacy information. Databases indexing all print ads in *The New York Times*, *The Times* (London), and the UK edition of *The Economist* magazine allow for this study to inventory climate-change-relevant print advertisements across the Atlantic in the "papers of record" from the print era to the Internet era. This paper applies the EPPM in a content analysis of climate change advertisements to gain insights into a previously unexamined aspect of the media environment that affects public views of climate science and mitigation policy.

1.1.1 *The Extended Parallel Process Model and Climate Change Advertising*

The EPPM is a leading model of "fear appeals," messages intended to motivate attitude or behavior change through the presentation of a threat. The EPPM explains the conditions under which fear appeals succeed and fail (Maloney, Lapinski, & Witte, 2011; Popova, 2012; Tannenbaum et al., 2015; Witte, 1992). On encountering a threatening message, the EPPM hypothesizes people experience threat, composed of severity (i.e., the degree of harm) and susceptibility (the extent to which one is personally at risk from the threat). Messages may also contain efficacy information. Efficacy is composed of *response efficacy*, "beliefs about the effectiveness of the recommended response in deterring the threat," and *self-efficacy*, "beliefs about one's ability to perform the recommended response to avert the threat." (Witte, Cameron, Keon, & Berkowitz, 1996, p. 320). The EPPM posits that two reactions to fear are possible: danger control, in which the subject acts

to mitigate the threat, or fear control, in which the subject denies the threat or otherwise engages in thoughts or actions not intended by the message. One of the most consistent findings of fear appeals research is that threats are more effective when matched with strong efficacy messages (Floyd, Prentice-Dunn, & Rogers, 2000; Milne, Sheeran, & Orbell, 2000; Peters, Ruiter, & Kok, 2013; Tannenbaum et al., 2015; Witte & Allen, 2000).

Studies applying the EPPM to a variety of communications including climate change journalism have generally found more threats than efficacy messages, especially self-efficacy. A wide range of studies examining the frequency of EPPM constructs in public health communications (Cohen, Shumate, & Gold, 2007; Goodall, Sabo, Cline, & Egbert, 2012; Gordon, 2003; Kline & Mattson, 2000; Krieger et al., 2013; Lavack, 1999; Ryan, Hocke, & Hilyard, 2012; Shi & Hazen, 2012; Turner, Boudewyns, Kirby-Straker, & Telfer, 2013) and workplace safety messages (Basil, Basil, Deshpande, & Lavack, 2013) identified, coded, and counted individual statements containing EPPM elements. In every case, the number of threat messages was greater than the number of efficacy messages. Similarly but in an environmental domain, a study of wildlife management pamphlets on bovine tuberculosis again finds that threats outweigh efficacy messages (Muter, Gore, Riley, & Lapinski, 2013). Even closer to the present study, climate change news coverage has also been more consistent in describing threats while inconsistent in providing efficacy information (Feldman et al., 2015; Hart & Feldman, 2014). Exceptions do exist, such as with sales messaging by an HPV vaccine manufacturer where efficacy messages were 2.5 times more common than threat messages (Ngondo, 2009). And in a tragic contrast, websites supporting and encouraging people with eating disorders *to continue their disorder* were more likely to have response efficacy messages than any other EPPM component (Lapinski, 2006).

EPPM Constructs and Climate Change. Applying the EPPM to climate change communication presents a challenge insofar as many solutions require indirect action or collective action such as democratic support for mitigation policy (IPCC, 2014). That is, people may believe they are capable of taking action, self-efficacy in the EPPM, but still not believe their individual actions will be effective in combating climate change.

Different authors have dealt with this challenge in different ways. Hart, Feldman and Milosevic (2015) address it by applying the political science concepts of *internal efficacy*, personal beliefs about one's ability to take political action, and *external efficacy*, one's belief that politicians are responsive to their constituents. Others (e.g. Thaker, 2012) have used the more broadly defined concept of *collective efficacy,* the belief that a community can work together to solve a problem (Bandura, 2000).

Self-efficacy and internal efficacy are similar constructs, but EPPM as previously applied does not consider anything quite like external efficacy. External efficacy is a fairly narrow construct limited to beliefs in the effectiveness of politicians and the political system. While climate mitigation may be framed as a political choice, it might also be seen as a matter of collective efficacy. Collective efficacy has been associated with general civic engagement (Kim, 2015) and specific to capacity for climate change adaptation (Thaker, 2012). Collective efficacy has also been previously incorporated into the EPPM (Smith, Ferrara, & Witte, 2007). This research considers collective efficacy in climate change ads because it is more broadly applicable to a variety of climate change mitigation pathways. Policies require public support, but many proposed solutions also require coordination of individual actions to directly combat the effects of climate change, for example purchasing solar panels or decreasing meat consumption.

Considering the EPPM construct of threat susceptibility with respect to climate change is also different from most previous applications of the EPPM. Threat susceptibility is usually considered as the degree to which a threat is personally relevant, but climate change communication may present threats to distant people animals (e.g. polar bears), or even future generations. Messages depicting susceptibility to a threat are necessary to influence intentions and behaviors (Tannenbaum et al., 2015), presenting a challenge to climate change communications.

Hart & Feldman (2014) and Feldman, Hart & Milosevic (2015) found evaluating severity difficult so instead coded information on how close in time and space the impacts of climate change were to the audience; this paper takes a similar approach.

1.1.2 *Research Questions and Hypotheses*

Already mentioned in the introduction, this paper's overarching question is formalized as the following research question:

RQ1: Are fear appeals used in climate change ads, how common are they, and what are trends over time in their use? Specifically, what is the relative frequency of threat messages (severity and susceptibility) and efficacy messages (self-efficacy, response efficacy, and collective efficacy) in climate change ads?

This question has a related hypothesis generated from the major finding of most previous EPPM-based content analyses of risk communications, including EPPM-based analyses of climate change news reports:

H1: Climate change ads will feature threats more often than efficacy messages.

While confirmatory of much previous research on risk communications if supported, this hypothesis is not trivial in its implications. One criticism of the EPPM is that it does not account for pre-existing emotions, beliefs or knowledge about a threat or its solutions (Popova, 2012). A

message meant to be moderate in its level of threat could generate a high-fear reaction because of previous beliefs. For example a message about radiation exposure might generate great fear in someone already concerned about it. Conversely, subjects may encounter an ad with few efficacy messages and still perceive high efficacy because of prior knowledge about mitigating the hazard. For relatively well-known health topics, the latter circumstance may not be a serious flaw in the design of a fear appeal. In other words, a reminder about the dangers of tooth decay to someone who knows about brushing and flossing may not need great emphasis on efficacy. In the case of fear appeals for threats from climate change, the omission of efficacy information may be a more serious flaw, as recent surveys of the American public reveal a poor understanding of effective actions to mitigate climate change (Reynolds et al., 2010).

RQ2: What groups sponsor climate-change relevant ads (e.g. corporations, NGOs, industry association/front groups, or governments) and how have they changed over time?

The sponsor of an ad has been found to influence the likelihood of using a threatening message (Gordon, 2003; Lavack, 1999). For example, in environmental ads in National Geographic, corporate sponsors used gain frames (emphasizing the advantages of adopting the recommended behaviors) nine times more often than loss frames (emphasizing the disadvantages of noncompliance, including fear appeals), in contrast to associations, front groups, and environmental advocacy organizations, which used gain and loss frames about equally (Bortree et al., 2012). Accordingly, we develop the following hypothesis:

H2: Corporate-sponsored advertisements will use threatening messages less often than other sponsors.

Research on the British and US print media has focused on themes and trends in journalistic coverage in both writing and imagery. Relatively few international comparisons have been made

between the UK and US, but those have generally portrayed US journalism as more contesting of science than in the UK, as described below. Given that journalism may be considered a "mirror" of society (Boykoff & Yulsman, 2013), as may be advertising (Ahern, Bortree, & Smith, 2013), this research anticipates the US advertising space to be more contested than that of the UK given the more politicized and polarized nature of climate change coverage in the US (Boykoff, 2007; Feldman et al., 2015; Jang & Hart, 2015; McCright & Dunlap, 2011b). To investigate these trends and comparisons the research question is expressed as:

RQ3: What is the incidence of climate change ads in prestigious print media over the study period and what are the trends in their incidence?

While reporting on scientific predictions of sea level rise from 1989 to 2009 was largely consistent with scientific consensus and was especially tied to the release of IPCC reports (Rick, Boykoff, & Pielke Jr, 2011), other journalistic coverage in the US did not mirror scientific consensus of the anthropogenic causes of climate change. Instead, the journalistic norm of balanced reporting resulted in articles that often gave equal weight to a minority of skeptics, a phenomenon termed "balance as bias" (Antilla, 2005; Boykoff & Boykoff, 2004). US reporting improved in the mid-2000s by increasing acknowledgement of anthropogenic causes, though still adopting a misleadingly "balanced" approach. Contrastingly, UK coverage became largely consistent with scientific consensus (Boykoff, 2007). Despite this, contrarian or denialist voices remained influential in both US and UK newspapers, creating false debates and threatening public acceptance of potential policy solutions (Boykoff, 2013; Elsasser & Dunlap, 2012).

The above and other important long-term trends in climate change coverage may also be reflected in climate change advertising. Newspaper coverage in the US and UK focused on climate change risks and consequences in the early (1980s) coverage of climate change (Carvalho &

Burgess, 2005; McComas & Shanahan, 1999), and focus shifted to scientific controversy in 1990 during a "maintenance" stage of the news cycle before attention waned in the early 1990s. The late 1990s and early 2000s were marked by a new appreciation for possible links of climate change to extreme weather events in the UK press (Carvalho & Burgess, 2005).

None of these just-mentioned studies focused on fear or fear appeals, but it will be useful to compare trends in ads to trends in journalistic coverage. We expect advertising in US and UK newspapers to mirror trends over time in quantity of journalistic coverage. Furthermore, we expect US newspapers to show more disagreement than the UK press, with more ads in the US questioning climate science or the urgency of climate policy. These expectations are expressed as two hypotheses:

H3a: The incidence of climate change ads in newspapers will exhibit trends similar to newspaper coverage of climate change.

H3b: The New York Times will have a larger proportion of ads questioning climate science or questioning the urgency of mitigation than The Times and The Economist.

1.2 Methods

The study sampling frame is the full-text-searchable PDF ad libraries of *The New York Times*, *The Economist* (UK edition), and *The Times*. The text of print ads from *The New York Times* is searchable through ProQuest and *The Economist* and *The Times* ads are text-searchable via Gale NewsVault. All three are indexed from the first appearance of a climate-change relevant ad in April 1980 through the end of 2009. These texts are selected as leading examples of a) elite American and British broadsheet newspapers with high circulation numbers and wide influence; and b) the British edition of a globally recognized weekly news magazine focused on business and international affairs. At the end of the study period, *The Times*' daily average print circulation was

617,483 (January 2009). *The New York Times*' daily print circulation was 928,000 weekdays. *The Economist*'*s* United Kingdom edition from which ads were selected had an average circulation of 189,201 in 2009. The time series spans three decades, from when climate change first started making news in the mid-1980s alongside concerns over stratospheric ozone depletion, to the 1992 UN Earth Summit in Rio de Janeiro, through adoption of the Kyoto Protocol in 1997, and ending around the time of the UN Climate Change Conference in Copenhagen in December 2009.

Previous studies of climate change news coverage usually consider content from only a few newspapers selected on the basis of national prominence and influence in the news cycle, some justifying that newspapers were selected to reflect a diversity of editorial positions or because they represented "relatively small but well-educated and influential readerships" (Carvalho & Burgess, 2005). In a similar approach, this study examines ads from the English-language prestige press, the papers of record from the leading English-language countries on either side of the Atlantic. Table 1 presents a summary of the sources used in several studies and the search terms for each.

Climate-change relevant advertisements were identified through the search terms "climate change," "global warming," "greenhouse effect," "greenhouse gas" or "greenhouse gases", similar to previous studies of journalistic coverage of climate change (Table 1: Antilla, 2005; Boykoff & Boykoff, 2004, 2007; Carvalho & Burgess, 2005; Feldman et al., 2015; Hart & Feldman, 2014; Smith & Joffe, 2009). 1,638 advertisements were identified with search terms and downloaded and screened. Ads were considered climate change-relevant and retained if they featured at least one complete sentence on the topic of the identified phrase. For example, ads mentioning climate change in a list of topics taught in a university program were considered tangential and excluded. Accidental hits (e.g., real estate ads with the phrase "…and greenhouse. Gas fireplace…") and job announcements were also excluded. Special advertising sections from *The Economist* that ran

longer than two pages were also excluded. A total of 313 ads were screened out, leaving 1323 climate-change-relevant advertisements. 461 ads were marked as duplicates that appeared twice or more; duplicates were included in the final sample of counts.

A database of the 866 unique ads was created and shared between three coders. Coders trained on a small sample of ads to learn the coding instructions and review differences in coding, then worked independently to code all ads. In addition to their own portion of ads, coders were all assigned to a 20% of ads in common so that inter-coder reliability could be calculated. Coding instructions are presented in Appendix 1A.

Table 1.1. Newspapers and search terms used in selected studies of climate change newspaper coverage.

Newspaper	Rick, Boykoff & Pielke Jr., 2011	Boykoff, 2007	Carvalho & Burgess, 2005	Boykoff & Boykoff, 2004	McComas & Shanahan, 1999
US:					
Los Angeles Times	X	X		X	
New York Times	X	X		X	X
USA Today		X			
Wall Street Journal		X		X	
Washington Post	X	X		X	X
UK:					
Financial Times	X	X			
Guardian	X	X	X		
Independent		X	X		
The Times (London)	X	X	X		
Daily Telegraph	X	X			
Search terms:					
"climate change"		X	X	X	X
"global warming"		X	X		X
"greenhouse"					X
"greenhouse effect"			X		
"sea" AND "level" AND "rise"	X				

1.2.1 *Measures*

To answer the research questions and evaluate the study hypotheses, measures are based primarily on EPPM constructs. Others are based on coding schema developed by Hart & Feldman (2014) and Feldman, Hart, & Milosevic (2015) for comparison. Those authors coded at the level of entire articles or newscasts for whether or not a measure was mentioned. Similarly, in this study the unit of analysis is the entire advertisement.

Centrality. Ads were coded for the degree to which climate change or its mitigation were the focus of the advertisement. This measure allowed for the consideration of ads that were mostly about climate change independent of those that only mentioned it briefly. The scale ranged from 1 (“Mostly-Main topic”) to 3 (“Not very much-Very minor point”).

Cause of Climate Change. Coders assessed whether each ad appeared to accept the scientific consensus that human activity is responsible climate change. The coding was binary between “anthropogenic” and “dismissive/doubtful” with the additional option of coding “don’t know/can’t tell”. The relative frequency of “dismissive/doubtful” ads is used to test H3b.

Purpose. Categories were generated inductively after reviewing the population of ads. Each ad was coded for up to two purposes: 1) purchase featured product or service; 2) encourage political action or advocacy; 3) encourage conservation behavior; 4) inform reader of business or technologic innovation; 5) encourage business or technologic innovation; and 6) support inaction or the status quo, including denial. This measure describes the previously undocumented landscape of climate change advertising to answer RQ2 and test H2.

Impacts and Actions. Ads were coded with binary measures for whether any *impact* of climate change was present and whether any mitigative or adaptive *action* was presented. Mentions

of climate impacts represent threatening information and mentions of actions represent efficacy information. Both measures are considered in answering RQ1 and H1.

Threat information. To evaluate RQ1 and H1, the EPPM constructs of *threat severity* and *threat susceptibility* were coded using the text of each ad on a scale ranging from 0 (“not at all”) to 3 (“very severe”/”very much”). Images were also coded separately on scales of threatening/not threatening or “can’t tell/irrelevant” as well as for general positive or negative affect. Hart & Feldman (2014) found evaluating severity difficult so instead coded information on how close in time and space the impacts of climate change were to the audience. Similarly, this paper considers the geographic scale of any described climate impacts, from domestic (US or UK, depending on periodical), the wider developed world, the economically developing world, or the entire world.

Efficacy information. Also to answer RQ1 and H1, text was evaluated for presence of the EPPM constructs of *self-efficacy* and *response efficacy,* and then coded on a 0 (“not at all”) to 3 (“very much”) scale. *Collective efficacy* was also coded on the same scale (Table 1.2 presents definitions and examples of each measure). Following Hart, Feldman, and Milosevic (2014, 2015), each form of efficacy was also coded in the negative sense, so statements indicating that it was difficult for everyone to work together would be coded as *negative collective efficacy* and statements that proposed solutions wouldn’t work would be coded as *negative response efficacy*. Since ads might contain both negative and positive information, each efficacy construct was coded independently for positive and negative values for a total of six efficacy measures. Negative response efficacy is also used to evaluate H3b.

Table 1.2. Definitions and examples of EPPM and related measures.

Concept	*Definition*	*Examples*
Positive Self Efficacy	Language indicating individual action is possible, easy, simple… Including language indicating corporate action is possible, easy, or simple. Not including green branding statements where a corporation touts its own action.	"Want to do something about it? Good, we need people like you." "So you're also helping to address climate change by reducing the levels of harmful greenhouse gases your home produces." "you can help prevent climate change" Christian Aid, Times, 2/19/07 "the average person wields incredible power when it comes to conserving energy" Chevron, Economist, 3/18/06
Positive Collective Efficacy	Language indicating everyone working together to counter climate change is possible/achievable, at any scale including governments working together.	"To prevent global warming, we must not only make concerted efforts to fulfill the commitments….Japan, in collaboration with other countries around the world, is determined to make every effort to overcome the problem of global warming." Government of Japan, Times, 3/26/98
Positive Response Efficacy	Language indicating the action/technology/corporation is effective in countering climate change.	"Thanks to combined heat and power technology, [brand] has cut CO2 emissions by 5 million tonnes a year." Veolia, Times, 10/16/07 "50% of profits from [brand] will be donated to worldwide projects that tackle climate change." Barclay, Times, 7/5/07
Negative Self Efficacy	Language indicating individual action is difficult/costly/insufficient.	"Where I live...the open space of democracy appears to be closing." Orion Magazine, NYT, 9/2/04
Negative Collective Efficacy	Language indicating cooperation is difficult/costly, including criticism of international agreements.	"Without full participation by developing countries, the Kyoto Protocol will not lead to a net reduction of global...emissions" Mobil, NYT, 9/10/98
Negative Response Efficacy	Language indicating proposed solutions are costly/difficult.	"Neither route is free of policy problems or cost implications." British Gas, Times, 10/4/90 "...continuing uncertainty around the cost and effectiveness of emerging technologies" Shell, Economist, 12/12/09

1.2.2 *Reliability*

Inter-rater reliability was calculated for each measure using Krippendorff's α (Krippendorff, 1989, 2004) and presented in **Table 1.3** (Pairwise inter-rater reliabilities are presented in Appendix 1B). Krippendorff (2004) recommends an α threshold of no lower than 0.667 for tentative conclusions,

a condition met by measures of centrality, threat severity, positive self-efficacy, and negative response efficacy. Given the preliminary nature of this study, it includes positive response efficacy despite its α of 0.62; results based on that measure should therefore be interpreted with caution and in need of replication. Coding for personal susceptibility, negative self-efficacy, and both positive and negative collective efficacy was not reliable and limits the evaluation of some hypotheses.

Since more than one purpose could be selected for an ad, a binary variable was created for each purpose and inter-rater reliability was calculated independently for each. The purposes of making a purchase, political action, and informing of business/tech innovation had acceptable reliability.

Of the remaining measures, only the binary code for the presence of mitigative or adaptive actions had acceptable reliability (Table 1.3).

Examining the data for explanations of low reliability considered whether some coding categories might be less reliable than others following Krippendorff (2004). To this end, reliabilities were calculated for only those ads rated with climate change as "Mostly" or "Somewhat" central to the ad, since ads with climate change less central may have been more difficult to code. This improved reliability for positive self-efficacy, negative response efficacy, and negative collective efficacy but reliability declined for positive response efficacy. Since positive response efficacy was already low, no changes were made in the selection of data.

Table 1.3. Reliability of coded measures (Krippendorff's α)

Ordinal Variables		Nominal Variables	
Centrality*	0.71	Cause of climate change	0.34
Threat Severity*	0.71	Scale of impacts	0.30
Susceptibility	0.44	Impacts mentioned	0.55
Positive Self-Efficacy*	0.68	Mitigative or adaptive actions mentioned*	0.66
Positive Response Efficacy*	0.62	Threatening images	0.47
Positive Collective Efficacy	0.47	Image affect (positive/negative)	0.55
Negative Self-Efficacy	0.21		
Negative Response Efficacy*	0.67	Purpose of ad:	
Negative Collective Efficacy	0.54	Purchase product or service	0.64
		Encourage political action or advocacy*	0.73
		Encourage conservation behavior	0.59
		Inform of business/tech innovation	0.63
		Encourage business/tech innovation	0.57
		Inaction/support status quo/denial	0.53
		Don't know/can't tell	-0.01

*Reliabilities considered acceptable in this study.
Pairwise inter-rater reliabilities are presented in Appendix 1B.

1.3 RESULTS

RQ1: Are fear appeals used in climate change ads, how common are they, and what are trends over time in their use? Specifically, what is the relative frequency of threat messages and efficacy messages (self-efficacy, response efficacy, and collective efficacy) in climate change ads?

The first research question of this study expands on the knowledge of climate change communications in the media ecosystem, as little is known about use of threat and efficacy information in climate-change relevant advertising. To answer this research question, the presence of a fear appeal is assessed using the threat severity measure. Positive self-efficacy and both positive and negative response efficacy measures are considered too. Measures of threat

susceptibility, collective efficacy, and negative self-efficacy were not reliable enough to be evaluated. Results are summarized in Table 1.4 and discussed in that order.

Threats and Efficacy. Slightly less than half of all ads (48.8%, 646 of 1,323) had a message that communicated the severity of climate change was at least "a little severe". In contrast, more than half of all ads (58.4%, 772 of 1,323) included text that communicated the reader's self-efficacy, and a large majority (76.5%, 1,012 of 1,323) included a response efficacy message.

The EPPM emphasizes the importance of pairing threats with efficacy messages. Table 1.4, Panel B presents the percentage of threatening ads that contained different types of efficacy message. Of the 646 ads that contained a threat severity message, 63.9% (413 of 646) included a self-efficacy message and 86.1% (556 of 646) included a response efficacy message. 368 of 646 threatening ads (57.0%) included both self-efficacy and response efficacy.

These results leave the first hypothesis, H1: Climate change ads will feature threats more often than efficacy messages, somewhat unsupported. This hypothesis was generated as one of the most consistent findings of EPPM-oriented content analyses. Both studies by Hart and Feldman (2014; with Milosevic, 2015) found US newspapers and television broadcasts relayed threat information more often than efficacy information, and often presented threats in the absence of efficacy information. For example, Feldman, Hart & Milosevic (2015) found only one-third of press articles included positive coverage of response efficacy. In contrast, more than three-quarters of all ads in this study including positive response efficacy information, a percentage that increased to 86.1% for ads with a severity message. 57% of ads with a severity message featured both a self-efficacy and a response efficacy message. From the perspective of the EPPM, the 43% of ads without both forms of efficacy are less likely to be persuasive, but efficacy messages appear far

more commonly with threatening information than would be expected from the literature previously applying EPPM to risk communication in the media.

Table 1.4. Frequency of threat severity and efficacy information by periodical

A. Frequency of measure	**Total**	**Economist**	**NYT**	**Times**	$F_{(2,1320)}$
Threat Severity	48.8%	58.2%†	47.0%	45.4%	6.42**
Positive Self-Efficacy	58.4%	42.9%†	50.5%†	78.7%†	64.78***
Positive Response Efficacy	76.5%	85.8%	67.6%†	82.5%	25.16***
Negative Response Efficacy	8.2%	6.0%	12.9%†	3.4%	16.9***
n	1,323	282	596	445	

*p<0.05 **p<.01 ***p<.001
† significant difference from other categories using Bonferroni-adjusted multiple comparisons in one-way ANOVA; all differences p<.01; unmarked cells are not significantly different from one another.

B. Frequency of efficacy messages as a percentage of ads with threat severity messages				
Severity ∩ Pos. Self-Efficacy	63.9%	42.7%	64.3%	80.7%
Severity ∩ Pos. RE	86.1%	88.4%	87.1%	82.5%
Severity ∩ Pos. RE ∩ Pos. SE	57.0%	39.0%	58.2%	69.8%
Severity ∩ Neg. RE	5.6%	9.2%	5.0%	3.5%

RE = Response Efficacy; SE = Self-Efficacy

Negative response efficacy occurred in only 8.2% (109 of 1,323) of all ads. It was more common in ads without a severity message (10.8%, 73 of 677) than ads with any such message (5.6%, 36 of 646, z=3.45, p<0.001). The occurrence of negative response efficacy is consistent with the EPPM, which theorize that positive response efficacy messages should be paired with threats; ads with negative response efficacy messages also contained threat severity messages only 5.6% of the time on average.

Differences by periodical. There were significant differences in the relative use of threats between periodicals. *The Economist* included messages that climate change was at least "a little severe" in 58.1% of ads (164 of 282), compared to 47.0% (280 of 596) in *The New York Times* and 45.4% (202 of 445) in *The Times*. An omnibus ANOVA of a binary measure of severity by periodical was significant ($F_{(2,1320)}$=6.42, p=0.0017). Post-hoc Bonferroni-corrected multiple comparisons were performed to evaluate differences between periodicals. Results indicate no

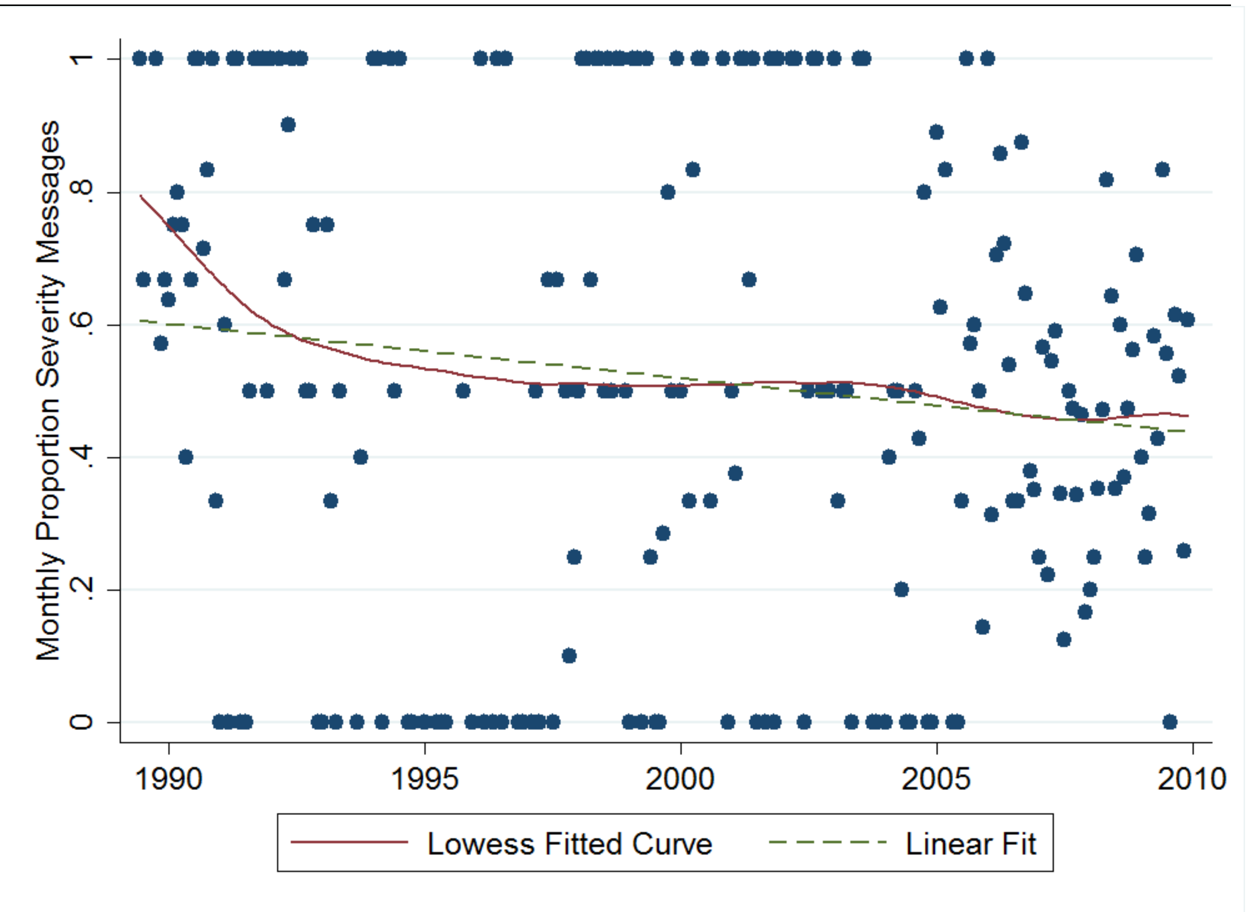
difference between *The New York Times* and *The Times* ($p=0.999$). There were significant differences in the relative proportion of threat severity messages between *The Economist* and *The New York Times* ($p=0.006$) and between *The Economist* and *The Times* ($p=0.002$), with *The Economist* featuring more ads with threat severity messages than either other periodical.

Positive response efficacy messages were more common in ads in *The Times* and *The Economist* than *The New York Times* ($p<0.0001$). Negative response efficacy was significantly more common in *The New York Times* than either other publication ($p \leq 0.001$).

Trends. There is evidence the relative frequency of severity messages declined over time. The sample was restricted to the years 1989-2009 to reduce the effect of time outliers, as only six ads appeared in the 1980-88 period, all in *The New York Times*[1]. Logistic regression is used because the variable of interest is binary: an ad either contains a severity message or does not. Because some years had many more ads than others, weights were assigned as the inverse of the monthly total of ads. Weighted logistic regression of the likelihood of a severity message onto month ($n_{month}=209$, 35 months in the period did not have any ads) indicates a significant decrease in the likelihood of an ad containing a severity message (Odds ratio = 0.9973, $z = -2.37$, $p=0.018$). This translates to an approximately 0.3% lower odds of a severity message appearing in an ad, month-on-month. In other words, while there was great month-to-month variation in the proportion of ads that contained severity messages, the model predicts about 60% of messages in 1989 would contain a severity message but only about 44% would by the end of 2009. Visual analysis of the data indicates the rate of change has not been consistent over the entire period (Figure 1.1) and specific hypotheses might be evaluated over shorter time periods with more sophisticated tests.

[1] As a check on robustness the analysis was re-run with the outliers included; the result was significant and in the same direction as with outliers removed.

Similar weighted logistic regressions of efficacy messages onto time were all not significantly different from zero (positive self-efficacy OR = 1.0017, p=0.153, positive response efficacy OR = 1.0022, p=0.087, negative response efficacy OR = 0.9979, p=0.134). As with threat severity, there are some shorter-term curvilinear trends suggested by visualization of the data. Nonparametric tests of trend guided by specific hypotheses may reveal more nuanced information.



Linear regression β = -0.000681, p=0.021
For data visualization the proportion of ads with a threat severity message is displayed for each month; small ad counts create clustering at 0, 0.5, and 1 until late in the period.

Figure 1.1. Trends in monthly proportion of ads featuring threat severity messages.

RQ2: What groups sponsor climate-change relevant ads (e.g. corporations, NGOs, industry association/front groups, or governments) and how have they changed over time?

This question is a precursor to examining the potential for ad sponsorship to influence message content, including threats and efficacy information. The proportion of ads by most sponsor types varied between each periodical. Sponsors were categorized inductively from a review of all ads building on an earlier categorization scheme (Bortree et al., 2012). Categorization guidelines are included as Appendix 1C. Sponsor types and the proportion of ads they sponsored are summarized in Table 1.5.

Two major patterns emerge from Table 1.5. First, all three periodicals differ from each other in the proportion of corporate ads and NGO ads, with *The Economist* featuring more than two-thirds of its climate-change relevant advertising from corporate sponsors while *The Times* has just more than one-third of its climate-change relevant ads from corporate sponsors. *The New York Times* was in between those extremes with 45.6% of ads sponsored by corporations. Though smaller in total proportions, the relationship is reversed for nongovernmental organizations (NGOs), which *The Times* leads with 27.6% and *The Economist* trails with 3.9% of ad sponsors. These differences likely reflect the focus of *The Economist* on business.

The second pattern that emerges is a trans-Atlantic difference between the two British periodicals and *The New York Times*. *The New York Times* has a significantly greater proportion of its climate change advertising sponsored by think tanks (5.5% vs. 0.4% or less) and educational institutions (10.2% vs. 2.0% or less), and far less by government agencies (4.5% vs. about 18.9% and 22%).

Table 1.5. Number (percent) of advertisements by type of sponsor and periodical.

	Total	Economist	NYT	Times	$F_{(2,1320)}$
Corporation	619 (46.8%)	192 (68.1%)†	272 (45.6%)†	155 (34.8%)†	40.9***
Industry Association	33 (2.5%)	7 (2.5%)	17 (2.9%)	9 (2.0%)	0.36
Nongovernmental Organization	235 (17.8%)	11 (3.9%)†	101 (17.0%)†	123 (27.6%)†	35.3***
Think Tank	33 (2.5%)	1 (0.4%)	33 (5.5%)†	0 (0%)	19.6***
Government	173 (13.1%)	62 (22.0%)	27 (4.5%)†	84 (18.9%)	37.5***
Media	71 (5.4%)	5 (1.8%)†	35 (5.9%)	31 (7.0%)	4.9**
Education	71 (5.4%)	1 (0.4%)	61 (10.2%)†	9 (2.0%)	26.8***
Other or Multiple Sponsors	87 (6.6%)	3 (1.1%)†	50 (8.4%)	34 (7.6%)	9.1***
Totals (percent by column)	1,323 (100%)	282 (21.3%)	596 (45.1%)	445 (33.6%)	

*p<0.05 **p<.01 ***p<.001
† significant difference from other categories in row using Bonferroni-adjusted multiple comparisons in one-way ANOVA; all marked differences p<.01.

Trends. No changes in proportion of ad sponsorship over the 21-year period were evident. Again the six ads with dates earlier than 1989 are excluded. Analysis is limited to the three largest categories (corporations, NGOs, and governments) to avoid small cell sizes in many time periods. Weighted logistic regression does not indicate a trend over the 21-year period for the proportion of corporate (OR = 1.0002, p=0.868), NGO (OR = 0.9995, p=0.683), or government (OR = 0.9985, p=0.456) sponsors. As with the examination of trends in severity messages, some visualizations suggest curvilinear distributions over shorter time periods that could be further investigated to evaluate specific hypotheses.

Threat severity message components by sponsor. Corporations were no more or less likely to use severity messages (305 of 619, 49.3%) than all other sponsors (341 of 704, 48.4%; two-sample test of proportions z = 0.327, p=0.744). Given the large number of comparisons possible, Bonferroni-corrected comparisons of means were calculated to further explore relationships beyond this initial test. Corporations were no more or less likely to use severity messages than any group except think tanks and educational organization, which used severity messages in only 5.9% and 29.6% of ads, respectively. The second hypothesis, H2: corporate-sponsored advertisements will use threatening messages less often than other sponsors, is not supported.

While media was not statistically more likely to include severity messages than any categories other than think tanks and education, it has the highest proportion of ads with threat severity information by category, in nearly two-thirds of ads.

The frequency of other EPPM-based message components varied significantly by sponsor with the exception of corporations and industry groups, which had no significant differences between them. Table 1.6 presents the relative proportion of EPPM constructs for each category of ad sponsor. The significant differences between individual cells within a column are complex enough they cannot be easily called out in Table 1.6; the largest differences are described here while complete comparison-of-means tables for the frequency of each EPPM component by sponsor category are presented in Appendix 1D.

Positive self-efficacy. Ads with positive self-efficacy messages occurred most frequently in ads sponsored by NGOs, governments, and the “other/multiple sponsor” category; in many cases of multiple sponsorship, NGOs and governments were involved. Ads by corporations, industry associations, and think tanks were the least likely to feature self-efficacy messages.

Positive response efficacy. Contrastingly, positive response efficacy messages were quite common from corporations, industry associations, NGOs, governments, and "other/multiple" sponsors; in particular 97.1% of ads by government contained at least one positive response efficacy message. Media- and education-sponsored ads were less likely to contain positive response efficacy messages, with think tanks by far the least likely.

Negative response efficacy. NGOs and governments included negative response efficacy less than 2% of the time, in contrast to ads from corporations and industry associations that used negative response efficacy in a little more than 10% of ads. But think tanks stand out with 50% of their ads including negative response efficacy messages.

A closer look at the specific sponsors of ads containing negative response efficacy reveals some interesting characteristics. Of the 68 corporation-sponsored ads with a negative response efficacy message, 52 (76.5%) were from Mobil, later ExxonMobil, corporation. Of the 17 think-tank-sponsored ads with a negative response efficacy component 13 (again 76.5%) were from The Heartland Institute, a right-leaning think tank identified as a "leading voice in the denier choir" (Elsasser & Dunlap, 2012). Together these two sponsors account for 59.6% (65 of 109) of all ads with a negative response efficacy component; no other sponsor had more than five ads with negative response efficacy.

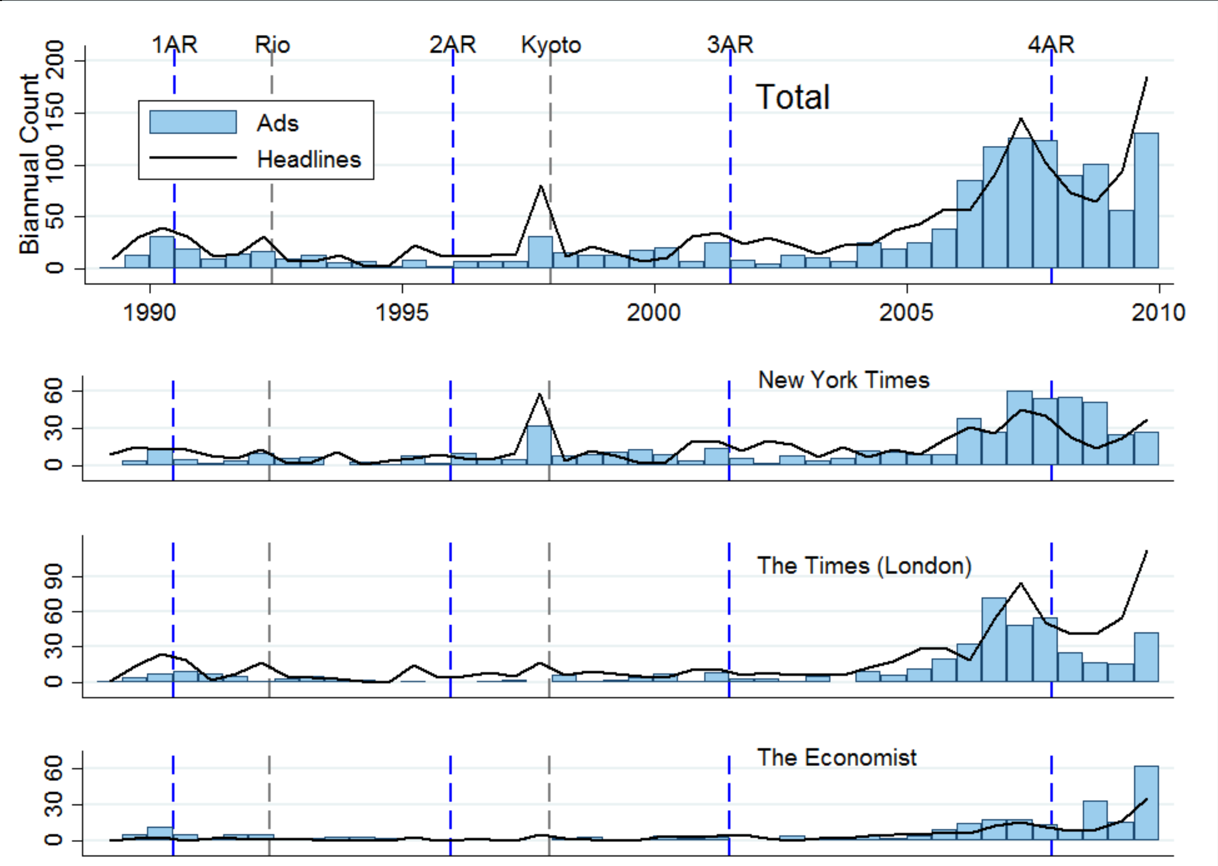
Table 1.6. Percentage of ads with EPPM components by type of ad sponsor.

	n	Threat Severity	Positive Self-Efficacy	Positive Response Efficacy	Negative Response Efficacy
Corporation	619	49.3%	42.3%	82.1%	11.0%
Industry Assoc.	33	39.4%	30.3%	81.8%	12.1%
NGO	235	52.8%	81.2%	81.3%	1.3%
Think Tank	34	5.9%	35.3%	14.7%	50.0%
Government	173	48.6%	90.8%	97.1%	1.7%
Media	71	66.2%	49.3%	42.3%	8.5%
Education	71	29.6%	54.9%	31.0%	2.8%
Other / Multiple	87	57.5%	75.9%	70.1%	6.9%
Total, mean %	1,323	48.8%	58.4%	76.5%	8.2%

The first part of the third hypothesis, H3a: the incidence of climate change ads in newspapers will exhibit trends similar to trends in newspaper coverage of climate change, is evaluated by comparing the time series of climate change ads to a time series of articles in the same periodicals. Research databases (LexisNexis for *The New York Times* and Gale NewsVault for *The Times* and *The Economist*) were searched for headlines including the same keywords used to identify ads (“greenhouse gas/es,” “climate change,” and “global warming”). Searching on headlines allowed for a similar total number of items to be located without requiring analysis of thousands of articles for their relevance to climate change. Blog entries and letters to the editor were excluded and a biannual count of articles by periodical was created to allow for resolution of clusters while still smoothing out the time series. Figure 1.2 displays the total articles and total ads for each six months 1989-2009.

To formally evaluate Hypothesis 3a, Pearson’s r correlation is calculated between the time series of each periodical’s headline and ad counts (Table 1.7). Correlations are very strong at 0.891 for *The Economist*, 0.789 for *The Times*, and 0.699 for *The New York Times*. The overall correlation between climate-change relevant headlines and ads across all three periodicals is 0.892.

All within-publication correlations are significant at $p<0.0001$. Hypothesis 3a is supported: climate change advertisements and media attention to climate change are closely matched, as would be expected when sponsors view advertising as a tool to influence public opinion or capitalize on current events to promote their commercial interests.



Articles were selected by keyword searches in headlines/titles only.
1AR-4AR = First through Fourth Assessment Reports of the Intergovernmental Panel on Climate Change; Rio = 1992 UNCED Earth Summit; Kyoto = 1997 ratification of Kyoto Protocol.

Figure 1.2. Number of climate-change relevant advertisements and article headlines, 1989-2009.

Table 1.7. Zero-order correlations of biannual ad counts and headlines by periodical, 1989-2009

	NYT Ads	Econ Ads	Times Ads	NYT HL	Econ HL
NYT Ads	1.0000				
Economist Ads	0.5539	1.0000			
Times Ads	0.7181	0.6403	1.0000		
NYT Headlines	0.6994	0.4625*	0.5951	1.0000	
Economist Headlines	0.6130	0.8909	0.7191	0.6203	1.0000
Times Headlines	0.7100	0.8701	0.7891	0.6599	0.9436

*p<.01; all other correlations p≤0.0001
Boxes highlight correlations of ads and headlines within each periodical.
NYT = *The New York Times*; Econ = *The Economist*; Times = *The Times*; HL = Headlines

The final hypothesis, H3b: *The New York Times* will have more ads questioning climate science or questioning the urgency of mitigation than *The Times* and *The Economist*, cannot be evaluated using the coded measure of ad purpose for inaction/doubt/denial because of low reliability. But negative response efficacy can be examined as a measure of questioning the urgency of mitigation.

Indeed, negative response efficacy is much more common in *The New York Times* than *The Times*. This finding is demonstrated in Table 1.4. Of 109 ads coded for at least "a little" negative response efficacy, 70.6% (n=77) appear in *The New York Times*. This represents a much greater proportion of ads with negative response efficacy in *The New York Times* (12.9% of all ads) than *The Economist* (6.0%) or *The Times* (3.4%). This difference is significant ($F_{(2,1320)}$ =16.9, p<.0001; Bonferroni-corrected comparisons are significant between *The New York Times* and both *The Times* (p<0.001) and *The Economist* (p=0.001) but the difference between *The Times* and *The Economist* is not significant (p=0.597). Hypothesis 3b is supported, lending further support to the idea that climate change communication is more politicized and contested in the United States than Great Britain.

1.4 DISCUSSION

This research contributes to the climate change communication literature by conducting a longitudinal content analysis of climate-change relevant print advertising, a previously neglected part of the climate change communication media environment. Applying the EPPM to climate change ads reveals several interesting results, not all of which are consistent with previous research on climate change communication.

First, climate change advertisements sometimes take on the characteristics of fear appeals by including threatening information about the severity of climate change impacts. But unlike climate change news coverage, threatening climate change ads frequently include efficacy messages, especially response efficacy. 86.1% of ads that contained a severity message also contained a response efficacy message. While self-efficacy messages were less common, they were still present in nearly two-thirds of threatening ads. Advertisers appear to behave as if they are guided by the EPPM, a finding fairly uncommon from most EPPM-based content analyses of risk communications, including EPPM-based analyses of climate change news coverage (Feldman et al., 2015; Hart & Feldman, 2014). The use of severity messages appears to have declined slightly over the 21 years between 1989 and the end of 2009 and was higher from *The Economist* than the other two periodicals studied.

Unexpected findings extend to the lack of support for the second hypothesis that corporations will be less likely to use threats than other organizations. Rather, threats are no more or less likely from corporations than from other sponsors. This result is different from previous studies of advertising that found non-corporate entities more likely to use loss frames, present risk information, or use fear appeals (Bortree et al., 2012; Gordon, 2003; Lavack, 1999). Consistent with previous climate change media studies using the EPPM, media-sponsored ads most frequently

contain messages about the severity of the threat (Feldman et al., 2015; Hart & Feldman, 2014; Hulme, 2008; O'Neill & Nicholson-Cole, 2009). Given those concerns about the use of threat and fear were based largely on media coverage of climate change, it is reassuring to find most climate-change related ads are both more likely than not to pair threats with efficacy information and only the media appears particularly fond of including threat information in ads. This insight is important to understanding the broader climate communication environment. The media has been criticized for not fostering civic "engagement" with climate change (Nisbet, 2009; O'Neill, Boykoff, Niemeyer, & Day, 2013; O'Neill & Nicholson-Cole, 2009), but perhaps the incentives journalists respond to are not well aligned with engagement. Rather, findings are consistent with the well-known fact that alarming headlines and stories result in more sales or reader impressions, incentives that had increased dramatically by the end of the study period (Anderson, 2009; Boykoff, 2013)

The Economist demonstrates different patterns of ad sponsorship from *The New York Times* and *The Times* by featuring a higher proportion of corporate sponsorship; ads by NGOs are most frequent in *The Times* and least in *The Economist*. This likely reflects *The Economist*'s focus as an elite weekly periodical marketed to leaders in business (The Economist Group, 2015).

There is also a trans-Atlantic difference, with *The New York Times* including a greater proportion of ads from think tanks and educational institutions and a smaller proportion from government than the UK periodicals. Clearly, climate-related public information campaigns are more common in the UK while the education sector is more active in the US, though the character of ads from each is not comparable. This difference can be added to already observed differences in media imagery of climate change impacts (O'Neill, 2013) and differences in media bias until the mid-2000s (Boykoff, 2007).

In a supported hypothesis, there is strong evidence of linkages between climate change advertising and press coverage of climate change. Some advertisers may attempt to influence climate policy as the media increases coverage close to newsworthy policy events, while others may attempt to capitalize on public attention to market their brand or sell a product. The latter helps to explain the high proportion of ads using response efficacy messages, which include claims that a product or service is effective in mitigating climate change.

The correlation between ads and news coverage offers some insight into another much-discussed aspect of climate change communication: what can explain the observed waxing and waning of media interest in climate change? There are several competing explanations of cycles in media coverage. Some attribute periodic coverage of environmental issues to Downs' (1972) "issue-attention cycle" of media attention (Gordon, Deines, & Havice, 2010; McComas & Shanahan, 1999). But others find Downs' model insufficient (Anderson, 2009; Boykoff & Boykoff, 2007). Boykoff and Boykoff (2007) instead attribute media coverage of climate change in the US as the interaction of "real-world issues, events, and dynamics" with "journalistic norms to successfully translate into media coverage"(p. 1195). The peaks in media coverage they observe mostly match the trends in ads observed here. If advertisers are motivated by news coverage to focus on particular topics, the observed association would be consistent. But if advertisers are in fact motivated by the same factors as news media without the constraint of journalistic norms, it raises the question of whether those norms do in fact mediate news attention to climate signals and advancements in climate science and policy. This study cannot make that determination, but the close correlations of ad frequency to news coverage lends support to the idea that both serve as a "reflection of society" as suggested in several recent studies of news coverage (Ahern et al., 2013;

Boykoff & Yulsman, 2013; Hiles & Hinnant, 2014): perhaps both media and ads are driven by secular trends in public attention.

In another supported hypothesis that is consistent with research on the news media (Boykoff & Rajan, 2007; Boykoff, 2007; Jang & Hart, 2015), the US advertising space reflects the contentious, politicized nature of climate change communication in the United States. A far greater percentage of ads in *The New York Times* (more than 1 in 8) included negative response efficacy messages, and a majority of those ads came from only two sponsors: an oil company and a right-leaning think tank. Trend analysis did not indicate any change in the relative frequency of these ads over time; these ads may help to explain some of the observed increase in Americans denying the scientific support for anthropogenic climate change in the 2000s (Smith & Leiserowitz, 2012).

Some questions and hypotheses were difficult to evaluate because of low reliability for several measures. Revising the coding system and coding instructions to increase inter-coder reliability would allow for more sophisticated analyses and for greater confidence in drawing conclusions.

For example, research questions about images in ads originally part of this study were unanswerable due to low reliability; examination of the data indicates some coders used "don't know" far more than others, so changing this category to a forced-choice format might increase reliability. For instance, after dropping all items coded as "don't know," the reliability for cause of climate change increased from 0.34 to 0.68, threatening images from 0.47 to 0.80, and image affect from 0.55 to 0.91. Running analyses omitting the "don't know" items is not defensible, but the exercise implies the coding instructions might be more clearly written or that the coding task was subject to the individual views of each coder.

This study describes the landscape of climate change advertising in print media up to its rapid decline: In 2009 only 5% of US newspapers with circulations over 50,000 offered a digital subscription service. By 2012 it was 54%, and 79% in 2015 (Williams, 2016). Knowing the history of climate-change relevant advertising develops a richer understanding of the climate change communication environment. But the decline of print media means that this study is necessarily retrospective: The databases used to locate climate-change relevant ads do not index more recently than the end of 2009 and the media environment is not only becoming more fractured so that there are no longer “papers of record,” but advertising is increasingly targeted at and tailored for specific audiences (Bostrom, Böhm, & O’Connor, 2013). Future work can characterize the extent to which advertising in the fractured media environment is about climate change, and whether the observed differences between the US and UK audiences persist. Public understanding of climate change has remained remarkably intractable in the US since the end of this study period (Leiserowitz, Maibach, Roser-Renouf, Feinberg, & Rosenthal, 2014), continuing the communication challenge. Climate-change relevant ads are likely to play an important role in climate change communication, whether advancing policy support or otherwise, into the foreseeable future.

This study has established that climate-change relevant ads have occurred for several decades in the US and UK press, they have contained threat messages, and while efficacy messages are fairly common, not all ads matched threats with efficacy. Given the concerns raised over presentation of threat without efficacy (Hart & Feldman, 2014; Maibach et al., 2008; O’Neill & Nicholson-Cole, 2009), could threatening climate change ads be contributing to negative attitudes, apathy, or anger about climate change mitigation? The next chapter experimentally investigates this question.

Appendix 1A. Coding Instructions and Coding Form

Climate change ads content analysis coding instructions

General guidelines
After reading through this, apply the codebook to each categorization task. When in doubt, review the codebook and apply it literally. Second-guessing will take more time, create more complications and less reliability. Imagine the coding task as a little like Family Feud, where you're trying to give the most popular answer from 100 average people viewing the ad, not guess at hidden meanings or secret clues in little sections of the ad, or guess what was going on inside the advertisers' minds.

Ad number
Enter 1-4 digits from beginning of ad filename

Centrality-How central is climate change or its mitigation?

Ads were selected because they contained the keywords "greenhouse gas", "climate change", or "global warming". The task here is to evaluate whether the ad is mostly about climate change, somewhat about climate change, or not very much about climate change.*

- *Ads that are 'not at all' about climate change have been screened out already so the lowest category is "not very much".*
- *Some ads feature multiple topics not related to climate change causes, effects, or solutions. For example an ad about agriculture that described climate change as one of several negative outcomes is more than an ad that only discusses causes of or solutions to climate change.*
- *General environmental references should not be considered specific to climate change, that is, an environmentally-focused ad may still only be "somewhat" or "not very much" about climate change.*

Keep centrality in mind when answering the rest of the items--ads that are 'not very much' about climate change may be difficult to assign codes other than 'don't know/can't tell'

Cause of Climate Change
Code whether the ad is accepting the consensus view that human activity is responsible for observed climate change, or not. Remember 2 includes doubtful ads/concern trolls/uncertainty "well we are worried about this but hold on, let's not go crazy"

1 Anthropogenic
2 Dismissive/Doubtful
9 Don't know/can't tell

Purpose
Select up to two most prominent purposes of the ad. *Select the primary goal (exceptionally, two goals) of the ad. The ad was purchased by a person, organization, or corporation. What is the goal? Code for the primary aim of the ad unless there are two clear goals.*

1 Purchase featured product/service--*A product or service is marketed explicitly to individuals or businesses*
2 Encourage political action or advocacy--*for or against climate mitigation, by governments or individuals*

3 Encourage conservation behavior-*e.g. saving money by cutting energy bills through conservation (not through a purchase)*
4 Inform reader of business/tech innovation--*no product featured, e.g. 'green' claims like a company's carbon reductions*
5 Encourage business/tech innovation--*promotes other businesses to change business or tech practices*
6 Inaction/support status quo/Denial--*Including ads encouraging "caution" on mitigation*
9 Don't know/can't tell

NB categories adapted from Feldman Hart Milosevic (2015)

Scale
At what scale does the ad mention or show climate impacts as occurring? Select the most prominent.
1 Subnational/national (US or UK)
2 Regional-developed (North America or Europe)
3 Regional-developing (Africa, Asia, Latin America)
4 Global
9 Unknown/can't tell

Climate Impacts--Does the ad present one or more impacts of climate change? Y/N. *If no information, it's No. Code even general references to negative/harmful effects as Yes. Do not code impacts of mitigation here for ads that present mitigation as the threat and deny the importance of climate change.*

Climate Actions-Does the ad present one or more mitigative or adaptive actions that can be taken/is being taken to address climate change? Y/N

Threatening images
Does the ad present climate change as a threat using a threatening image? Skip if no images.
1 Y 0 N 9 Can't tell/irrelevant

Images-positive/negative
On balance, are images positive or negative? *This item is looking for a gut response, but try to infer from the tone of the ad what kind of reaction is intended. When in doubt, code "Can't tell." When both positive and negative images are present, code "Can't tell." When climate change is central one of several topics, consider whether the images are climate-relevant; but if climate change is a minor part of the ad consider the images only if they are matched with the topic of climate change specifically.*

Severity *-text only*
To what extent does the text communicate climate change is severe?
0 not at all - 1 a little severe - 2 somewhat severe - 3 very severe
When no threat is communicated use 0. Consider all aspects of the text, including titles and wording. Examples:
"It is no longer a question of whether climate change is a threat, but how to deal with a phenomenon that looms increasingly large on the global stage"
"Believing it could lead to disaster is the first step to making sure that it doesn't."

Susceptibility*-text only*
To what extend does the text communicate climate change will directly impact the reader? *Consider visual references to individuals "saved" from climate change, including children; but do not consider mentions of people in developing countries.*

0 not at all - 1 a little - 2 somewhat - 3 very much
When no threat is communicated use 0
Examples:
“for the sake of our health and the health of our children…”
“our world is warming...affecting the world’s forests, oceans, atmosphere, animals and *ourselves*” (emphasis added)
“Thank you [brand] for making my sky bluer”

Efficacy-text only, *positive and negative*
Self Efficacy: To what extent does the text communicate the individual is able to perform the recommended action/the action is easy for you to take?-*regardless of whether you the coder believe that action will work; when an ad is targeting a corporation consider statements to the manager or executive as self-efficacy too.*
Collective Efficacy: To what extent does the text communicate everyone is able to work together?
Response Efficacy: To what extent does the text communicate the recommended action will be effective?

Same ratings as Susceptibility
When no action is communicated or concept is missing use 0

Concept	*Definition*	*Examples*
Self Efficacy-Positive	Language indicating individual action is possible, easy, simple… Include language indicating corporate action is possible, easy, simple. Do not consider green branding statements where a corporation touts its own action.	“Want to do something about it? Good, we need people like you.” “So you’re also helping to address climate change by reducing the levels of harmful greenhouse gases your home produces.” “you can help prevent climate change” “the average person wields incredible power when it comes to conserving energy”
Collective Efficacy-Positive	Language indicating everyone working together to counter climate change is possible/achievable, at any scale including governments working together	“To prevent global warming, we must not only make concerted efforts to fulfill the commitments…” “Japan, in collaboration with other countries around the world, is determined to make every effort to overcome the problem of global warming.”
Response Efficacy-Positive	Language indicating the action/technology/corporation is effective in countering climate change	“Thanks to combined heat and power technology, [brand] has cut CO_2 emissions by 5 million tonnes a year.” “50% of profits from [brand] will be donated to worldwide projects that tackle climate change.”

Self Efficacy-Negative	Languages indicating individual action is difficult/costly/insufficient	“Where I live...the open space of democracy appears to be closing.”
Collective Efficacy-Negative	Language indicating cooperation is difficult/costly, including criticism of international agreements	“Without full participation by developing countries, the Kyoto Protocol will not lead to a net reduction of global...emissions”
Response Efficacy-Negative	Language indicating proposed solutions are costly/difficult	“There are no relatively easy means to reduce global emissions of CO2 or some of the other greenhouse gases.” “Neither route is free of policy problems or cost implications.” “...continuing uncertainty around the cost and effectiveness of emerging technologies”

(NB efficacy schema adapted from Feldman Hart Milosevic, 2015)

Coder First Name *

Your answer

Ad number *
1-4 digits from beginning of filename

Your answer

Centrality-How central is climate change or its mitigation?

- ○ 1 Mostly-Main topic
- ○ 2 Somewhat-One of several points
- ○ 3 Not very much-Very minor point

Cause of Climate Change

- ○ 1 Anthropogenic
- ○ 2 Dismissive/Doubtful
- ○ 9 Don't know/can't tell

Purpose
Select up to two most prominent purposes of the ad.

- ☐ 1 Purchase featured product/service
- ☐ 2 Encourage political action or advocacy
- ☐ 3 Encourage conservation behavior
- ☐ 4 Inform reader of business/tech innovation
- ☐ 5 Encourage business/tech innovation
- ☐ 6 Inaction/support status quo/denial
- ☐ 9 Don't know/can't tell

NEXT

Scale

- ○ 1 National/subnational (US or UK)
- ○ 2 Regional-developed (North America or Europe)
- ○ 3 Regional-developing (Africa, Asia, Latin America)
- ○ 4 Global
- ○ 9 Don't know/can't tell

Climate Impacts

Does the ad present one or more impacts of climate change?

- ○ 1 Yes
- ○ 0 No

Climate Actions

Does the ad present one or more mitigative or adaptive actions that can be taken/is being taken to address climate change?

- ○ 1 Yes
- ○ 0 No

Threatening images

Does the ad present climate change as a threat using a threatening image? Skip if no images.

	1 Yes	0 No	9 Can't tell/irrelevant
Images	○	○	○

Images- positive/negative affect

On balance, are images positive or negative? Skip if no images.

	1 Positive	2 Negative	9 Can't tell/irrelevant
Images	○	○	○

BACK NEXT

Severity

To what extent does the text communicate climate change is severe?

	0 not at all severe	1 a little severe	2 somewhat severe	3 very severe
Severity	◯	◯	◯	◯

Susceptibility

To what extent does the text communicate climate change will directly impact the reader?

	0 not at all	1 a little	2 somewhat	3 very much
Susceptibility	◯	◯	◯	◯

Positive Efficacy

To what extent does the text communicate...

	0 not at all	1 a little	2 somewhat	3 very much
The individual is able to perform the recommended action	◯	◯	◯	◯
Everyone is able to work together	◯	◯	◯	◯
The recommended action will be effective	◯	◯	◯	◯

Negative Efficacy

To what extent does the text communicate...

	0 not at all	1 a little	2 somewhat	3 very much
The individual is NOT able to perform the recommended action	◯	◯	◯	◯
Everyone is NOT able to work together	◯	◯	◯	◯
The discussed action will NOT be effective	◯	◯	◯	◯

BACK SUBMIT

Appendix 1B. Inter-rater reliabilities

	Inter-rater reliability (Krippendorff's α)			
Ordinal Variables	**All 3 coders**	**coders 1&2**	**coders 1&3**	**coders 2&3**
Centrality*	0.713	0.759	0.705	0.641
Threat Severity*	0.712	0.718	0.702	0.725
Susceptibility	0.439	0.444	0.420	0.401
Positive Self-Efficacy*	0.677	0.661	0.607	0.719
Positive Response Efficacy*	0.616	0.635	0.560	0.656
Positive Collective Efficacy	0.470	0.463	0.447	0.489
Negative Self-Efficacy	0.211	0.280	-0.019	-0.009
Negative Response Efficacy*	0.674	0.696	0.658	0.670
Negative Collective Efficacy	0.543	0.751	0.415	0.414
Nominal Variables				
Cause of climate change	0.342	0.642	0.276	0.125
Scale of impacts	0.303	0.350	0.175	0.344
Impacts mentioned	0.550	0.640	0.517	0.421
Mitigative or adaptive actions mentioned*	0.664	0.727	0.646	0.592
Threatening images	0.473	0.454	0.441	0.538
Image affect (positive/negative)	0.553	0.451	0.446	0.689
Purpose of ad:				
Purchase product or service	0.643	0.686	0.621	0.607
Encourage political action or advocacy*	0.730	0.707	0.744	0.723
Encourage conservation behavior	0.587	0.664	0.525	0.438
Inform of business/tech innovation	0.635	0.718	0.588	0.615
Encourage business/tech innovation	0.574	0.569	0.766	0.405
Inaction/support status quo/denial	0.526	0.650	0.475	0.383
Don't know/can't tell	-0.010	-0.003	-0.016	-0.009

*Reliabilities considered acceptable in this study.

Appendix 1C. Ad sponsor category descriptions

Ad sponsor categorization task

Fill in the G column with one of the following codes (just number is OK, or copy-paste into cell)
1-Corporation
2-Industry association or front group
3-Nongovernmental organization
4-R leaning think tank
5-L leaning think tank*
6-Government
7-Media
8-Education
9-Other/Multiple/Can't tell
*NB this category was collapsed with 4 into a single category because so few ads coded as "5" (n=3)

Details:

Code the primary sponsor or if all sponsors are the same. If multiple competing categories of sponsor, code 9.

1-Corporation
Any ad sponsored by a single or multiple corporations. Include state-owned enterprises that are identified as an LLC or otherwise has a corporate organization, like many power companies.

2-Industry association or front group-Any sponsors organized around a particular industry or issue (e.g. "American Coalition for Clean Coal Energy"); consider checking SourceWatch.org

3-Nongovernmental organization-should be mostly environmental nonprofits but include other organizations that are working outside of government, e.g. religious organizations.

4-left- or right-leaning think tank (consider checking Wikipedia if unsure)

5-L leaning think tank *NB this category was collapsed with 4 into a single category because so few ads coded as "5" (n=3)

6-Government - includes state/regional/national governments as well as government-supported initiatives, e.g. Carbon Trust/ Act On CO2. Also includes intergovernmental organizations like UN organizations.

7-Media-do not include publishers, bookstores, or film studios (most of these will be corporations), only sponsors who are primarily focused on journalism.

8-Education-include any schools or universities and their presses

9-Other/Multiple/Can't tell-please use sparingly but if necessary

Appendix 1D. Multiple comparisons of EPPM construct frequency by sponsor.

In each cell the first number is the row mean minus the column mean (in each case, the proportion of the construct occurring in all ads from that sponsor); the second number is the Bonferroni-corrected p-value for that comparison of means.

Threat severity

Col Mean	Corporation	Industry Association	NGO	Think Tank	Government	Media	Education
Industry	-0.09879						
	1.000						
NGO	0.034929	0.13372					
	1.000	1.000					
Think Tank	-0.43391	-0.33512	-0.46884				
	0.000	0.151	0.000				
Government	-0.00718	0.09161	-0.04211	0.426726			
	1.000	1.000	1.000	0.000			
Media	0.169242	0.268032	0.134312	0.603148	0.176423		
	0.171	0.275	1.000	0.000	0.309		
Education	-0.19696	-0.09817	-0.23189	0.236951	-0.18977	-0.3662	
	0.040	1.000	0.014	0.590	0.176	0.000	
Other/Multiple	0.081982	0.180773	0.047053	0.515889	0.089164	-0.08726	0.278938
	1.000	1.000	1.000	0.000	1.000	1.000	0.011

Positive self-efficacy

Col Mean	Corporation	Industry Association	NGO	Think Tank	Government	Media	Education
Industry	-0.12023						
	1.000						
NGO	0.389503	0.509736					
	0.000	0.000					
Think Tank	-0.07032	0.049911	-0.45983				
	1.000	1.000	0.000				
Government	0.484251	0.604484	0.094748	0.554573			
	0.000	0.000	1.000	0.000			
Media	0.069694	0.189927	-0.31981	0.140017	-0.41456		
	1.000	1.000	0.000	1.000	0.000		
Education	0.126032	0.246265	-0.26347	0.196355	-0.35822	0.056338	
	0.724	0.270	0.000	1.000	0.000	1.000	
Other/Multiple	0.335357	0.45559	-0.05415	0.40568	-0.14889	0.265663	0.209325
	0.000	0.000	1.000	0.000	0.339	0.007	0.105

Positive response efficacy

Col Mean	Corporation	Industry Association	NGO	Think Tank	Government	Media	Education
Industry	-0.0025						
	1.000						
NGO	-0.00791	-0.00542					
	1.000	1.000					
Think Tank	-0.67362	-0.67112	-0.66571				
	0.000	0.000	0.000				
Government	0.15042	0.152916	0.158332	0.824039			
	0.000	0.984	0.001	0.000			
Media	-0.39814	-0.39565	-0.39023	0.275476	-0.54856		
	0.000	0.000	0.000	0.016	0.000		
Education	-0.51082	-0.50832	-0.50291	0.1628	-0.66124	-0.11268	
	0.000	0.000	0.000	1.000	0.000	1.000	
Other/Multiple	-0.11953	-0.11703	-0.11162	0.554091	-0.26995	0.278614	0.39129
	0.177	1.000	0.559	0.000	0.000	0.000	0.000

Negative response efficacy

Col Mean	Corporation	Industry Association	NGO	Think Tank	Government	Media	Education
Industry	0.011358						
	1.000						
NGO	-0.097089	-0.108446					
	0.000	0.76					
Think Tank	0.390145	0.378788	0.487234				
	0.000	0.000	0.000				
Government	-0.092514	-0.103871	0.004575	-0.482659			
	0.001	1.000	1.000	0.000			
Media	-0.025348	-0.036705	0.071741	-0.415493	0.067166		
	1.000	1.000	1.000	0.000	1.000		
Education	-0.081686	-0.093043	0.015403	-0.471831	0.010828	-0.056338	
	0.38	1.000	1.000	0.000	1.000	1.000	
Other/Multiple	-0.040889	-0.052247	0.0562	-0.431034	0.051624	-0.015542	0.040797
	1.000	1.000	1.000	0.000	1.000	1.000	1.000

Chapter 2. UNINTENDED REACTIONS TO THREATENING MESSAGES IN CLIMATE CHANGE COMMUNICATION

Abstract

The efficacy of threatening messages about climate change (a.k.a. "fear appeals") is debated but rarely tested. Persuasive communication may create psychological reactance, a motivational state of opposition characterized by counterarguments and anger. In a large (n=845) randomized experiment of US adults, this study finds a climate change fear appeal generates reactance and suppresses support for mitigation policy conditional on political orientation. First, while all respondents experience greater levels of reactance when exposed to a climate change fear appeal vs. control, right-leaning respondents experience significantly greater levels of reactance. Second, among right-leaning respondents reactance plays a critical role in policy support. While exposure to a fear appeal increased policy support among right-leaning respondents low in reactance, policy support boomerangs among high-reactance right-leaning respondents exposed to a fear appeal. This suggests fear appeals can polarize support for mitigation policy. Reactance has no significant effects on policy support among left-leaning respondents. Finally, reactance to a climate change fear appeal also suppresses donations to climate change-related organizations. Overall, findings suggest using fear appeals to motivate support for climate change mitigation should be undertaken with caution. The research highlights reactance as an important mechanism through which climate change fear appeals can backfire, and suggests climate change communications should be tested for reactance.

2.1 INTRODUCTION

Evidence of the role of affect (an immediate sense of “goodness” or “badness”) in risk perception and communication (Finucane, Alhakami, Slovic, & Johnson, 2000; Slovic & Peters, 2006)has spurred an increased focus on the influence of specific emotions in risk judgments and decision making (Angie, Connelly, Waples, & Kligyte, 2011; Lench, Flores, & Bench, 2011; Lerner & Keltner, 2000). Communications may be deliberately designed to induce and leverage the effects of emotions like fear, guilt, or empathy. Naturally, concerns have been raised about the ethical issues of persuading through these emotional appeals (Arthur & Quester, 2003; Hastings, Stead, & Webb, 2004). Others are investigating the possibility a communication intended to arouse specific emotions for a persuasive goal may incidentally create other emotions that undermine the communication’s intended purpose (Byrne & Hart, 2009; Cho & Salmon, 2007; Visschers et al., 2012). These challenges extend to fear appeals about climate change, with some arguing that fear can be a useful persuasive strategy (Cismaru et al., 2011; Meijnders et al., 2001; Roeser, 2012), while others caution against it (Hulme, 2008; Moser, 2007b; O’Neill & Nicholson-Cole, 2009).

An urgent call for experimental tests of fear appeals in climate change communication issued seven years ago has thus far gone largely unanswered (Maibach et al., 2008). That call recommended evaluating whether fear could be used effectively in climate change communication and identified the importance of emphasizing self-efficacy and collective efficacy messages in any such appeals. Respondents’ feelings of efficacy are hypothesized as being critical to minimize the risk of defensive reactions including message derogation, denial, avoidance, or even a backlash against the recommended response (e.g., causing a *decrease* in policy support compared to no message at all), which some studies have shown (Byrne & Hart, 2009). The implications of defensive reactions for public policy are tremendous: Climate change fear appeals might not

simply fail, but they might make things worse by increasing the polarization of attitudes and beliefs about climate change and its mitigation, a perverse outcome called a "boomerang effect" (Hart & Nisbet, 2011; Hart, 2014).

The extended parallel process model (EPPM: Maloney, Lapinski, & Witte, 2011; Witte, 1992, 1994), a leading theory of fear appeals, predicts that perceptions of a threat as personally relevant and severe are necessary to motivate attitude change and action. Further, for a fear appeal to be effective, subjects must not only be afraid of a threat, they must have efficacy beliefs: they must believe the response to avert the threat will work and that they are capable of effecting that response. The EPPM further predicts that *fear control* responses occur under conditions of low efficacy (the respondent feels incapable of averting the threat) and high threat (the threat is personally relevant and severe). When high levels of fear of a threat combine with beliefs that one is unable to reduce the threat, fear is controlled through defensive avoidance, denial, or *reactance* (Witte & Allen, 2000; Witte et al., 1996).[2] The possibility of reactance is acknowledged in many studies of fear appeals but it is rarely a central concept, instead often listed as one of several possible negative outcomes and rarely measured (Popova, 2012). This research is principally concerned with testing if reactance may be provoked by a climate change fear appeal and what effects reactance may have on climate change beliefs, policy support, and donation behavior.

2.2 Psychological Reactance and Fear Appeals

Psychological reactance (hereinafter "reactance") is backlash against a perceived attempt to limit one's freedom (Brehm, 1966; Quick, Shen, & Dillard, 2012), including limiting freedom of choice

[2] The example of denial Witte and Allen (2000) provide is "it won't happen to me", whereas they describe defensive avoidance as "This is just too scary, I'm simply not going to think about it" and reactance as "They're just trying to manipulate me, I'm going to ignore them" (Witte and Allen, 2000 p 594).

through persuasion (Burgoon et al., 2002). Reactance has been validated as a intertwined combination of anger and counterarguments[3] about a message (Dillard & Shen, 2005; Quick & Stephenson, 2007; Rains, 2013). A common approach to measuring reactance is to ask respondents to list their thoughts about a message. Discrete thoughts in disagreement with the message are then counted as counterarguments. Respondents also answer a series of Likert-type scales on the extent to which the message made them feel angry, irritated, or annoyed, which are summed and averaged into a single scale (Quick et al., 2012).

The EPPM distinguishes between defensive avoidance ("I'm not going to think about this right now") and denial of the threat's existence separately from reactance (Witte & Allen, 2000). But denying a threat's severity or existence is a counterargument. Since conventional measures of reactance include counterarguments, psychological reactance may be a good candidate to measure maladaptive responses to fear appeals generally.[4]

2.2.1 *Reactance, Psychological Distance, and Efficacy*

The EPPM holds two implications for the likelihood of reactance to a climate change fear appeal. First, the perceived threat generated in a fear appeal is likely to diminish with increased psychological distance. Psychological distance is the extent to which an object, event or idea is absent from the observer's direct experience (Liberman, Trope, & Stephan, 2007). Personal relevance and the strength of emotional responses decrease with increased psychological distance (Trope & Liberman, 2010). Tests of fear appeals and climate change risk communications have demonstrated a reduction in perceived threat from increased psychological distance (Davis, 1995;

[3] Counterarguments are also referred to as "negative cognitions" in the literature on psychological reactance.

[4] Such threat denials are also consistent with the effects of anger, the other component of reactance, as angry people tend to have more optimistic risk perceptions and beliefs they can gain control of or change a situation (Lerner & Tiedens, 2006).

Powell, 1965; Scannell & Gifford, 2013; Spence & Pidgeon, 2010). It follows that to be most effective, climate change fear appeals should threaten us personally, here, and now. This might generate a sufficient emotional response to meet the EPPM's criterion of high threat perceptions. However, such a threat could conflict with common portrayals of climate change as affecting psychologically distant other people, other places, or future generations (Gifford, 2011; Leiserowitz, 2005; Moser, 2007b; O'Neill & Hulme, 2009; Weber, 2006) and thereby might increase the likelihood of the message being perceived as having manipulative intent, a key predictor of reactance (Witte et al., 1996).

Second, low efficacy perceptions present a challenge to effective climate change communication, as some may doubt their actions taken alone will avert climate change (Adger, 2003; Gifford, 2011; Kellstedt, Zahran, & Vedlitz, 2008; Lorenzoni, Nicholson-Cole, & Whitmarsh, 2007; Staats, Wit, & Midden, 1996). The need to create a high level of threat by decreasing psychological distance combined with the difficulty of generating strong efficacy beliefs (Bandura, 1998; Thaker, 2012) may create a dangerous mix, increasing reactance to climate change fear appeals.

Further, because the strength of emotions decreases with psychological distance (Williams, Stein, & Galguera, 2014) and high perceived efficacy is associated with adopting the recommended attitude or response to a fear appeal (Witte, 1992, 1994), this study hypothesizes that in an experimental test of climate change fear appeals, *H1a: reactance will be greatest in conditions of low psychological distance and low efficacy,* and *H1b: least in conditions of high psychological distance and high efficacy.*

2.2.2 *Elements of Reactance and Support for Climate Change Mitigation Policy*

A climate change fear appeal encouraging support for mitigation policy that generates reactance may boomerang and instead decrease policy support. This develops the hypothesis that elements of reactance from such an appeal will be negatively correlated with support for climate change mitigation policy.

Witte et al. (1996) characterizes issue derogation or denial as a form of reactance. This concept has been more recently formalized as one component of reactance: counterarguments against the message (Dillard & Shen, 2005; Quick et al., 2012; Quick & Stephenson, 2007), which leads to hypothesis *H2a: counterarguments will be negatively correlated with support for climate change mitigation policy.*

Reactance is negatively correlated with perceived persuasiveness (Quick & Stephenson, 2007), and perceived message effectiveness is a determinant of message acceptance (Dillard, Shen, & Vail, 2007), suggesting hypothesis *H2b: message acceptance will be positively correlated with policy support and H2c: perceived manipulative intent will be negatively correlated with policy support.*

Finally, fear appeals have been demonstrated to generate emotions other than fear, including anger (Dillard, Plotnick, Godbold, Freimuth, & Edgar, 1996), a principal component of reactance (Dillard & Shen, 2005; Quick et al., 2012; Quick & Stephenson, 2007). Consequently the hypothesis follows: *H2d: anger will be negatively correlated with policy support.*

2.2.3 *Reactance and Political Orientation*

Based on research on the framing of politically partisan issues including climate change (Druckman, Peterson, & Slothuus, 2013; Hart & Nisbet, 2011; Kahan, Jenkins-Smith, & Braman,

2011; Myers et al., 2012), political party orientation is expected to interact with treatment effects, *H3: political orientation will interact with all experimental conditions (treatment) such that right-leaning respondents will display greater reactance than left-leaning respondents vs. a control condition.*

2.2.4 *Reactance, Policy Support, and Donation Behavior*

Finally, reactance has been associated with boomerang effects on attitudes and behaviors, which are opposite the intention of the communicator (Hart, 2014; Quick et al., 2012). For a climate change fear appeal intended to generate support for climate mitigation policy, a boomerang effect would reduce policy support compared with a control condition. As discussed below, this study also explores donation behavior, by giving respondents the choice to donate money to a conservative, climate change contrarian organization, a liberal, climate change mitigation organization, or not at all. The boomerang effects expected include *H4a: Reactance caused by climate change fear appeals will decrease policy support*, and *H4b: Reactance caused by climate change fear appeals will increase donation to climate-contrarian organizations.*

These hypotheses are evaluated through a survey experiment, discussed next.

2.3 Data and Methods

As part of a larger study on climate change fear appeals, participants were recruited through Amazon Mechanical Turk (MTurk) and compensated $0.75 to complete a survey instrument on the Qualtrics online survey platform as part of a larger study examining fear appeals in climate change communication. Participants were recruited with the text “Answer a survey about your opinions. Give us your opinion about an advertisement” and were blind to the study topic before

the presentation of stimuli. The survey asked respondents for their consent to participate in the study.[5] The survey instrument is presented in Appendix 2A.

Respondents answered questions on age, sex, and political orientation. Political orientation was classified through branching questions, detailed in Appendix 2A (Malhotra, Krosnick, & Thomas, 2009). This allowed for classification of respondents into left-leaning (n=579, 68.5%) or right-leaning (n=266, 31.5%).[6] These proportions are consistent with those previously reported for MTurk samples (Berinsky, Huber, & Lenz, 2012).

Respondents were assigned randomly to one of 8 experimental conditions (together, “treatment”) displaying a climate change fear or a control condition. The experimental conditions varied collective efficacy, self-efficacy, and psychological distance in a 2X2X2 factorial design. The control condition presented an advertisement for a popular brand of paint. Experimental manipulations and control are presented in Figure 2.1.

2.3.1 *Reactance measures*

Counterarguments. After viewing the ad for a minimum of 20 seconds, respondents proceeded to a thought-listing task (Cacioppo & Petty, 1981) where they were asked to write any thoughts they had while viewing the advertisement. The full text of the prompt is included in Appendix 2A. Respondents were shown a timer and were not allowed to advance to the next survey page until at least 90 seconds had elapsed.

Two coders coded each thought (n=4,497). Discrete respondent thought listings were randomly sorted so each could be rated independently of other thoughts from the same respondent.

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[5] Study materials and methods were approved by the University of Washington Institutional Review Board, Application #47417.

[6] Three respondents who did not answer the follow-up branching questions were included in the left-leaning group.

Unique identifiers were kept with each cognition to allow ratings to be totaled for each respondent. Discrete thoughts were coded as in agreement with the climate change advertising message, in disagreement, or irrelevant/not able to be determined.[7] Raters practiced and conferred on a set of cognitions from respondents who were dropped from analysis for not meeting study criteria, then coded responses independently. Inter-rater reliability on counterarguments was acceptable, Krippendorff's $\alpha = 0.805$ (Krippendorff, 2004). Coding instructions are presented in Appendix 2B.

Table 2.1 displays some examples of thought listings and their coding for counterarguments. The table displays thought listings randomly selected from respondents with totals of 0, 1, 3, 5, and 7 counterarguments. Coding thoughts independently is a conservative approach as context cues in the thought lists might imply more counterarguments than were counted.

Anger, persuasiveness, and perceived manipulative intent. Next, respondents were presented with eight items (randomized between respondents) assessing anger (To what extent did you feel [angry / irritated / annoyed]?), message acceptance (To what extent did you feel the ad is [persuasive / convincing]?) and perceived manipulative intent (To what extent did you feel the ad tried to [manipulate you / make a decision for you/pressure you]?). All items featured four-point item-specific response scales, e.g. Not at all angry/A little angry/Somewhat angry/Very angry. Items were presented in random order within the survey page. Related items were summed and averaged into scales with good reliability, α=0.841 to 0.906. Scales and reliability are presented in Appendix 2C.

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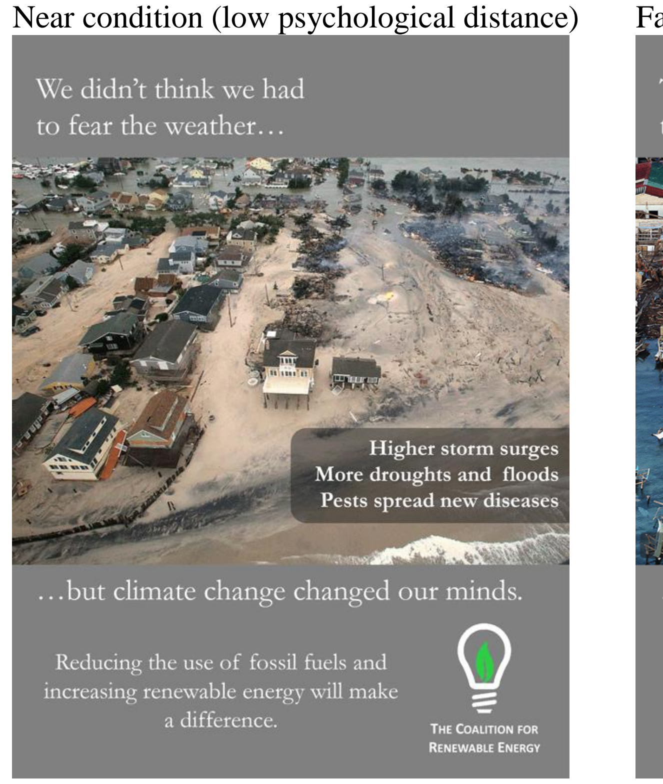
[7] Because all thought listings were randomized it was not possible to tell in every case if a statement was disagreeing with the climate change message or the message promoting a particular brand of paint, the control condition. Therefore, statements like "disbelief" in response to the control condition were coded as disagreement. A total of 9 of 93 (9.7%) respondents in the control condition had more than zero counterarguments, compared with 309 of 752 (41.1%) respondents in treatment.

Reactance was operationalized by summing and averaging the three anger scales and both coders' counterargument counts, scale $\alpha = 0.856$.

Near condition (low psychological distance)	Far condition (high psychological distance)



Near, low self-efficacy and low collective efficacy

Far, low self-efficacy, low collective efficacy

Low self-efficacy, high collective efficacy message
Used in both near and far

High self-efficacy, low collective efficacy message
Used in both near and far

High self-efficacy, high collective efficacy message
Used in both near and far

Control condition

Figure 2.1. Experimental and control stimuli. The two pictures shown were used throughout with text variations as shown for a total of eight experimental conditions.

Table 2.1. Examples of counterarguments.
Statements identified as counterarguments by both coders are starred.

Respondent 55: 0 counterarguments	hurricane Sandy devestating all true we have to change our ways more awful storms scare me higher food prices hurting the economy rebuilding homeless people hurt and killed people
Respondent 2: 1 counterargument	Climate change What kinds of renewable energies are you talking about What did fossil fuels have to do with that disaster* That place looks horrible Where did that occur How does it look now?
Respondent 6: 3 counterarguments	Not sure if climate change is for real* Devastation was severe Probably a liberal organization* sort of tired of all the climate change pushes*
Respondent 116: 5 counterarguments	Propaganda* Lies* fear mongering* No trust that it is God's world, not ours.* Climate change has ALWAYS happened!* People should NOT build on swamps and coastlines known for storms and bad weather.
Respondent 404: 7 counterarguments	the ad lacks scientific evidence* climate change is natural* climate change is not man made* living on the coast is not very smart storms have always hit the coast causing flooding* people should put more thought into where they live the ad does not convince me that climate change is real* this ad seems to be a fear tactic without fact to back it up* more research needs to be done to understand natures cycles*

2.3.2 *Other measures*

Respondents next answered questions mostly related to a different study covering 23 items assessing psychological distance and EPPM constructs (fear, threat severity, threat susceptibility,

response efficacy, self-efficacy, and collective efficacy). Each item was the form of a statement and respondents selected from a seven-point response scale ranging from strongly disagree to strongly agree. An attention-check item (e.g., "please indicate your careful reading of this survey by leaving this row unanswered") was included in each page. After two questions on psychological distance, the page order of the next three pages (7 items per page) and question order within each page was randomized to minimize question order effects.

2.3.3 *Policy Support Scale*

Five items similar to those used in previous research (Ding, Maibach, Zhao, Roser-Renouf, & Leiserowitz, 2011; Leiserowitz, 2005; Smith & Leiserowitz, 2013) assessed policy support for climate change abatement. Each item was scored on a "forced choice" six-point scale (*strongly oppose/oppose/somewhat oppose/somewhat support/support/strongly support*). Items were presented in random order with the scale order invariant from strongly oppose to strongly support. The five items were summed and averaged into a policy support scale with good reliability, $\alpha=0.835$.

2.3.4 *Donation Behavior*

After completing three pages of response items measuring psychological distance and EPPM constructs, respondents viewed a final survey section where they were thanked for their participation and awarded a 10-cent bonus, equal to 13% of their compensation. Participants were presented with two randomly ordered non-profit organizations. One was randomly selected from three climate change mitigation organizations (350.org, Center for Climate and Energy Solutions, and Beyond Coal) and the other from three climate change contrarian organizations (GlobalWarming.org, Climate Depot, and Nongovernmental International Panel on Climate

Change). Each organization had a logo taken from its website and a short description excerpted from Wikipedia, including the parent organization of the contrarian groups (none of the contrarian organizations were stand-alone nonprofits). Respondents were given the option to choose to donate all or part of their bonus to one of the two groups or keep it all for themselves. Respondents who elected to keep the bonus were routed to the end of the survey; respondents who elected to donate all or part of their bonus were presented with a final question where they could choose how much of their bonus (between 1 and 10 cents) to donate before finishing the survey. Prompts and organization descriptions are presented in Appendix 2A.

2.4 RESULTS

1123 responses were obtained in October 2014. Several observations were dropped from the final analytic dataset: First, data were cleaned by dropping all responses from participants who circumvented a screening script to complete the survey more than once (40 observations from 19 participants, with 17 completing the survey twice and 2 completing it three times), reducing the sample to 1083 unique observations. Observations missing one or more attention check questions or missing values on three or more items were also dropped from the sample. As a major part of the experiment focuses on the manipulation of psychological distance, and since the national origin and time in the US of foreign-born respondents is unknown, responses from foreign-born participants were dropped. 64 respondents were not born in the US, 125 missed one or more attention-check questions, and 68 observations contained 3 or more missing values. Some observations represented more than one of these conditions. A total of 238 observations were dropped for a final sample size of 845.

Though assignment to condition was random and initially balanced among all conditions, some unbalancing occurred as cases were dropped, with the number of observations by condition

ranging from 85 to 100. However, comparing the distribution by condition before and after the cases were removed passes a chi-square test of independence (χ^2=1.20, p=0.997), including condition by political orientation (χ^2=13.72, p=0.089).

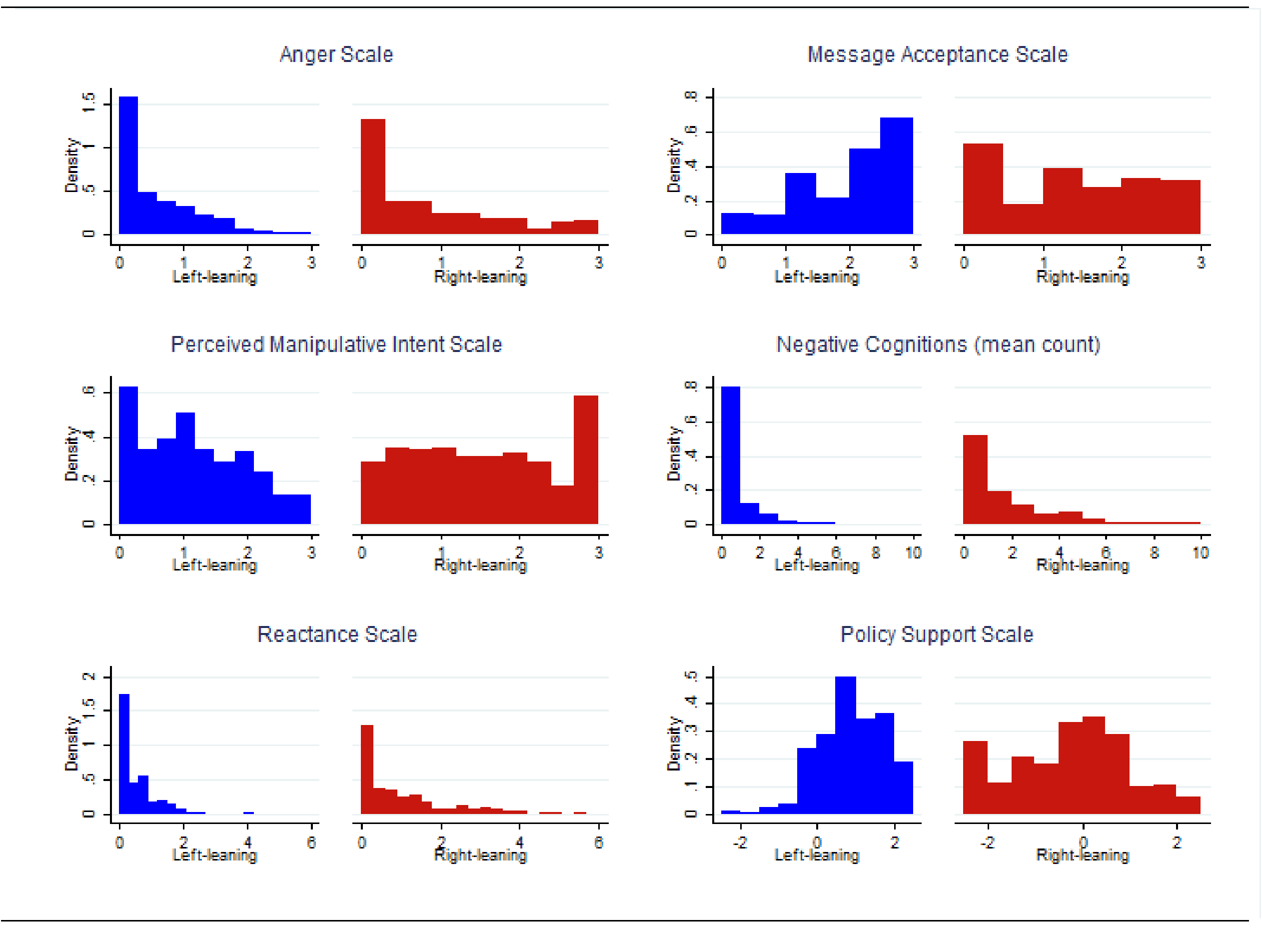


Figure 2.2. Scale histograms by political orientation.

Age ranges from 18 to 81 years, with a mean of 36.4 years and standard deviation of 12.6 years. The sample is 58.1% (n=491) female. Summary statistics and zero-order correlations of measures are presented in Table 2.2, with their distributions graphed by political orientation in Figure 2.2.

There is a strong positive correlation between counterarguments and anger (r=0.528, Table 2.2). This correlation compares favorably to studies included in a recent meta-analysis, which

found an average correlation between anger and counterarguments of 0.31 (14 studies, total N=3509; Rains, 2013).

2.4.1 *H1: Reactance and Experimental Effects*

The reactance scale is Poisson distributed, displaying a strong positive skew (skewness=2.15). This skewness means 33.73% (n=285) of the sample holds a zero value and 66.86% (n=565) has a value less than the mean of 0.631. Further consistent with a Poisson distribution, the variance (0.713) is close to the mean. Accordingly, Poisson regressions are used to evaluate hypotheses in which the reactance scale is the dependent variable. Incidence rate ratios are reported for Poisson regressions.

There are no significant differences by experimental manipulation. A Poisson regression of reactance on a three-way full factorial interaction (2X2X2) of the distance manipulation, self-efficacy manipulation, and collective efficacy manipulation finds no effect (Poisson likelihood ratio $\chi^2(7, n=752)= 3.01, p=0.884)$[8]. Hypotheses 1a and 1b, that reactance would decrease by experimentally increasing efficacy and psychological distance, is not supported.

However, while the experimental manipulations have no measurably differential effects on reactance, there is a significant difference in mean reactance between the control condition and treatment across all conditions. A change from control condition to treatment increases reactance 385 percent (IRR=3.848, n=845, p<0.001). Reactance in the control condition has a mean of 0.178 and median of zero, while reactance across all experimental conditions has a mean of 0.687 and median of 0.4. So while attempts at manipulating psychological distance, self-efficacy, and

[8] Post-hoc goodness-of-fit tests for this regression fails one test of independence (Pearson goodness-of-fit χ^2 (744)=815.6, p=0.035). To evaluate the appropriateness of the Poisson designation, adding an interaction term for political orientation finds a significant model (Poisson model likelihood ratio χ^2 (15, n=752)=101.63, p<0.0001) that passes both deviance goodness-of-fit (χ^2 (736)=617.4, p=0.999) and Pearson goodness-of-fit (χ^2 (736)=619.3, p=0.999) tests. In the latter model only political orientation was a significant predictor of reactance.

collective efficacy did not have differential effects on reactance, presenting any version of the threatening climate change message had a dramatic effect on reactance compared with the control condition.

While treatment effects did not differ significantly by psychological distance or efficacy conditions, comparing all treatment conditions to control while controlling for reactance showed significant differences. Regressing psychological distance on treatment and reactance revealed that all treatment conditions on average decreased psychological distance by 0.482 versus control (about half a point on a scale of 1 to 7 where 1 = "strongly disagree" and 7 = "strongly agree"), $p=0.002$, holding reactance constant. Similarly, treatment increased the collective efficacy scale by 0.304 (again on a 1 to 7 scale) versus control, $p=0.049$, holding reactance constant. Finally, treatment increased the self-efficacy scale by 0.373 on the same 7-point scale versus control, $p=0.010$, holding reactance constant. There was no significant effect of treatment on response efficacy holding reactance constant, $p=0.186$. Bivariate relationships without the reactance measure were not significant, indicating reactance may suppress treatment effects.

2.4.2 *H2: Elements of Reactance and Support for Mitigation Policy*

Mitigation policy support decreases significantly as counterarguments, perceived manipulative intent, and anger increase (Table 2.2). Hypotheses 2a, b, c, and d are supported. Also as expected, as message acceptance increases, policy support increases (Table 2.2). The correlations between counterarguments and policy support and between message acceptance and policy support are strong. The correlations between manipulative intent and policy support as well as those between anger and policy support are medium in size (Cohen, 1992).

Table 2.2. Correlations and descriptive statistics.

Variables	1	2	3	4	5	6
1 Anger Scale	1					
2 Message Acceptance Scale	-0.325§	1				
3 Perceived Manipulative Intent Scale	0.446§	-0.348§	1			
4 Counterarguments	0.528§	-0.501§	0.516§	1		
5 Reactance Scale	‡	-0.492§	0.555§	‡	1	
6 Policy Support Scale	-0.274§	0.477§	-0.331§	-0.516§	-0.458§	1
n	845	845	845	845	845	841
Mean	0.604	1.640	1.274	0.675	0.639	0.496
Standard Deviation	0.767	0.971	0.941	1.266	0.897	1.134
Range[i]	0-3	0-3	0-3	0-9.5	0-6.25	-2.5-2.5
Chronbach's α	0.838	0.876	0.853	0.965	0.855	0.835

§ Significant at p<.0001.
‡ The reactance scale is an average of Anger and Counterarguments.
[i] Scales are not standardized to preserve meaning for ease of interpretation: zero means none or "not at all"; for policy -2.5 corresponds with "strongly oppose" and +2.5 corresponds with "strongly support".

2.4.3 *H3: Reactance and Interaction with Political Orientation*

The third hypothesis, that reactance will differ by political orientation with right-leaning respondents exhibiting greater reactance than left-leaning respondents in all experimental conditions, is supported. A bivariate Poisson regression of reactance on political orientation is significant (likelihood ratio χ^2 (1, n=845)=82.0, p<.0001), with right-leaning respondents experiencing a risk of reactance 221 percent greater than left-leaning respondents (IRR=2.211, n=845, p<0.001). Across all experimental conditions, left-leaning respondents had a mean reactance score of 0.487, median 0.4, while right-leaning respondents had a mean reactance score of 1.132, median 0.8.

Right-leaning respondents display much greater reactance (vs. left-leaning respondents) to treatment with a threatening climate change ad. The already described treatment effect of being exposed to a threatening climate change ad interacts with political orientation: There is no difference in reactance between left-leaning and right-leaning respondents in the control condition. Reactance increases significantly for both types of respondent in the treatment condition, but there

is also an interaction effect such that reactance by right-leaning respondents is significantly greater than for left-leaning respondents (Figure 2.3).

Interpreting this effect in terms of incident rate ratios, left-leaning respondents exposed to treatment increase reactance 252 percent compared to those in the control group. For right-leaning respondents, treatment results in a 747 percent increase in reactance vs. control.

2.4.4 *H4a: Reactance and Policy Support*

Hypothesis 4a, that reactance will decrease policy support, is related to the already demonstrated significant, strong negative correlation between reactance and policy support. As earlier demonstrated in the evaluation of Hypothesis 1, the experimental treatment has a significant

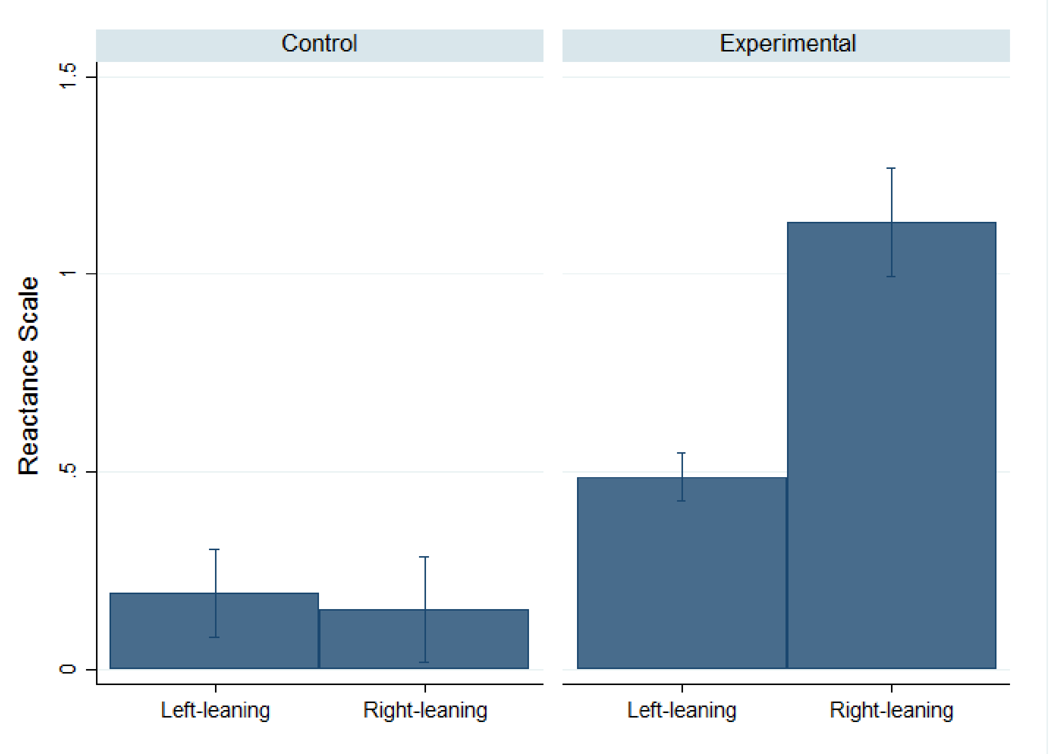


Figure 2.3. Treatment effects on reactance by political orientation.

effect on reactance. To evaluate whether reactance decreases policy support beyond the bivariate correlation, a series of regressions of policy support on the experimental treatment is conducted,

including political orientation and its interaction with treatment as covariates (Hypothesis 3). Results are presented in Table 2.3.

Table 2.3. OLS regressions on climate change mitigation policy support scale.

Independent variables	1	2	3	4	5
Treatment	0.002	0.327**	0.200†	0.048	0.042
Reactance		-0.637***	-0.471***	-0.483***	-0.474***
Right-leaning			-0.932***	-1.326***	-1.328***
Right-leaning X Treatment				0.453*	0.464*
Male					-0.092
Age					-0.003
F	0.00	116.75	149.70	113.89	76.44
Adjusted R^2	-0.001	0.216	0.347	0.350	0.350

†p<0.10, *p<0.05, **p<0.01, ***p<0.001
Treatment is a binary variable set to 1 for any experimental condition and 0 for the control condition, right-leaning is a binary variable set to 1 for right-leaning and 0 for left-leaning; 3 respondents who refused to indicate lean are not included. Reactance is a continuous Poisson-distributed scale. Age is in years and male is set to 1 for male, 0 for female.

The series of regressions demonstrates that treatment has a significant positive effect on policy support, but only after reactance is taken into account (Table 2.3 column no. 2). For the sample as a whole, the experimental treatment does not appear to influence policy support directly, only indirectly through reactance. After taking into account reactance, being in one of the experimental treatments increases policy support among those who are right-leaning (i.e., the interaction of political orientation with treatment is significant, while the main effect of treatment is essentially null). Examining this significant positive interaction of political orientation with treatment reveals that the observed treatment effect is only among right-leaning respondents. In the most parsimonious model (Table 2.3, column no. 4), the interaction has a net effect on right-leaning respondents of increasing the policy support measure by 0.453 vs. the control condition, controlling for reactance (Figure 2.4). This corresponds to half the distance between any two points on the rating scale, e.g. a move halfway from “slightly agree” to “agree.” The effect of treatment

with a threatening climate change ad, after taking into account reactance, is to move right-leaning respondents from an average of “slightly disagree” to not significantly different from zero, the scale midpoint between “slightly agree” and “slightly disagree.”

Controlling for reactance reveals an effect of treatment on right-leaning respondents, and Hypothesis 3 established that right-leaning respondents experienced higher levels of reactance than left-leaning respondents, and especially so in response to treatment with an experimental condition. The coefficients in Model 4 (Table 2.3, column no. 4) predict that when reactance is equal to 1, the negative effects of reactance cancels out the gains to policy support from the treatment effect on right-leaning respondents. 29% (n=76) of right-leaning respondents had reactance scores greater than 1, with only one of these (0.38%) in the control condition.

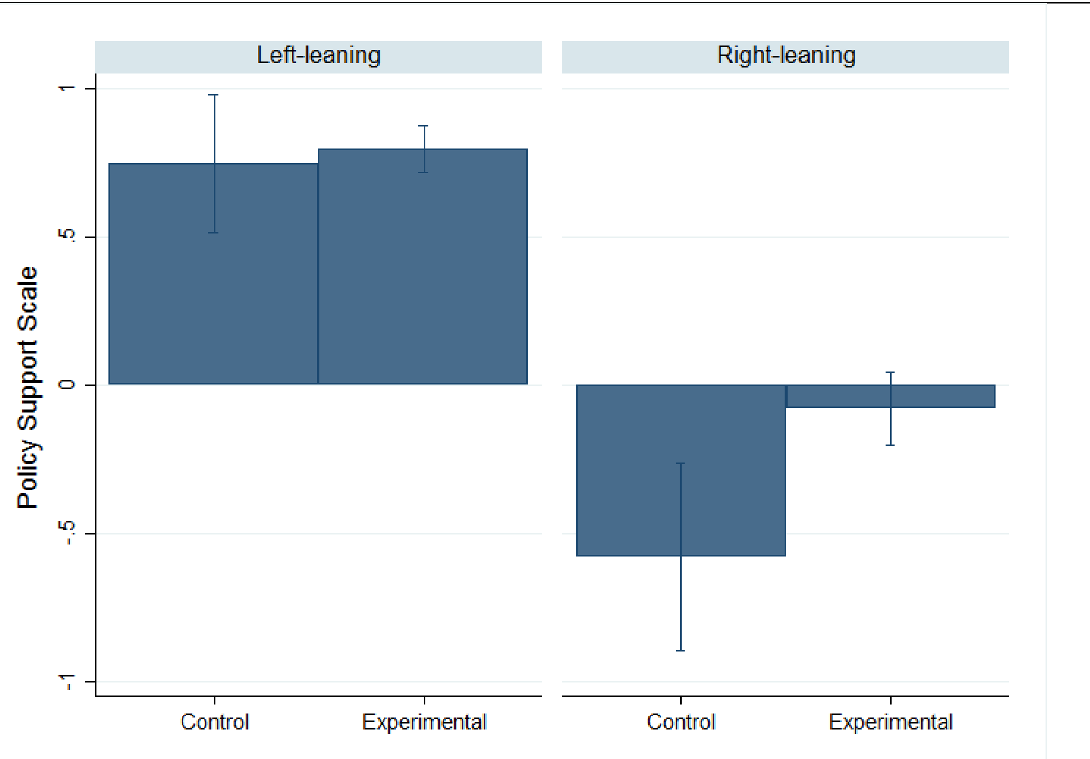


Figure 2.4. Treatment effects on policy support by political orientation
Predicted values controlling for reactance

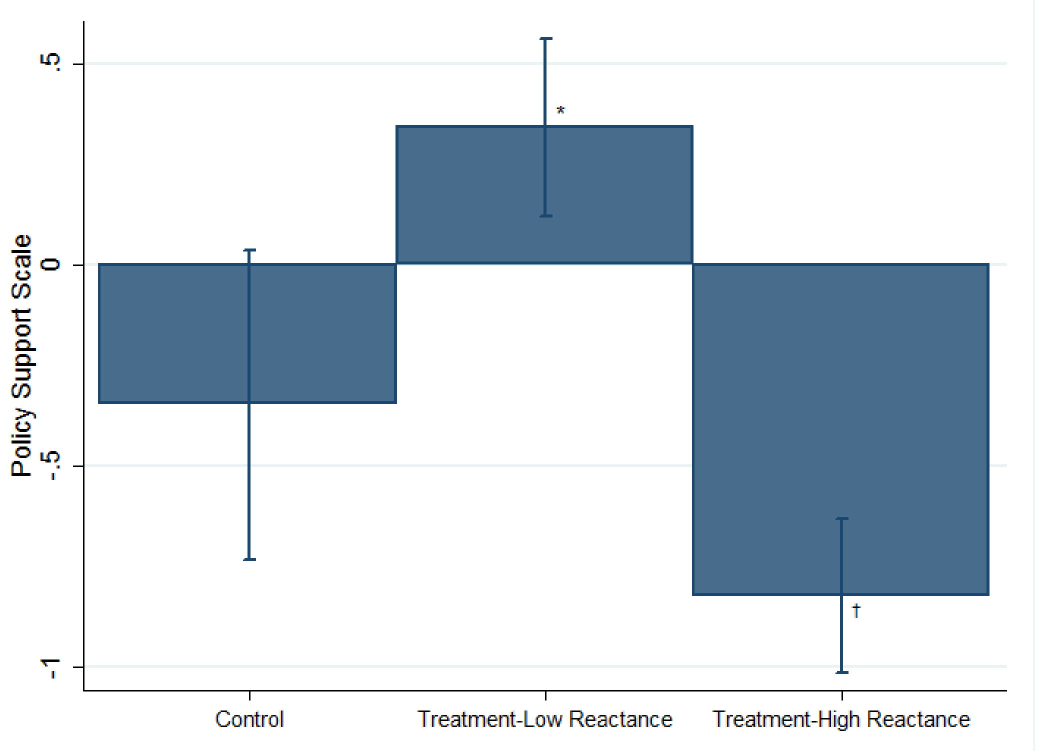
To illustrate the effect of reactance on policy support among right-leaning respondents who view a climate change fear appeal, right-leaning respondents are dichotomized into high- and low-reactance groups. The groups are cut at the median of less than or equal to 0.6 (mean reactance=0.155, sd=.169, n=131), and greater than 0.6 (mean reactance= 1.878, sd= 1.109, n=132). The control condition for right-leaning respondents has a mean reactance of 0.155, standard deviation of 0.292, and n=33. The difference between the high-reactance and low-reactance groups under treatment is significant in a 3-group ANOVA, ($F_{(2,262)}=30.64$, $p<0.0001$). The difference between groups under treatment amounts to just over 1 standard deviation in the policy support scale, generally considered a large effect (Cohen, 1992). The differences between the high-reactance group, low-reactance group, and control are evaluated using Tukey's test of honestly significant differences. Low reactance vs. control is significant (contrast=0.689, p=0.007, 95% CI 0.158 to 1.221). High reactance vs. control is significant at $p<0.10$ (contrast=-0.477, p=0.077, 95% CI -0.991 to 0.039). These differences are presented in Figure 2.5. The movement of the high-reactance half of right-leaning respondents under treatment to levels of policy support lower than the mean of right-leaning respondents in the control condition represents a classic boomerang effect (Byrne & Hart, 2009; Hart, 2014), in support of Hypothesis 4a.

2.4.5 *Combining H3 and H4a in a Test of Moderated Mediation*

Hypothesis 3 established that the level of reactance from treatment is a function of political orientation. This relationship is an example of political orientation moderating the relationship between treatment and reactance: treatment results in significantly lower levels of reactance for left-leaning than right-leaning respondents (Baron & Kenny, 1986).

Further, evaluation of Hypothesis 4 demonstrates that for right-leaning respondents, reactance is strongly associated with decreased policy support. Since reactance is hypothesized as

a result of treatment, is strongly associated with treatment, and treatment was randomized, causality can be inferred with greater confidence than with correlational data (Kraemer, Wilson, Fairburn, & Agras, 2002; Muller, Judd, & Yzerbyt, 2005; Shrout & Bolger, 2002).



†p<0.10, *p<0.05 difference from control, Tukey's honestly significant difference test

Figure 2.5. Influence of reactance on right-leaning respondents in treatment conditions vs. control.

The resultant model is a case of moderated mediation, "when the strength of an indirect effect depends on the level of some variable" (Preacher, Rucker, & Hayes, 2007, p. 193). In this case the strength of the effect of treatment on policy support via reactance (the indirect effect) depends on political orientation (the moderator). Reactance decreases policy support among both left- and right-leaning respondents, but more so for right-leaning respondents.

The classic approach to mediation is from Baron & Kenny (1986). According to this approach, mediation is established by first finding a significant relationship between the dependent

variable and the independent variable (path *c* in Figure 2.6 panel I). Then, in two regressions, a) the mediator is regressed on the independent variable and b) the dependent variable is regressed on both the independent variable and the mediator. These relationships are diagrammed as paths *a, b* and *c'* in Figure 2.6 panel II. Classically, mediation is confirmed if the product of the indirect coefficients, *ab*, is significant and *c'* is smaller than *c*.

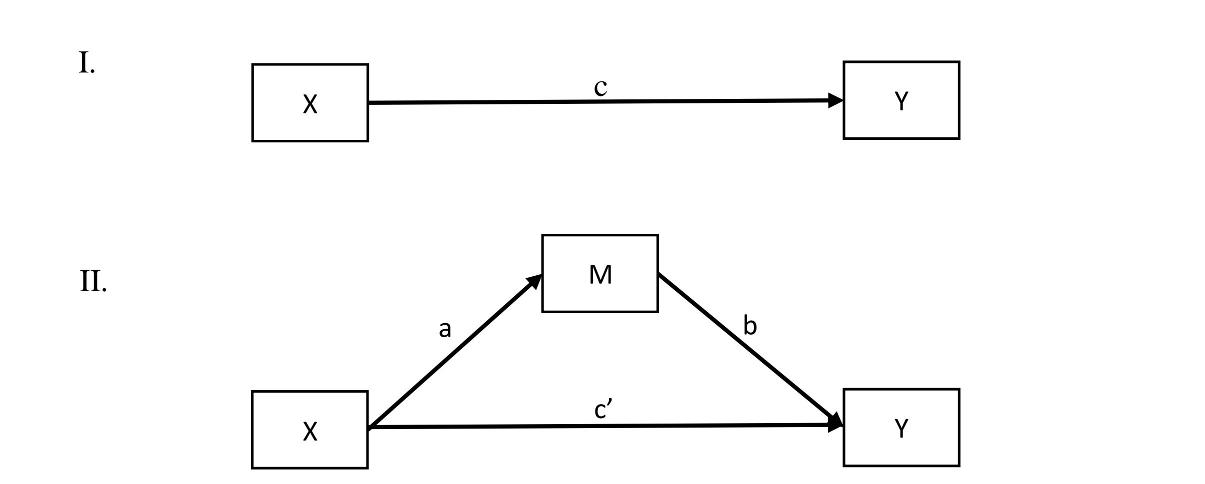


Figure 2.6. Mediation after Baron & Kenny (1986).

But what if path *a* is positive and path *b* is negative, or vice-versa? The possibility that a mediator can serve as a *suppressor* has been raised in critiques of Baron & Kenny's (1986) requirement that there be a significant relationship between the independent variable and the dependent variable (Rucker, Preacher, Tormala, & Petty, 2011; Shrout & Bolger, 2002; Zhao, Lynch Jr., & Chen, 2010). Rather, these critiques hold, only the indirect effect must be significant.

Testing for a significant indirect effect is problematized by the Poisson distribution of reactance, the candidate for mediator, because indirect effects are often estimated with models that assume normal distributions, such as structural equation models. However, with large sample sizes

and bootstrapped standard errors the *ab* term is still a reliable estimate of the indirect effect for Poisson-distributed variables (Coxe & Mackinnon, 2010).

A generalized structural equation test of moderated mediation evaluates the moderated mediation hypothesis generated from Hypotheses 3 and 4a. As the product of coefficients is not normally distributed even when the mediator is (Preacher et al., 2007), standard errors are bootstrap estimated with 5,000 replications as a check on robustness. The model is also run as a standard structural equation model with the reactance measure square-root transformed. Results are reported in

Table **2.4**. The model supports reactance as a suppressing mediator moderated by political orientation. Both the Poisson GSEM and the square-root-transformed SEM models indicate a suppression effect of reactance on mitigation policy support different from zero for both right- and left-leaning respondents. The central estimates of the indirect effects indicate reactance has approximately two to two and one-half times the suppression effect on right-leaning respondents as on left-leaning respondents. The full model is presented in Appendix 2D.

Table 2.4. Indirect effect estimates of treatment on policy support via reactance as mediator, moderated by political orientation.

Moderator	Indirect Effect	95% CI (normal)		95% CI (bootstrap)	
GSEM using Poisson regression to predict reactance					
Left-leaning	-0.169	-0.305	-0.032	-0.299	-0.039
Right-leaning	-0.367	-0.611	-0.123	-0.597	-0.138
SEM using square-root-transformed reactance measure					
Left-leaning	-0.042	-0.079	-0.005	-0.077	-0.007
Right-leaning	-0.103	-0.183	-0.022	-0.179	-0.026

2.4.6 *H4b: Reactance and Donation Behavior*

Respondents received a \$0.10 “bonus” payment near the end of the survey and could elect to donate some or all of that amount. At least \$0.01 was donated by 29.4% (n=247) of the sample. 33.0% (n=190) of left-leaning respondents gave at least \$0.01 versus 21.5% (n=57) of right-leaning respondents (**Table 2.5**). This difference is significant (Pearson’s χ^2 (2, n=841)=21.753, p=0.001).

A test of independence of only those who gave crossing political orientation (left- vs. right-leaning) with organization type (contrarian vs. mitigation) is significant (Pearson’s χ^2 (1, n=247)=12.435, p<0.001.). Unsurprisingly, left-leaning respondents are more likely to donate to mitigation organizations, with 82.5% (n=151) of those who gave choosing climate mitigation organizations. While right-leaning respondents are more likely than left-leaning respondents to donate to contrarian organizations, against expectations a majority of donations from right-leaning respondents (56.1%, n=32) were to mitigation organizations.

Table 2.5. Donation behavior by political orientation.

Donation choice		Left-leaning	Right-leaning	Total
Contrarian organization	n	39	25	64
(Mean donation \$0.078, SD	row %	(60.9%)	(39.1%)	(100%)
\$0.029)§	col %	(6.8%)	(9.4%)	(7.6%)
Mitigation organization	n	151	32	183
(Mean donation \$0.077, SD	row %	(82.5%)	(17.5%)	(100%)
\$0.029)§	col %	(26.2%)	(12.1%)	(21.8%)
No donation	n	386	208	594
	row %	(65%)	(35%)	(100%)
	col %	(67.0%)	(78.5%)	(70.6%)
Total	n	576	265	841
	row %	(68.5%)	(31.5%)	(100%)
	col %	(100%)	(100%)	(100%)

Pearson’s χ^2 (2)=21.753, p<0.001.
§No significant differences between organizations in donation amount by political orientation among those who gave, p=0.99 (left-leaning) and p= 0.28 (right-leaning)

Donated amounts are "lumpy" with many respondents electing to give $0.05 (28% of all donations, n=69) or $0.10 (59.35% of all donations, n=146). Because of this non-normal distribution, donations are dichotomized as a choice to donate at least $0.01 or not. Even then, the sample is low in power to test Hypothesis 4b, as a total of 25 right-leaning respondents gave to a contrarian organization. This sample limits the ability to perform multivariate analysis, especially to test interaction effects already established in earlier hypothesis testing.

To evaluate the hypothesis that reactance leads right-leaning respondents to give to contrarian organizations, the decision to give to either a contrarian or mitigation organization is modeled as a two-step sequential logistic process.[9] First, the respondent must decide whether to make a donation or keep the bonus payment. Next, the respondent must choose between giving to a contrarian organization or a mitigation organization. The model is diagrammed in the top panel of Table 2.6.

Results are presented in Table 2.6 below the model diagram. Political orientation, sex, and reactance are significant predictors of the choice to donate some vs. keep all of the bonus payment. The odds of donating for right-leaning respondents are 37.4% less than the odds of left-leaning respondents, holding constant age, treatment, sex, and reactance. Male respondents have 30.4% lower odds of donating than females, holding constant political orientation, age, treatment, and reactance. An increase of 1 in the reactance score is associated with a 29.2% decrease in the odds of making a donation, holding constant all other covariates.

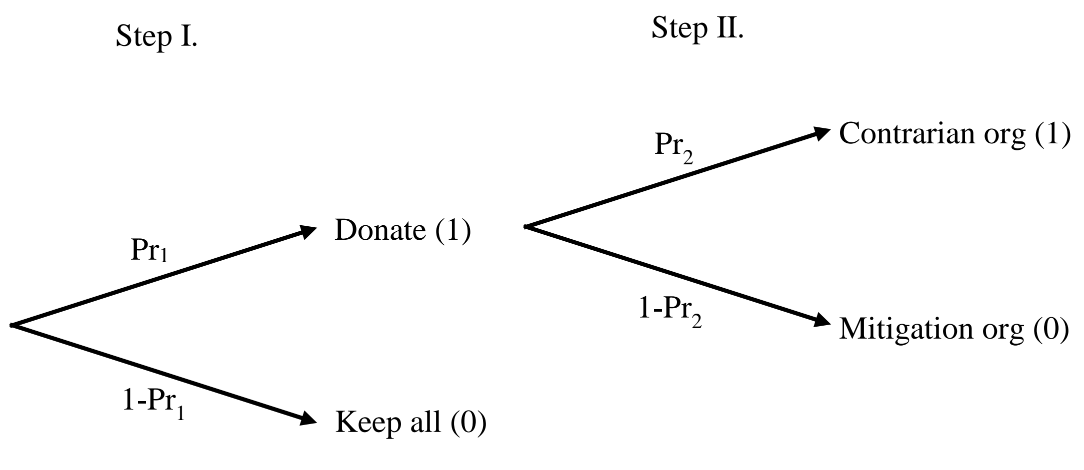
Only political orientation is a significant predictor of the choice between contrarian and mitigation organizations in the second step, with the odds of right-leaning respondents donating to

[9] Since the choice of organization was presented simultaneously with the choice to donate, it is possible that respondents did not consider the decision sequentially but rather as a choice among three options. In that case, a multinomial logit model is more appropriate. Multinomial logistic results are included in Appendix 2E.

a contrarian organization 311% higher than for left-leaning respondents, controlling for treatment, age, sex, and reactance. The coefficient on reactance is in the hypothesized direction but is not significant, leaving Hypothesis 4b not supported.

These results again suggest reactance is a suppressing mediator moderated by political orientation. Given the Poisson distribution of the reactance variable and the binary distribution of the outcome, paired with the relatively small number of decisions to donate, there is not sufficient power to estimate the indirect effect of mediation by reactance conditional on political orientation. The evaluation of reactance from Hypothesis 4a is repeated and presented in Table 2.7. Results should be interpreted cautiously because of the low power, but again reactance plays a robust role in suppressing the influence of treatment on outcomes, in this case the decision to donate to any

Table 2.6. Sequential logistic regression of the choice to donate followed by choice of organization.



Variable	Odds Ratio Step I	Odds Ratio Step II
Right-leaning	0.626*	3.113**
Treatment	0.893	0.878
Age	1.011†	0.987
Male	0.696*	0.972
Reactance	0.708**	1.246
Model Likelihood Ratio	$\chi^2(10) = 46.45$, $p<0.001$	

†p<0.10, *p<0.05, **p<0.01, ***p<0.001

organization. Adding covariates diminishes the role of reactance as a suppressor only slightly; in

the final model (Table 2.7, column 5) an increase of 1 in the reactance score decreases the odds of making a donation by 28.8%, holding constant all other covariates. Another finding in common with the sequential logistic regression model is that men are less likely to donate than women, with the odds of a man making a donation 30.3% lower than the odds of a woman.[10]

This result does not suggest Hypothesis 4b is occurring at levels too low to be statistically significant, as even donations to contrarian organizations are included as a decision to donate for the regressions in Table 2.7. Rather, it suggests that reactance is suppressing, or 'turning off', a desire to donate, regardless of political orientation.

Table 2.7. Logistic regressions on decision to donate to any organization (1) vs. none (0). Coefficients are odds ratios.

Independent variables	1	2	3	4	5
Treatment	0.812	0.986	0.932	1.001	0.957
Reactance		0.647***	0.692**	0.696**	0.712**
Right-leaning			0.653*	0.796	0.758
Right-leaning X Treatment				0.793	0.798
Male					0.697*
Age					1.011†
Model Likelihood Ratio χ^2	0.78	17.89***	23.64***	23.85***	33.13***
Pseudo R^2	0.001	0.017	0.023	0.023	0.033

†p<0.10, *p<0.05, **p<0.01, ***p<0.001

Treatment is a binary variable set to 1 for any experimental condition and 0 for the control condition, right-leaning is a binary variable set to 1 for right-leaning and 0 for left-leaning. Reactance is a continuous Poisson-distributed scale. Age is in years and male is set to 1 for male, 0 for female.

2.4.7 *Further observations on donations*

In addition to being more generous overall, left-leaning respondents were almost as likely as right-leaning respondents to give to contrarian organizations (Table 2.8, both panels). There

[10] The series of regressions invites further investigation of a sex X reactance interaction. A nearly significant (p=0.052) interaction effect exists when added to the final model (**Table 2.7**, column 5), rendering all other effects not significant. This is taken as suggestive that sex may moderate suppression by reactance such that men will experience reactance more often or more intensely than women, and higher reactance in turn negatively affects donations.

were no significant differences in giving based on the climate mitigation organization respondents were presented with (Pearson's χ^2 (4, n=841)=0.5213, p=0.971). But donations did vary depending on the contrarian choice presented across the entire study population (Pearson's χ^2 (4, n=841)=10.468, p=0.033). Further investigation revealed the relationship was significant for left-leaning (Pearson's χ^2 (4, n=576)=10.192, p=0.037, Table 2.8 top panel) but not right-leaning respondents (Pearson's χ^2 (4, n=265)=5.014, p=0.286, Table 2.8 lower panel). Left-leaning respondents may not have discriminated carefully between the choices they were given.[11] Further investigation of determinants for right-leaning respondents to donate to mitigation organizations would be useful.

[11] More detailed analysis of choices by left-leaning respondents is presented in Appendix 2E.

Table 2.8. Donation behavior by political orientation and contrarian group option.

I. Left-leaning respondents		Contrarian organization choice presented			Total
		Climate Depot	Global Warming.org	NIPCC	
Contrarian organization	n	5	20	14	39
	row %	(12.8%)	(51.3%)	(35.9%)	(100.0%)
	col %	(2.6%)	(10.3%)	(7.5%)	(6.8%)
Mitigation organization	n	57	49	45	151
	row %	(37.8%)	(32.5%)	(29.8%)	(100.0%)
	col %	(29.2%)	(25.3%)	(24.1%)	(26.2%)
No donation	n	133	125	128	386
	row %	(34.5%)	(32.4%)	(33.2%)	(100.0%)
	col %	(68.2%)	(64.4%)	(68.5%)	(67.0%)
Total	n	195	194	187	576
	row %	(33.9%)	(33.7%)	(32.5%)	(100.0%)
	col %	(100.0%)	(100.0%)	(100.0%)	(100.0%)

Pearson's χ^2 (4)=10.1915, p=0.037.

II. Right-leaning respondents					
Contrarian organization	n	7	12	6	25
	row %	(28.0%)	(48.0%)	(24.0%)	(100.0%)
	col %	(8.1%)	(13.8%)	(6.5%)	(9.4%)
Mitigation organization	n	9	8	15	32
	row %	(28.1%)	(25.0%)	(46.9%)	(100.0%)
	col %	(10.5%)	(9.2%)	(16.3%)	(12.1%)
No donation	n	70	67	71	208
	row %	(33.7%)	(32.2%)	(34.1%)	(100.0%)
	col %	(81.4%)	(77.0%)	(77.2%)	(78.5%)
Total	n	86	87	92	265
	row %	(32.5%)	(32.8%)	(34.7%)	(100.0%)
	col %	(100.0%)	(100.0%)	(100.0%)	(100.0%)

Pearson's χ^2 (4)=5.014, p=0.286.
Participants were presented with the choice to donate to a pro-climate change mitigation organization [Beyond Coal, The Center for Climate and Energy Solutions (C2ES), and 350.org, randomly assigned] or a contrarian organization (shown below, also randomly assigned) or not to donate.

2.5 CONCLUSIONS

Exposure to a threatening message about climate change increased support for climate change mitigation policy relative to the control condition for only a small proportion of the sample, offset

by boomerang effects away from support for mitigation policy. Reactance also decreased donations to climate change mitigation organizations vs. an irrelevant control condition. This boomerang effect is predicted by *reactance* to the message, that is, backlash against the recommended response, measured as counterarguments. Reactance suppresses the effect of treatment conditional on political orientation: Right-leaning respondents who experience higher levels of reactance to a climate change fear appeal are significantly more in opposition to mitigation policy than those with lower levels of reactance. In contrast, left-leaning respondents exhibit lower levels of reactance to climate change fear appeals overall, and among left-leaning respondents reactance does not significantly dampen policy support. This research suggests few gains are to be made from climate change fear appeals such as those tested in this study.

The observed boomerang effect among some right-leaning respondents represents a potential cause of polarization on climate change beliefs. Repeated exposure to threatening messages about climate change may have contributed to the observed polarization of the American public on climate science and mitigation policy (Dunlap & McCright, 2008; McCright & Dunlap, 2011b).

The observed boomerang finding is also consistent with the cultural cognition hypothesis (Kahan & Braman, 2006), which argues that people perceive the costs or benefits of policy through the lens of their cultural group's values, not on the scientific or other merits of the policy debate. Previous work in cultural cognition has focused on the role of gender and race in creating low risk perceptions among white men (Kahan, Braman, Gastil, Slovic, & Mertz, 2007) and specifically the climate change skepticism of white male conservatives (McCright & Dunlap, 2011a). This study does not consider race, but conservatives and males show higher rates of reactance to

treatment and lower levels of policy support than liberals and women. Conservatives and males were also less likely to donate to any climate-related organization.

The theory of cultural cognition may help to explain why reactance was observed to all treatment conditions without the hypothesized variation between conditions. Two message features were common across experimental conditions: 1) a threatening message that climate change should be feared and 2) a response efficacy message that "reducing the use of fossil fuels and increasing renewable energy will make a difference." Perhaps the fear appeal is responsible for generating reactance, or perhaps the renewable energy message sends a cultural or socio-political signal (Kahan et al., 2011; McCright, Dentzman, Charters, & Dietz, 2013). The distance manipulation varied images of hurricane wind and storm surge damage to New Jersey and the Philippines. But perhaps both images had a similar effect on reactance, as some respondents in each of the distance conditions perceived the graphic portrayal of destruction as an attempt to manipulate their beliefs. The effects of these messages are explored further in the next chapter.

This research makes several contributions to our understanding of the role of reactance in climate change communication. Treatment across all experimental conditions generated higher levels of reactance than the control condition. Limitations in experimental effects do not allow attribution of the cause of reactance to any particular element of the ad (i.e., to what extent reactance was generated by the fear appeal nature of the ads, the mention of climate change, renewable energy, or some other ad component). But the combined effect suggests that to the extent that these ads are representative of threatening climate change messages, the boomerang effects from reactance outweigh any potential positive influence of climate change fear appeals on policy support.

This research has several further implications for policy. First, climate change communications should be carefully pre-tested before launch (Kahan, 2014; Moser, 2010), including for reactance. Reactance as measured in this study appears to be a robust measure of message rejection, with suppression effects on attitudes and behaviors. This study demonstrates that reactance may have an effect that disguises a polarizing communication as one with null findings or no attitude change. It would also be conceivable that a polarizing communication could display a small effect in the intended direction while still boomeranging with a significant portion of the audience. Message pre-testing should therefore include an evaluation of reactance to forestall any such polarizing effects.

Further work should investigate which message elements are likely to increase reactance so they might be avoided. Research has most often manipulated reactance by presenting varying levels of “threat to choice,” manipulated by varying the level of forceful language about the action recommendation (Quick et al., 2012; Quick & Stephenson, 2007). This research did not include a deliberate threat to choice manipulation but clearly generated greater levels of reactance among treatment conditions vs. control. It is unclear what message elements may have represented such a threat to choice in this experiment.

Study conclusions may be limited by the non-representative nature of the sample. Amazon MTurk populations have been criticized for “gaming” in an attempt to earn payments quickly with an absolute minimum of effort (Downs, Holbrook, Sheng, & Cranor, 2010) and “nonnaïveté” or “savviness” among experienced MTurk respondents who take multiple surveys and may expect an experimental manipulation (Chandler, Mueller, & Paolacci, 2014; Krupnikov & Levine, 2013). But MTurk workers have been found to be more representative of the US population than student or other convenience samples (Berinsky et al., 2012) and gaming effects can be controlled, as in

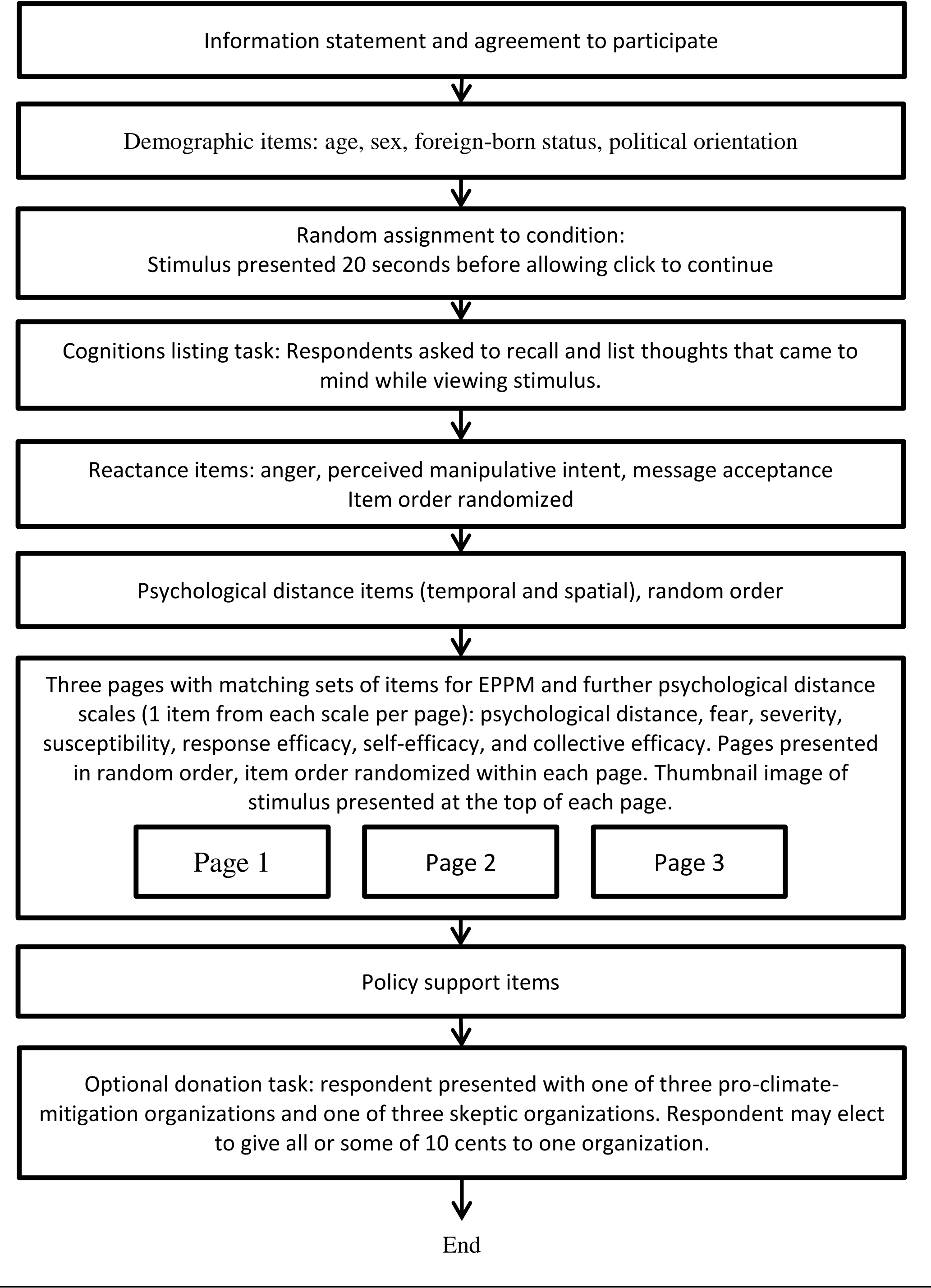
this study, by including quality assurance or attention-check questions (Mason & Suri, 2012). Further research on samples representative of U.S. and other populations would be valuable for estimating the size and relevance of the observed effects.

Evidence from health and environmental risk communications implies climate change communications should be most effective if carefully tailored and targeted to reach the audience segment most likely to adopt the recommended behaviors (Bostrom et al., 2013). This research indicates a climate change fear appeal could increase support for climate change mitigation policies among right-leaning respondents if it targeted only those unlikely to experience reactance. But the demonstrated boomerang effect of reactance on desired outcomes means a poorly targeted message might do more harm than gain by further polarizing preferences. Messages targeted to maximum benefit but designed to generate less reactance overall would involve less risk in a communication campaign than directly confronting the beliefs of right-leaning respondents dismissive of climate science or mitigation policy (Roser-Renouf, Stenhouse, Rolfe-Redding, Maibach, & Leiserowitz, 2015).

The next chapter applies the EPPM to the advertisement stimuli used in this study to examine the role of psychological distance and the presence of specific efficacy messages on attitudes and mitigation policy support.

Appendix 2A. Survey Instrument.

Survey instrument organization.



Consent Statement

University of Washington
Research Consent Form
Opinions about Advertising

Researchers: Tim Scharks, PhD Candidate (faculty advisor Dr. Ann Bostrom).

Researchers' Statement: We are asking you to be in a research study. The purpose of this consent form is to give you the information you will need to help you decide whether to be in the study or not. Please read it carefully. You may ask questions about the purpose of the research, what we would ask you to do, the possible risks and benefits, your rights as a volunteer, and anything else about the research or this form that is not clear. When we have answered all your questions, you can decide if you want to be in the study or not. This process is called "informed consent."

Purpose of the Study: This study is measuring what people like you think about different types of advertising messages.

Study Procedures: This online survey should take about 15 minutes. There are mostly multiple choice questions and one open-ended question. There are no right or wrong answers; we are interested in your own thoughts and opinions. Please answer the questions in the order in which they appear. You may refuse to answer any item.
Your name will not be associated with any of your answers, only your MTurk Worker ID. We will record your device's IP address to determine the approximate geographic location (city or state) from which you completed the survey because we are interested to learn whether responses differ based on what region of the country people live in.

If you contact us with your MTurk Worker ID it would be possible to associate your email and name with your answers, so if you wish to remain anonymous you should not reference your MTurk Worker ID in any email. Summary results will be available a few weeks after the study closes; please contact us at the email listed below if you wish to learn more about our study and the results.

Risks, Stress, or Discomfort: You will view and read a printed advertisement and then answer questions about your thoughts, attitudes, and beliefs. We believe the experience, including any discomfort or stress, would be similar to what you would encounter from viewing an advertisement in a magazine or newspaper. In the event of a research-related injury, contact Tim Scharks at tims2@uw.edu.

Benefits of the Study: Your participation in the study will help to advance our scientific understanding of how people perceive advertising and some of their opinions on important topics. It may bring you some insights into how you view different types of advertisements. You will be compensated $0.75 by Mturk.com for successfully completing the survey.

Other Information: Participation is voluntary. You may refuse to participate and you are free to withdraw from this study at any time without penalty or loss of benefits to which you are otherwise entitled.

Contact Information: If you have any questions about participating, please contact researcher Tim Scharks via email at tims2@uw.edu and wait for a response before deciding whether you wish to continue with this study. You may also contact us via this email if you have questions, concerns, or complaints while participating or afterwards. If you would like to contact an independent representative of the University of Washington about this research, please can call the Human Subjects Division at (206) 543-0098.

Please select "Yes" below if you agree to participate and wish to continue. If you do not agree to participate, please close this browser window now.

Do you wish to continue?

O Yes.

Demographic Questions	varname
What is your age? ___	age
Generally speaking, do you think of yourself as a...	
Republican	
Democrat	
Independent	
Another party, please specify:	
No preference	
Which best describes your status in the United States?	usborn
I was born in the United States.	1
I was born outside the United States but am now a citizen or permanent resident.	2
I am in the United States on a temporary basis (e.g., work or student visa)	3
Please select your gender.	male
Male	1
Female	0
In general, do you think of yourself as...	ideology
Extremely liberal	1
Liberal	2
Slightly liberal	3
Moderate, middle of the road	4
Slightly conservative	5
Conservative	6
Extremely conservative	7
Question logic on new page following political orientation question	xparty7
For those who answered “Republican”	
You answered "Republican". Would you call yourself a...	
Strong Republican	1
Not very strong Republican	2
For those who answered “Democrat”	
You answered "Democrat". Would you call yourself a...	
Strong Democrat	7
Not very strong Democrat	6
For those who answered “Independent/Another party/No preference”	
You answered [“Independent”/”Another party”/”No preference”]. Do you think of yourself as closer to the…	
Republican Party	3
Democratic Party	5
[skipped unanswered]	4

Stimulus presentation

Respondent randomly assigned to 1 of 9 conditions (8 experimental, 1 control; see Figure 2.1). Image presented with text "Please take a few moments to consider the message displayed here." Respondents are not allowed to continue with survey until 20 seconds has elapsed.

Reactance measures I. Thought-listing task

We are interested in what you were thinking about while looking at the advertisement. There are no right or wrong answers, and every thought you have is relevant. Simply list what you were thinking while the ad was presented, the first idea you had in the first box, the second idea in the second box, and so on.

This is the only question in this survey requiring typing.

You will have 1-1/2 minutes to write your thoughts.

1.
2.
3.
4.
5.
6.
7.
8.
9.
10.

Reactance measures II. Scales

[presentation of items randomized across respondents]

Thank you. Now we have a few questions about what you thought or how you felt while viewing and reading the ad.

To what extent did you feel angry? [anger1]

Not at all angry	A little angry	Somewhat angry	Very angry
O	O	O	O

To what extent did you feel irritated? [anger2]

Not at all irritated	A little irritated	Somewhat irritated	Very irritated
O	O	O	O

To what extent did you feel annoyed? [anger3]

Not at all annoyed	A little annoyed	Somewhat annoyed	Very annoyed
O	O	O	O

To what extent did you feel the ad is persuasive? [accept1]

Not at all persuasive	A little persuasive	Somewhat persuasive	Very persuasive
O	O	O	O

To what extent did you feel the ad is convincing? [accept2]

Not at all convincing	A little convincing	Somewhat convincing	Very convincing
O	O	O	O

To what extent did you feel the ad tried to manipulate you? [manipulate1]

Did not try at all	Tried a little	Tried somewhat	Tried a lot
O	O	O	O

To what extent did you feel the ad tried to make a decision for you? [manipulate2]

Did not try at all	Tried a little	Tried somewhat	Tried a lot
O	O	O	O

To what extent did you feel the ad tried to pressure you? [manipulate3]

Did not try at all	Tried a little	Tried somewhat	Tried a lot
O	O	O	O

Climate change items I.

Thank you. The next questions ask your opinions on climate change.

[Re-presentation of stimulus as thumbnail image, centered at top of page (experimental conditions only; control condition presents the phrase, “The questions on this page ask for your views on climate change.”]

When, if at all, do you think climate change will start to harm people?

1-It already has	2	3	4	5	6	7-It never will
O	O	O	O	O	O	O

How close to you or far from you are the effects of climate change?

1-Very close to me	2	3	4	5	6	7-Very far from me
O	O	O	O	O	O	O

Climate change items II (EPPM constructs).

[Re-presentation of stimulus as above, items divided into three blocks of eight items each, blocks presented in random order and items randomized within blocks.]

Please rate the extent to which you agree or disagree with the following statements:

	varname
My local area is likely to be affected by climate change.	spatial2
Climate change scares me.	fear1
I believe that climate change is significant.	sev1
The effects of climate change will impact me personally.	sus1
Limiting the use of fossil fuels and increasing renewable energy will lessen climate change.	reff1
I am able to limit climate change.	seff1
I am confident we can all work together to lessen climate change.	ceff1
Without regard to climate change, please do not select any answer for this row.	qc1
Climate change is likely to have a big impact on people like me.	social1
I am frightened of the effects of climate change.	fear2
I believe that climate change is serious.	sev2
It is possible that I will be affected by climate change.	sus2
The effects of climate change will be reduced by reducing the use of fossil fuels and increasing renewable energy.	reff2
My actions can contribute to lessening the effects of climate change.	seff2
Climate change can be reduced by our collective efforts.	ceff2
Please indicate your careful reading of this survey by leaving this row unanswered.	qc2
Climate change will impact the area I live.	spatial3
Thinking about climate change makes me anxious.	fear3
I believe that climate change is severe.	sev3
It is likely that I will be affected by climate change.	sus3
Switching to renewable energy from fossil fuels will be effective at reducing climate change.	reff3
It's easy for me to support policies preventing climate change.	seff3
If we act collectively, we will be able to minimize climate change.	ceff3
For quality control purposes please select the second bubble.	qc3

Scale:

Strongly Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Strongly Agree
O	O	O	O	O	O	O

Policy support items.

[items presented in random order]

Some policies have been proposed to reduce climate change. Please rate the extent to which you support or oppose each policy.

	varname
Increase taxes on gasoline by 25 cents per gallon and return the revenues to taxpayers by reducing the federal income tax.	policy1
Sign an international agreement committing the United States and other countries to cut carbon dioxide emissions 90% by the year 2050.	policy2
End tax breaks and other subsidies supporting the production of fossil fuels like oil and coal.	policy3
Add an extra charge to electrical bills to establish a fund to help make buildings more energy efficient and to teach US citizens how to reduce energy use.	policy4
Require electric utilities to produce at least 20% of their electricity from renewable energy sources.	policy5
Show your careful attention to this survey by selecting the somewhat support choice regardless of your policy views.	qc4

Scale:

Strongly Oppose	Oppose	Somewhat Oppose	Somewhat Support	Support	Strongly Support
O	O	O	O	O	O

Donation choice

Thank you for your careful attention to this survey!

You've been awarded a 10-cent bonus.

We want to give you the opportunity to donate all or part of your bonus payment to a cause you believe in.

Below are descriptions of two nonprofit organizations, presented in random order. The descriptions are taken from Wikipedia. You may choose to support ONE of the two organizations with all or part of your 10-cent bonus.

You may donate some or all of your bonus to one of these organizations.

[one climate change contrarian organization, one climate change mitigation organization, randomly selected and presented in random order; organizations presented on next pages]

Would you like to donate some of the bonus to one of these organizations?

- ○ Yes, to [Organization A]
- ○ Yes, to [Organization B]
- ○ No, I would like to keep all of the bonus for myself.

Contrarian organizations

CLIMATE DEPOT

Climate Depot is a project of The Committee for a Constructive Tomorrow (CFACT), a conservative Washington, D.C.-based non-profit organization. CFACT co-founder Craig Rucker states that mankind faces a threat "not from man-made global warming, but from man-made hysteria." Donations will go to CFACT.

NIPCC

Nongovernmental International Panel on Climate Change

The “Nongovernmental International Panel on Climate Change” is a group that disputes the positions of the United Nations Intergovernmental Panel on Climate Change (IPCC). NIPCC a project of The Heartland Institute, an American conservative and libertarian public policy think tank. Donations will go to The Heartland Institute.

GlobalWarming.org describes itself as "focused on dispelling the myths of global warming by exposing flawed economic, scientific, and risk analysis". It is a project of the Competitive Enterprise Institute, a non-profit American, libertarian think tank that fights what it sees as excessive government regulation. Donations will go to the Competitive Enterprise Institute.

Mitigation organizations

The Beyond Coal movement is an effort created by the Sierra Club to promote alternative energy sources instead of coal-based sources. The Sierra Club is one of the most influential grassroots environmental organizations in the United States. Donations will go to The Sierra Club.

C2ES, the Center for Climate and Energy Solutions, formerly the Pew Center on Global Climate Change, is an independent, nonpartisan, nonprofit organization that addresses energy and climate change challenges.

350.org is an international environmental organization that aims to have governments adopt policies to lower carbon dioxide emissions.

Appendix 2B. Cognition Coding Instructions.

Thought Coding Instructions

Rate each comment and whether it agrees with, disagrees with, or is not relevant to the message "Climate change is something to fear because of higher storm surges, more droughts and floods, and pests spreading new diseases. Reducing the use of fossil fuels and increasing renewable energy will make a difference."

There are three rating columns. Place a number 1 in the appropriate column to rate each row, leaving the other columns blank.

Comments are presented randomly and not related to one another.

- AGREE: any statement that agrees with the message, including single words like "yes".
- DISAGREE: any statement that disagrees with, contradicts, or questions the message, including single words like "no".
- DISAGREE: any statement that criticizes/attacks the advertisement tactic, the advertiser, or others held to be responsible for the message. Include statements like "propaganda", "scare tactics", or "fear mongering."
- IRRELEVANT/CAN'T TELL: Any comment that is not immediately relevant to the message or is not clearly in agreement or disagreement with it, including single words that could be interpreted various ways.
- IRRELEVANT/CAN'T TELL: Statements questioning the message effectiveness but not disagreeing with the message, e.g. "not sure this will work".
- IRRELEVANT/CAN’T TELL: Any statements of emotional feeling, e.g. sadness, except for describing fear mongering or scare tactics as mentioned above.

Appendix 2C. Items and scales.

Items and Scales

Variable	Item	Scale	α
neg_cog	Open-ended text response listing thoughts about the ad; negative cognitions about the message (counterarguments) were counted independently by two raters	Negative cognitions	0.965
anger1 anger2 anger3	To what extent did you feel angry? To what extent did you feel irritated? To what extent did you feel annoyed?	Anger	0.841
	anger2 and anger3 only averaged	Irritate	0.906
	Counterarguments score and anger scale	Reactance	0.856
accept1 accept2	To what extent did you feel the ad is persuasive? To what extent did you feel the ad is convincing?	Message Acceptance	0.891
manip…1 manip…2 manip…3	To what extent did you feel the ad tried to manipulate you? To what extent did you feel the ad tried to make a decision for you? To what extent did you feel the ad tried to pressure you?	Perceived Manipulative Intent	0.859
anger1-manipulate3 use a 4-point item-specific response scale: not at all ____ / a little____ /somewhat ____ / very ____			
temporal spatial1 spatial2 spatial3 social1	*When*, if at all, do you think climate change will start to harm people? *1-It already has….7-It never will* How close to you or far from you are the effects of climate change? *1-Very close to me….7-Very far from me* My local area is likely to be affected by climate change. *(reverse coded)* Climate change is likely to impact the area I live. *(reverse coded)* Climate change is likely to have a big impact on people like me *(reverse coded)*	Psych. Distance	0.928
sev2 sev3	I believe that climate change is serious. I believe that climate change is severe.	Threat severity	0.960
sus1 sus2 sus3	The effects of climate change will impact me personally. It is possible that I will be affected by climate change. It is likely that I will be affected by climate change.	Threat Susceptibility	0.943
reff1 reff2 reff3	Limiting the use of fossil fuels and increasing renewable energy will lessen climate change. The effects of climate change will be reduced by reducing the use of fossil fuels and increasing renewable energy. Switching to renewable energy from fossil fuels will be effective at reducing climate change.	Response Efficacy	0.960
seff1 seff2 seff3	I am able to limit climate change. My actions can contribute to lessening the effects of climate change. It's easy for me to support policies preventing climate change.	Self-Efficacy	0.838
ceff1 ceff2 ceff3	I am confident we can all work together to lessen climate change. Climate change can be reduced by our collective efforts. If we act collectively, we will be able to minimize climate change.	Collective Efficacy	0.920
	All 9 efficacy items combined	Overall Efficacy	0.960

[continued on next page]

Items and Scales

Variable	Item	Scale	α
	Some policies have been proposed to reduce climate change. Please rate the extent to which you support or oppose each policy described below.		
policy1	Increase taxes on gasoline by 25 cents per gallon and return the revenues to taxpayers by reducing the federal income tax.	Policy Support	0.835
policy2	Sign an international agreement committing the United States and other countries to cut carbon dioxide emissions 90% by the year 2050.		
policy3	End tax breaks and other subsidies supporting the production of fossil fuels like oil and coal.		
policy4	Add an extra charge to electrical bills to establish a fund to help make buildings more energy efficient and to teach US citizens how to reduce energy use.		
policy5	Require electric utilities to produce at least 20% of their electricity from renewable energy sources.		
Quality control 1	Without regard to climate change, please do not select any answer for this.	Quality Control Missed 1 or more: 85 (12.2%)	
Quality control 2	Please indicate your careful reading of this survey by leaving this row unanswered.		
Quality control 3	For quality control purposes please select disagree.		
Quality control 4	Select the somewhat agree option in this question on climate change.		

Items spatial2-ceff3 use a 7-point response scale:
Strongly Disagree / Disagree / Somewhat Disagree / Neither Agree nor Disagree / Somewhat Agree / Agree / Strongly Agree
Scales were created by averaging constituent items with pairwise deletion of missing data.

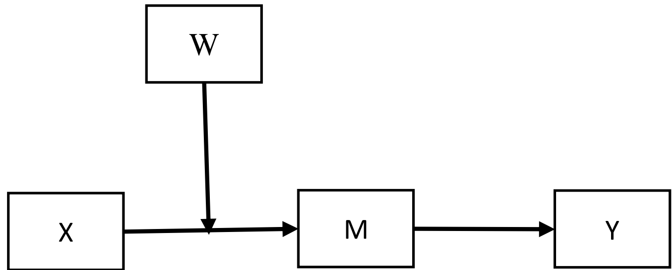
Zero-order correlations of climate change mitigation support items.

	1	2	3	4
1 Increase taxes on gasoline by 25 cents per gallon and return the revenues to taxpayers by reducing the federal income tax.	1			
2 Sign an international agreement committing the United States and other countries to cut carbon dioxide emissions 90% by the year 2050.	0.408	1		
3 End tax breaks and other subsidies supporting the production of fossil fuels like oil and coal.	0.407	0.601	1	
4 Add an extra charge to electrical bills to establish a fund to help make buildings more energy efficient and to teach US citizens how to reduce energy use.	0.548	0.450	0.373	1
5 Require electric utilities to produce at least 20% of their electricity from renewable energy sources.	0.395	0.746	0.613	0.421

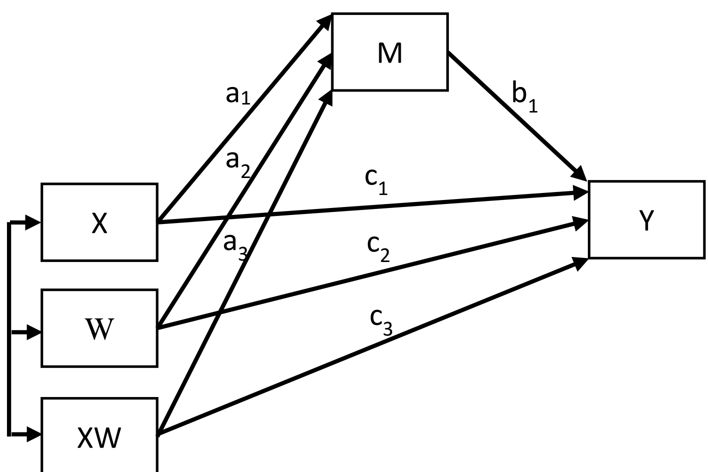
Appendix 2D. GSEM estimation of moderated mediation indirect effects

The model tested is a synthesis of H3 (treatment interacts with political orientation such that right-leaning respondents experience greater levels of reactance) with H4a (reactance decreases policy support) as a case of moderated mediation.

The model is presented in Preacher et al. (2007, p. 194) as Model 2. The basic form can be diagrammed as:



The full model relationships can be expanded as:



Where

X = independent variable (treatment)
W = moderator (political orientation)

M = mediator (reactance)

Y = dependent variable (policy support, centered and standardized)

XW = interaction of independent variable with moderator (treatment*political orientation)

Stata's gsem command for generalized structural equation modeling allows for Poisson estimates of a_1-a_3 in the following argument:

```
gsem (m <- x w wx, poisson)(y <- m x w wx mw)
```

Full model output is:

```
Iteration 0:   log likelihood = -2095.5135
Iteration 1:   log likelihood = -1926.0247
Iteration 2:   log likelihood = -1925.7555
Iteration 3:   log likelihood = -1925.7555

Generalized structural equation model             Number of obs   =        845
Log likelihood = -1925.7555

-----------------------------------------------------------------------------
-
             |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+---------------------------------------------------------------
-
m <-         |
           x |   .9242979   .3002691     3.08   0.002     .3357813    1.512815
           w |  -.2437302   .5349831    -0.46   0.649    -1.292278    .8048174
          wx |   1.086356   .5421757     2.00   0.045     .0237112    2.149001
       _cons |  -1.643339   .2936101    -5.60   0.000    -2.218805   -1.067874
-------------+---------------------------------------------------------------
-
y <-         |
           m |  -.2668084   .0678922    -3.93   0.000    -.3998746   -.1337421
           x |  -.0154007   .1248118    -0.12   0.902    -.2600272    .2292259
           w |  -1.267203   .1963502    -6.45   0.000    -1.652042   -.8823634
          wx |   .6288795   .2148985     2.93   0.003     .2076863    1.050073
          mw |  -.3296009   .0839201    -3.93   0.000    -.4940813   -.1651204
       _cons |   1.009083   .1173523     8.60   0.000     .7790766    1.239089
-------------+---------------------------------------------------------------
-
     var(e.y)|   .8159571    .039791                       .7415794    .8977946
-----------------------------------------------------------------------------
-
```

Per Preacher et al. (2007), conditional indirect effects for this model are estimated as

$(a_1+a_3*\mathrm{W})*b_1$

Since W, political orientation, is binary, conditional indirect effects are estimated for right-leaning respondents as

$(a_1+a_3)*b_1$

and for left-leaning respondents as

a_1*b_1

References:

Preacher, K. J., Rucker, D. D., & Hayes, A. F. (2007). Addressing Moderated Mediation Hypotheses: Theory, Methods, and Prescriptions. *Multivariate Behavioral Research*, *42*(1), 185–227. http://doi.org/10.1080/00273170701341316

Stata FAQ: How can I do moderated mediation in Stata? UCLA: Statistical Consulting Group. http://www.ats.ucla.edu/stat/stata/faq/modmed.htm

Appendix 2E. Logistic regressions on donation choice

I. Multinomial Logistic Regression

A multinomial logistic regression of donation choice (contrarian, mitigation, or none as base outcome) onto reactance, treatment, and political orientation:

Multinomial logistic regression			Number of obs		=	841
			LR chi2(6)		=	35.7
			Prob > chi2		=	0
Log likelihood = -632.6293			Pseudo R2		=	0.0274

Donation Choice	Relative Risk Ratio	Std. Err.	z	P>z	[95% Conf. Interval]	
Contrarian organization						
reactance	0.762137	0.139748	-1.48	0.139	0.532052	1.091722
treatment	0.832246	0.328748	-0.46	0.642	0.383721	1.805040
right-leaning	1.344010	0.377076	1.05	0.292	0.775513	2.329250
constant	0.134344	0.050712	-5.32	0.000	0.064107	0.281534
Mitigation organization						
reactance	0.657306	0.095134	-2.9	0.004	0.494960	0.872901
treatment	0.973577	0.265131	-0.1	0.922	0.570908	1.660256
right-leaning	0.468355	0.102620	-3.46	0.001	0.304840	0.719580
constant	0.479836	0.123505	-2.85	0.004	0.289736	0.794664
None	(base outcome)					

There are no significant predictors of choosing a contrarian organization vs. choosing not to donate. Power is low for this section of the analysis as only 64 donations were made to contrarian organizations in total and there is some evidence left-leaning respondents may have been confused by certain contrarian organizations, discussed below.

Reactance is negatively associated with choosing to donate to a mitigation organization. An increase in reactance by one unit is expected to decrease the relative risk of donating to a mitigation organization relative to the risk of not donating by a factor 0.657, holding constant treatment and political orientation.

Right-leaning political orientation is negatively associated with choosing to donate to a mitigation organization. For right-leaning respondents relative to left-leaning respondents, the risk of donating to a mitigation organization relative to not donating is expected to decrease by a factor of 0.468, holding constant reactance and treatment.

II. Logistic regression on specific organization choice

The difference in giving to contrarian organizations by political orientation indicates left-leaning respondents may not have read carefully the descriptions of the contrarian organizations they were presented with, or may have been misled by the name or logo of some organizations. A logistic regression of the choice to give to a contrarian organization by left-leaning respondents onto the contrarian organization that was presented reveals the odds of left-leaning respondents

giving to GlobalWarming.org were 4.4 times greater than their odds of giving to Climate Depot (odds ratio=4.368, p=0.004). The odds of left-leaning respondents giving to NIPCC were 3 times greater than their odds of giving to Climate Depot (odds ratio=3.023, p=0.037). Right-leaning respondents who gave to contrarian organizations were no more likely to give based on the choice they were presented with (odds ratios 1.806, p=0.239 and 0.778, p=0.664). Logistic regression results for this discussion are presented below:

Logistic regression of donating to contrarian organization (0/1) onto contrarian organization choice, sample restricted to left-leaning respondents.

Logistic regression	Number of obs	=	579
	LR chi2(2)	=	10.52
	Prob > chi2	=	0.0052
Log likelihood = -137.60995	Pseudo R2	=	0.0368

	Odds Ratio	Std. Err.	z	P>z	[95% Conf. Interval]	
Climate Depot	(reference category)					
GlobalWarming.org	4.367816	2.231481	2.89	0.004	1.604695	11.88875
NIPCC	3.022727	1.606242	2.08	0.037	1.066794	8.564806
constant	0.026316	0.011923	-8.03	0.000	0.010829	0.063953

Logistic regression of donating to contrarian organization (0/1) onto contrarian organization choice, sample restricted to right-leaning respondents.

Logistic regression	Number of obs	=	266
	LR chi2(2)	=	2.97
	Prob > chi2	=	0.2264
Log likelihood = -81.416824	Pseudo R2	=	0.0179

	Odds Ratio	Std. Err.	z	P>z	[95% Conf. Interval]	
Climate Depot	(reference category)					
GlobalWarming.org	1.805714	0.906789	1.18	0.239	0.674831	4.831735
NIPCC	0.778325	0.449597	-0.43	0.664	0.250881	2.414656
constant	0.088608	0.034943	-6.15	0.000	0.040907	0.191931

Chapter 3. AN EXPERIMENTAL TEST OF PSYCHOLOGICAL DISTANCE AND EFFICACY MESSAGES IN CLIMATE CHANGE FEAR APPEALS.

Abstract

Attempts to scare people into changing their behavior through threats of negative outcomes have a long tradition in public health, despite mixed evidence of their efficacy. Such 'fear appeals' have been proposed to bolster public support for environmental concerns, especially climate change mitigation policy. However, behavioral health threats may differ from the threat of climate change in two ways. First, the social dilemma presented by climate change means collective action is required for mitigation. Second, climate change is often perceived as psychologically distant in time or space, affecting future generations or distant locations. This chapter presents an experimental test of threatening climate change messages. The experiment expands on the extended parallel processing model (EPPM) of fear appeals by considering collective efficacy, psychological distance, and political orientation as additional variables of interest. Manipulating psychological distance from far to near increases political liberals' support for certain climate policies. However, there is evidence for a small but significant boomerang effect from the collective efficacy message "everyone can work together to limit climate change" on political conservatives. The phrase significantly decreased support for climate change mitigation policy among conservatives, with no effect on liberals. These results imply that in fear appeals, well-intended messages meant to bolster collective efficacy may backfire, decreasing policy support and increasing political polarization on important issues like climate change. In sum, the

experiment provides little support for the use of fear appeals to bolster collective action on climate change.

3.1 INTRODUCTION

Climate change, if left unchecked, will have disastrous consequences (IPCC, 2014). A central challenge to mitigating this risk is building democratic support for policy solutions limiting greenhouse gas emissions and other causes. Possible solutions include carbon taxes, investment in alternative energy and transportation, and land use changes. These solutions may be perceived as costing a country its economic competitiveness, disrupting personal consumption choices like those around commuting and housing, and otherwise upsetting the status quo. Climate change communication presents a way to inform the public of both the risks presented by climate change and the policy options for mitigation. One risk communication strategy favored by supporters of climate mitigation policies is public communication campaigns to change attitudes and behaviors (Atkin & Rice, 2013). Given the potential for public communications to serve as a policy tool influencing individual behavior (Abroms & Maibach, 2008; Snyder et al., 2004; Weiss & Tschirhart, 1994), it is hardly surprising they have already been used in climate change communication via mass media.

A familiar tactic in public communication campaigns are threatening messages, or fear appeals, which attempt to stimulate a desired response through fear of an impending threat (Maddux & Rogers, 1983). The use of fear appeals in climate change communication is contentious. While risk communication research agrees that emotional (or at least affective) responses play a key role in communicating risks for decisions, scholars remain deeply divided over the specific application of fear-inducing messages in climate change communication. Some scholars acknowledge the potential for fear appeals to be effective while simultaneously cautioning

their use in climate change communications (Maibach et al., 2008; Moser, 2007a; Patchen, 2010). Others are more bold in recommending the use of fear appeals as an effective lever against unawareness and apathy (Cismaru et al., 2011; Meijnders et al., 2001; Roeser, 2012). A final group, relying in part on lessons from fear appeals in public health campaigns, dismiss the use of fear as entirely counterproductive to motivating engagement and change (Hulme, 2008; O'Neill & Nicholson-Cole, 2009).

Those urging caution over the use of fear appeals in climate change communication have emphasized the need for efficacy messages (Moser, 2010; O'Neill & Nicholson-Cole, 2009), the power of which is one of the more robust findings from research on communicating health threats (Floyd et al., 2000; Milne et al., 2000; Ruiter, Abraham, & Kok, 2001). Previous considerations of climate change fear appeals include calls for careful empirical tests of effectiveness (Maibach et al., 2008; O'Neill & Nicholson-Cole, 2009; Visschers et al., 2012), but these have gone mostly unanswered (Meijnders et al., 2001 is a notable exception).

Caution may be well advised since our knowledge is limited: most research on fear appeals has been in public health, especially for behavioral health such as smoking cessation or STI prevention. Despite abundant research, there is still disagreement over the use of fear appeals to influence health behavior, with many concluding that fear appeals need only to be carefully designed (de Hoog, Stroebe, & de Wit, 2007; Floyd et al., 2000; Milne et al., 2000; Witte & Allen, 2000). Others are more skeptical of their potential to bring about behavioral change given the low efficacy of many targeted populations (Peters et al., 2013; ten Hoor et al., 2012). Regardless, it should be apparent that climate change and public health problems are different, and simply applying the same communication strategy may be misguided.

Two issues in particular preclude the direct application of most fear appeal research, which focuses largely on public health, to climate change. First, fear appeals are most often presented as a direct threat against the individual receiving the message (e.g. "smoking has a grip on your heart," or "which would you rather have, a cholesterol test or a final [medical] exam?") Climate change fear appeals may take the form of a direct threat against the individual, but they may also threaten future generations (e.g., "Consuming the Earth is consuming our future") or non-human nature (e.g., "Animals around the world are losing habitat due to climate change"). Researchers have long understood that a personally threatening risk is more feared (Slovic, Fischhoff, & Lichtenstein, 1980), and as a result fear appeals in public health may be more effective. Such portrayals of climate change as affecting psychologically distant targets of other people, other places, or future generations may be responsible in part for low levels of concern in large segments of the public (Gifford, 2011; Leiserowitz, 2005; Moser, 2007a; O'Neill, 2013; Weber, 2006). Consequently, adopting health frames or otherwise diminishing the psychological distance of impacts for climate change communication has been advocated (Maibach et al., 2008; Myers et al., 2012; Nisbet, 2009).

Second, feelings of efficacy may be diffused by perceptions of collective action problems, also known as social dilemmas, of climate change mitigation: People may perceive they bear the cost of a mitigating action directly and personally while the benefits of that action accrue publically (e.g., waiting for the bus in the rain so the planet benefits as a whole from a decrease in fossil fuel consumption) (Gifford, 2011; Smith & Leiserowitz, 2013; Staats et al., 1996). While fear appeal research indicates an increase in self-efficacy (i.e., one's belief in one's ability to perform the recommended action) has one of the most consistent effects on attitudes, intentions, and behaviors, it is not clear that this construct is as useful for persuasion regarding climate change. Instead,

collective efficacy (i.e., a group's shared belief in its ability to solve a problem) may be as important or more important in such a large collective action problem (Bandura, 2000; Thaker, 2012).

3.2 Fear appeals in health messages and beyond

The extended parallel process model (EPPM) is a leading model of fear appeals (Witte, 1992, 1994). It was developed to better explain not only the conditions under which fear appeals are likely to succeed, but also the conditions making them more likely to fail, a shortcoming of previous theorizations (Witte & Allen, 2000; Witte, 1992). The EPPM considers *threat* and *efficacy* as the most important message characteristics and variables. Threat is comprised of *threat severity* (the significance of consequences of inaction) and *threat susceptibility* (the likelihood of occurrence and one's personal vulnerability to the threat). Efficacy is comprised of response efficacy (the effectiveness of the recommended action in averting the threat) and self-efficacy (one's ability to adopt the recommended action). Research based on the EPPM most often relies on self-reported measures of perceived threat, efficacy, and fear in response to manipulated message characteristics (Popova, 2012).

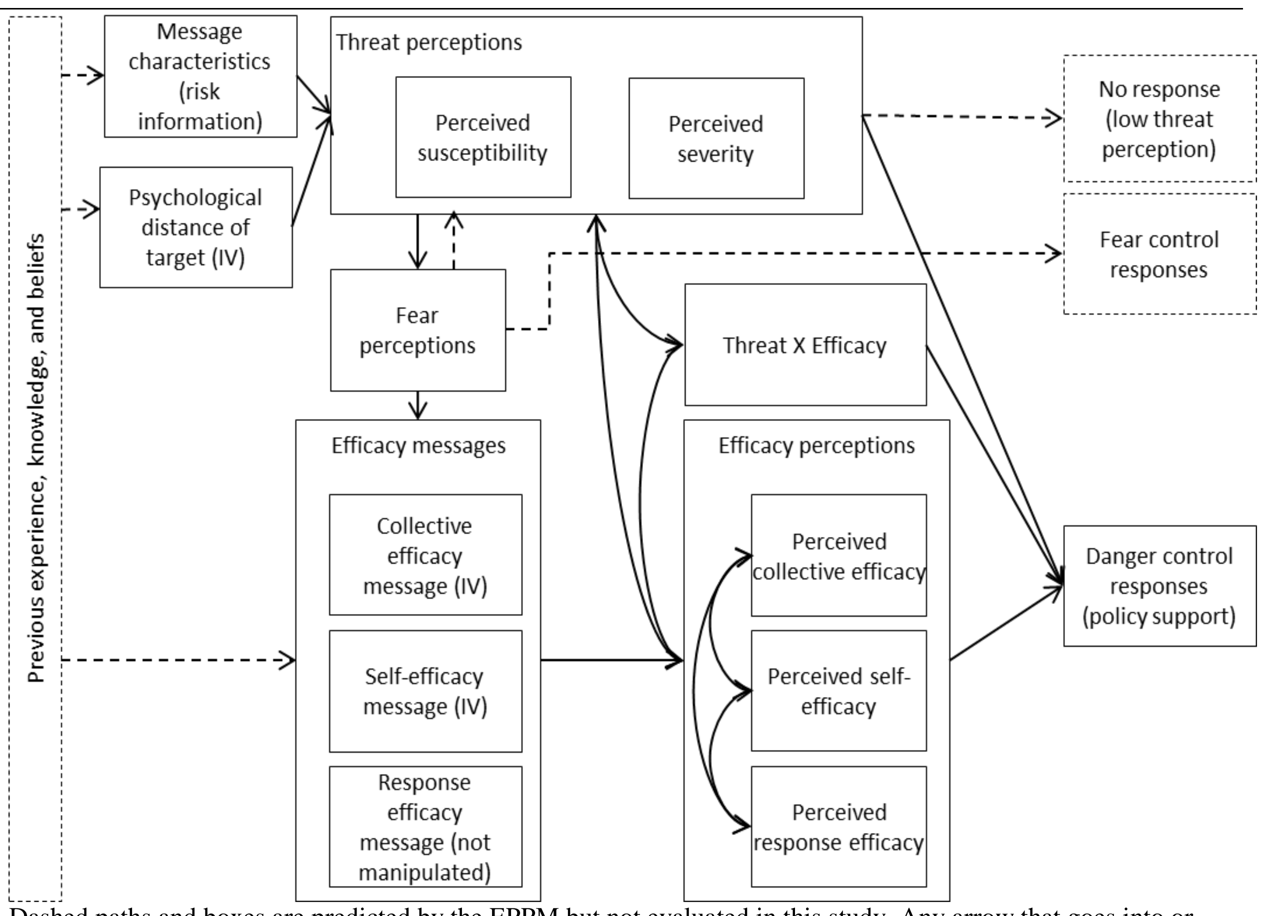
Importantly, while proponents of the EPPM claim "fear is reincorporated as a central variable" (Witte & Allen, 2000, p. 594) in comparison to preceding models, its measurement is complicated by several factors involved in message processing (de Hoog et al., 2007; Dillard, 1994; Popova, 2012; Ruiter et al., 2001). In fact, in meta-analyses of fear appeals that consider fear as a predictive variable (and not all have), effects of fear on outcomes are comparable to the effects of perceived severity and susceptibility, and are sometimes smaller than the effects of efficacy (Milne et al., 2000; Witte & Allen, 2000).

The EPPM predicts that a perceived threat generates fear. Fear then promotes further attention to efficacy information. Three outcomes are possible, as diagrammed in Figure 3.1 (Witte, 1992, 1994):

1. If the perceived threat is low, the subject does not attend to the message and *no response* occurs.
2. If perceived efficacy and threat are both high, *danger control* responses predominate, wherein the subject is motivated to follow the recommended response to the threat.
3. If the subject's fear goes unresolved because perceived efficacy is low, the EPPM postulates *fear control* responses predominate as the subject engages in coping strategies like message derogation, denial, avoidance, or even boomerang effects opposite the recommended response (Byrne & Hart, 2009; Hart, 2014). Boomerang effects have been observed in some research but results are generally inconclusive. A long-hypothesized interaction between threat and efficacy was confirmed in a meta-analysis with rigorous standards of inclusion (Peters et al., 2013); but a more recent meta-analysis failed to find such support (Tannenbaum et al., 2015).

This paper uses the EPPM as a framework to motivate hypotheses on three areas that may affect mitigation policy support in threatening messages about climate change. First, decreasing psychological distance is hypothesized to increase policy support by increasing perceptions of fear and threat as the threat becomes more personally relevant (Spence, Poortinga, & Pidgeon, 2012). Second, extending the EPPM, collective efficacy should play a key role in motivating policy support, given the social dilemma of climate change mitigation. Finally, given that climate change mitigation is a politically contentious topic, political orientation may moderate the effects of both

psychological distance and collective efficacy manipulations. It is anticipated that political liberals will maintain policy support despite increased psychological distance or an absence of collective efficacy messages.



Dashed paths and boxes are predicted by the EPPM but not evaluated in this study. Any arrow that goes into or out of a larger box is assumed to affect every component of the box.

Figure 3.1. Path diagram based on the EPPM (Witte, 1992, 1994)

3.2.1 *Threats to psychologically distant targets: is there a role for fear?*

Within the EPPM framework, psychological distance may amplify or attenuate the strength of response. Psychological distance refers to the extent to which an object (a person, place, or thing) is absent from the observer's direct experience. Distancing can occur along several dimensions: spatial, temporal, social, and hypothetical distance (Liberman et al., 2007; Trope & Liberman,

2010, 2012). Presenting a threat as psychologically distant may reduce perceived fear. Research to date has shown mixed results from manipulating the psychological distance of a threat.

Social distance. Simultaneous manipulations of spatial and temporal distance presented in a fear appeal about alcoholism had few significant interactions and no main effect on participants' intentions to moderate or abstain from alcohol (Sherer & Rogers, 1984). But a manipulation of the social distance of people featured in the message had a significant main effect on subjects' intentions to moderate their drinking. In another study, higher threat severity in indirect fear appeals given to male participants but targeting "a female who they considered to be close" resulted in higher perceived fear but no effects on intentions or behaviors compared with the low-fear condition (Morrison, 2005). A fear appeal for the construction of nuclear fallout shelters found increasing social distance from the participant's family to the entire country reduced policy support (Powell, 1965).

Other evidence supports the notion that social distance results in lower perceived fear. For example, a film about water shortages in Perth, Australia threatened the non-human targets of "reservoir levels, lawns and gardens, and water birds" (Kantola, Syme, & Nesdale, 1983, p. 171), and found no effect of a threatening message on fear or concern compared to a no-message control condition. Yet main effects were found for the manipulation of both severity and efficacy on intention to conserve, indicating that message severity perceptions still may influence outcomes without an increase in fear.

Temporal distance. A loss frame detailing threats to environmental quality ("What we now value will be lost…a broad range of environmental problems…will continue to grow") targeting the current generation generated significantly greater intentions for environmental conservation

than did gain-framed messages or targeting psychologically more distant future generations (Davis, 1995).

Spatial distance. In particularly relevant research, spatially distant targets and local targets of flooding risk caused by climate change showed no difference in perceived fear (Spence & Pidgeon, 2010). Distant targets generated higher perceived severity of impacts but lower favorable attitudes towards mitigation. Gain frames (vs. loss frames, aka fear appeals) resulted in more positive attitudes toward climate change mitigation and higher perceived severity of climate change impacts. Despite loss-framed fear appeals evoking more fear across both distance conditions, gain frames created more favorable attitudes about climate change mitigation. Interestingly, fear arousal suppressed the effect of gain framing on the perceived severity of climate change impacts. This provides evidence that in a climate change fear appeal, fear may mediate the relationship between message characteristics and severity perceptions, but the effect of fear on severity perceptions may not be sufficient to justify a fear appeal compared to a gain-framed message. The finding is inconsistent with the EPPM, which predicts that fear increases severity perceptions.

Finally, locally framed messages (near spatial distance) generated significantly more engagement with climate change than globally framed messages or a control condition, an effect increased by respondents' place attachment (Scannell & Gifford, 2013).

This research suggests the following hypotheses about the effects of manipulating psychological distance in a climate change fear appeal (Figure 3.2):

H1a Increasing psychological distance has a negative main effect on mitigation policy support.

H1b Perceived threat susceptibility and fear will decrease with increased psychological distance.

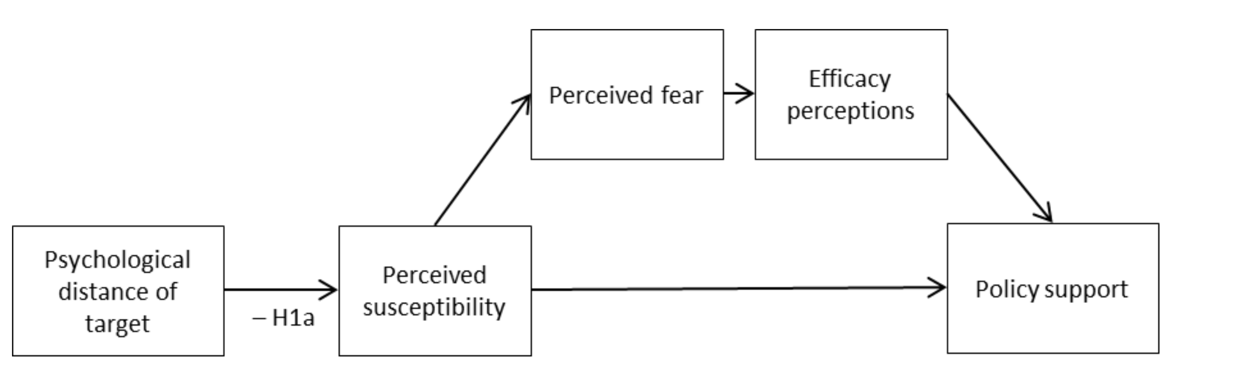


Figure 3.2. Hypotheses 1a and 1b.

3.2.2 *Collective efficacy: a counter to psychologically distant fear appeals?*

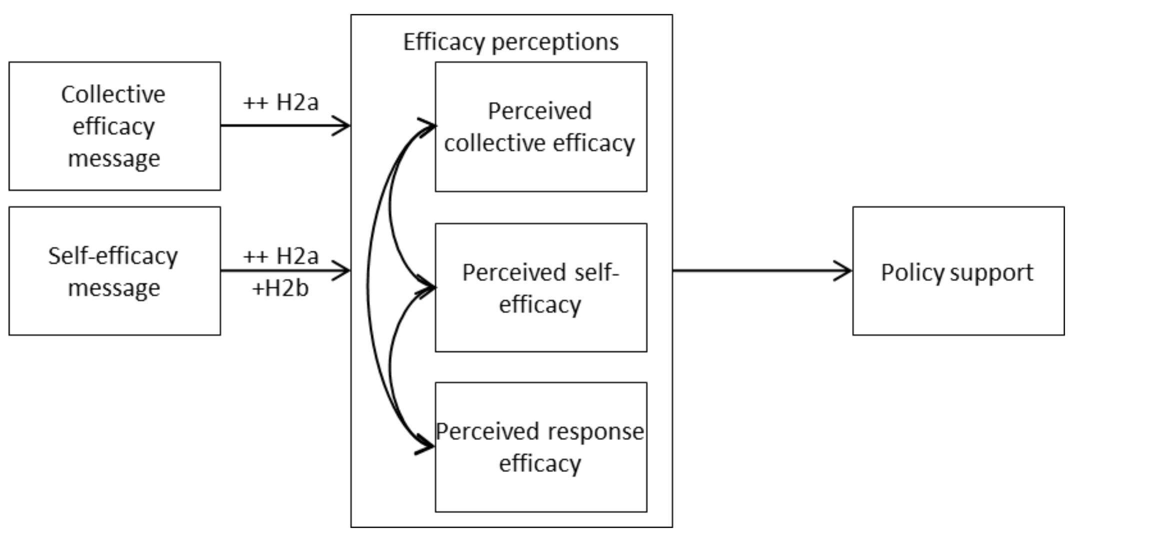
Collective efficacy is "people's shared beliefs in their collective power to produce desired results." (Bandura, 2000, p. 78, 2006) Collective efficacy has been recommended for inclusion in models of fear appeals for public health and disaster risk communication (Goodall et al., 2012; Roberto, Goodall, & Witte, 2009) but has received few tests. Prominent exceptions have investigated community support for HIV/AIDs patients and orphans (Smith et al., 2007) and health workers' willingness to put their personal health at risk out of concern for community health during an influenza pandemic (Barnett et al., 2009); both studies used correlations from survey data. While self-efficacy and collective efficacy beliefs are associated (Fernández-Ballesteros, Díez-Nicolás, Vittorio, Barbaranelli, & Bandura, 2002), collective efficacy is particularly applicable to large social dilemmas like climate change mitigation. Accordingly, manipulating collective efficacy beliefs may have more impact than increasing self-efficacy alone.

Figure 3.3 presents the pathways through which collective and self-efficacy messages are hypothesized to affect policy support as a simplification of the expanded EPPM model in Figure 3.1. Efficacy messages are hypothesized to impact overall perceptions of efficacy, which are

expected to be highly correlated and in turn affect policy support as mediator variables. The following is hypothesized about efficacy messages:

H2a Collective efficacy will have a stronger effect on policy support than self-efficacy alone, but

H2b Self-efficacy will still exhibit a main effect on policy support.



Not shown: interaction with psychological distance (Hypothesis 3).

Figure 3.3. Hypotheses 2a and 2b.

Given the established interaction between threat and efficacy (Peters et al., 2013) and the hypothesized effect of psychological distance on perceived threat, a hypothesis is necessary to test whether psychological distance interacts with efficacy. Accordingly, it is hypothesized that:

H3. Psychological distance and efficacy conditions will interact.

This relationship is not diagrammed here for space reasons because of the simplicity of the hypothesized relationship: Higher threat messages should be most effective in the presence of high efficacy messages and vice-versa.

3.2.3 *Effects may be moderated by political orientation*

The EPPM acknowledges the potential for moderation of effects by individual characteristics. Varying social distance has been found to interact with political party orientation (Hart & Nisbet, 2011). The presence of social cues (both low and high social distance) in a mock news story about climate change impacts to farmers increased support for climate mitigation versus a control condition of no social cues among strong Democrats. Contrastingly, low social distance cues had no effect on climate mitigation policy support versus a control condition for strong Republicans, while high social distance cues decreased their support. Importantly, no main effect of social distance was found, only an effect moderated by political partisanship.

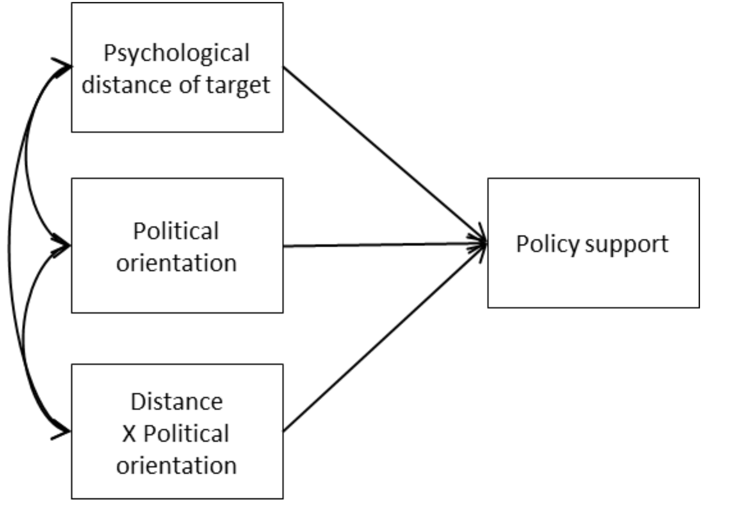
Similarly, concern for climate change moderated the effect of message framing on support for sustainable consumption and policy in the form of sustainability initiatives (Newman, Howlett, Burton, & Kozup, 2012). Subjects most concerned about climate change were more influenced by a gain-framed message. Those least concerned about climate change were more influenced by a loss-framed (vs. gain-framed) message. The loss-framed message was a fear appeal in the form of a threatening illustration of a polluted Earth and the text, “Without sustainable individual, government, and business practices, imagine the consequences for your children and future generations.” (p. 523). A second experiment in the same paper found a similar interaction between the regulatory focus of the message (prevention vs. promotion): Prevention frames highlighting losses to be avoided, a characteristic of fear appeals, were more influential on participants reporting low levels of concern for climate change. Given the correlation between concern for climate change and liberal ideology or Democrat party identification (Dunlap & McCright, 2008; Leiserowitz, 2005; Maibach, Leiserowitz, Roser-Renouf, & Mertz, 2011; McCright & Dunlap,

2011b), these results likely reinforce the findings of Hart & Nisbet (2011) that political orientation moderates responses to message characteristics.

These findings motivate the following hypothesis, illustrated in Figure 3.4:

H4: Political orientation will moderate the effects of psychological distance on policy support such that strong Democrats (vs. strong Republicans) will show less attenuation of mitigation policy support with increasing psychological distance.

Figure 3.4. Simple model of Hypothesis 4.



3.3 EXPERIMENTAL DESIGN, EMPIRICAL STRATEGY, AND DATA

To examine these hypotheses, this study used an online survey with a 2 X 2 X 2 full factorial experimental design. The experiment manipulated psychological distance (near vs. far), self-efficacy (present vs. absent), and collective efficacy (present vs. absent) in a mock print ad promoting a fictitious renewable energy organization.

Hypotheses predicting effects from experimental manipulations were tested with a 2 X 2 X 2 (distance X collective efficacy X self-efficacy) analysis of variance. Because the data showed ceiling effects for political liberals, a four-way full factorial (2 X 2 X 2 X 2) interaction model

with an indicator variable of 1 for those who identified as Republican or Republican-leaning (n = 266), 0 for all others, was also conducted to test for interaction effects of political ideology (Figure 3.5).

Three-way factorial model						
Psychological distance Near vs. Far	X	Self-efficacy present vs. absent	X	Collective efficacy present vs. absent		
Four-way factorial model						
Psychological distance Near vs. Far	X	Self-efficacy present vs. absent	X	Collective efficacy present vs. absent	X	Republican-leaning 0 vs. 1

Figure 3.5. Factorial models used in analyses of variance.

Participants were recruited through Amazon Mechanical Turk (MTurk) and compensated $0.75 to complete the survey instrument on the Qualtrics online survey platform as part of a larger study examining fear appeals in climate change communication. Participants were recruited with the text "Answer a survey about your opinions. Give us your opinion about an advertisement" and were blind to the study topic before the presentation of stimuli. The survey asked respondents for their consent to participate in the study. The survey instrument organization is displayed in Figure 3.6. Appendix A displays the full set of items and scales collected in the survey.

3.3.1 *Experimental Stimuli*

Respondents were randomly assigned to one of the 8 experimental conditions or a control. Experimental stimuli consisted of a mock advertisement containing a threatening image and message about climate change (Figure 3.7). The stimulus was presented for a minimum of 20 seconds before respondents were allowed to continue with the survey (longer if they wished).

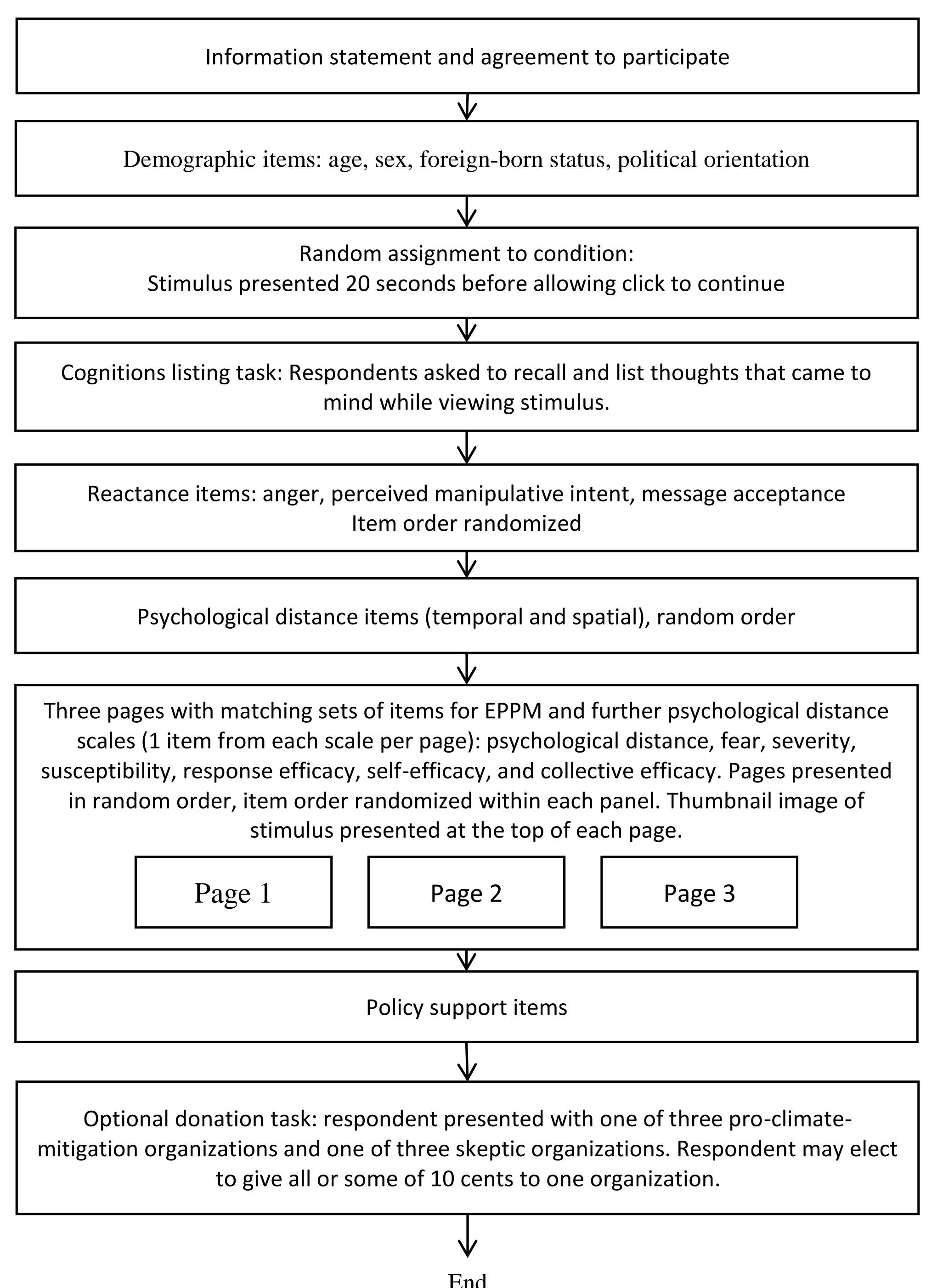


Figure 3.6. Survey instrument organization.

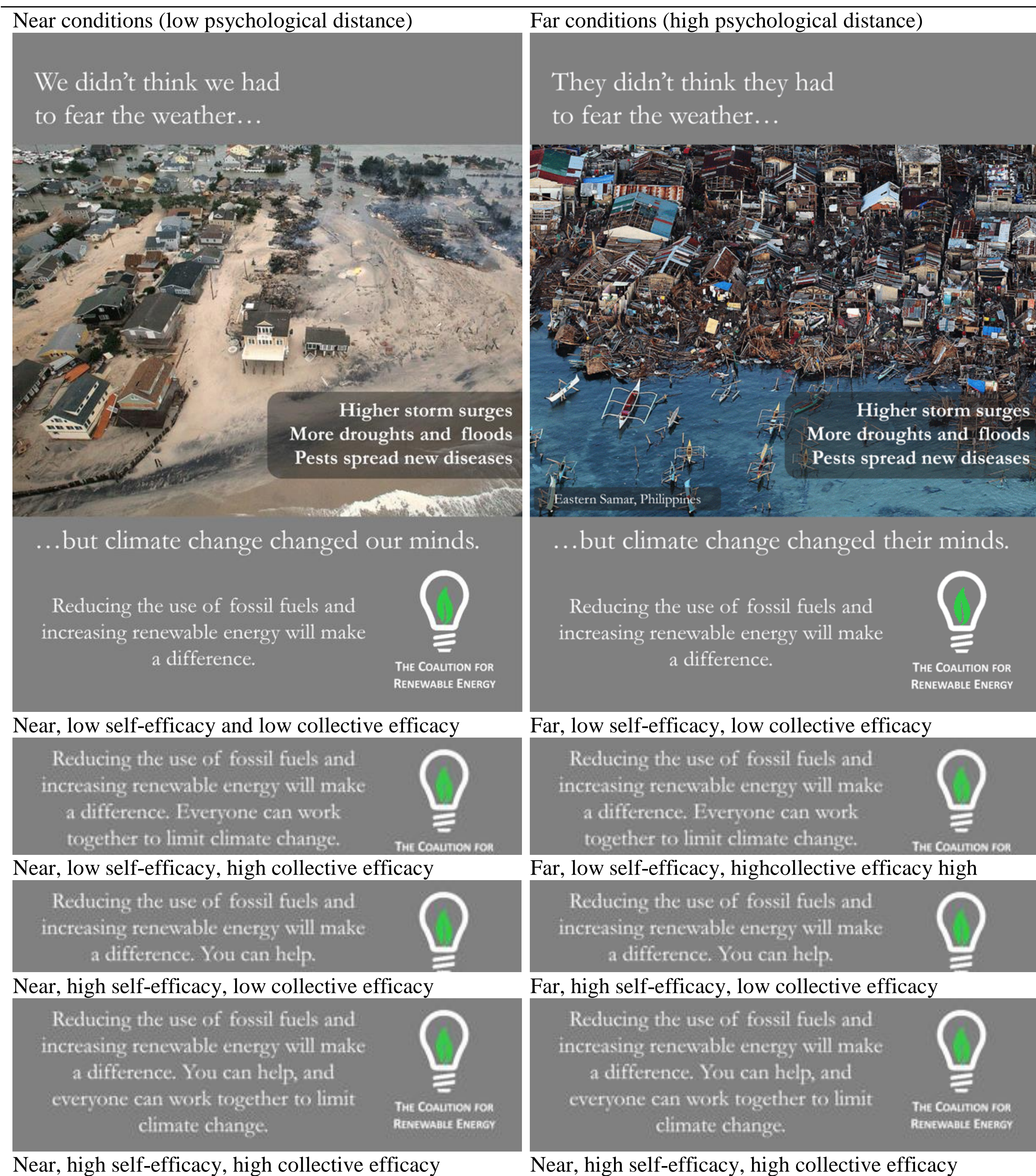


Figure 3.7. Experimental stimuli. The two pictures shown were used throughout with text variations as shown for a total of eight experimental conditions.

The main advertisement message featured large text in the close [distant] condition stating, "We[They] didn't think we[they] had to fear the weather…climate change changed our[their]

minds." This primary message text framed an image of coastal damage to New Jersey from Superstorm Sandy for the near condition and an image of coastal damage to the Philippines from Typhoon Haiyan for the distant condition. Both images featured a text box with the three lines of text: "Higher storm surges", "More droughts and floods", and "Pests spread new diseases." These bulleted items were derived from Haines et al.'s (2006) discussion of probable health impacts from climate change. The Philippines image also included the text "Eastern Samar, Philippines" because pre-tests indicated some respondents thought it might be a western hemisphere location closer to the US.

Experimental stimuli featured the invariant response efficacy message "Reducing fossil fuels and increasing renewable energy will make a difference" and the logo of a fictitious organization, The Coalition for Renewable Energy. Self- and collective efficacy messages were manipulated by adding the statements "you can help" and "everyone can work together to make a difference," respectively. For conditions where both manipulations were present they were joined as "you can help, and everyone can work together to make a difference."

A control condition presented an advertisement for a popular brand of paint.

Three survey modules immediately following the stimulus presentation collected data related to psychological reactance (Brehm, 1966) for a related study (see chapter 2) are not further discussed here.

3.3.2 *Measures*

The survey collected data on a number of covariates before presentation of stimulus. Respondents were asked questions on age, gender, US immigration status, and political orientation. Political orientation was classified through branching questions (Malhotra et al., 2009).

After presentation of the stimulus, respondents completed two items measuring the temporal and spatial psychological distance of climate change on a seven-point rating scale with higher numbers indicating greater psychological distance (see Appendix A). Respondents next answered questions covering 21 items assessing other dimensions of psychological distance and EPPM constructs (fear, threat severity, threat susceptibility, response efficacy, self-efficacy, and collective efficacy). Each item was the form of a statement and respondents selected from a seven-point response scale ranging from strongly disagree to strongly agree. An attention-check item (e.g., "please indicate your careful reading of this survey by leaving this row unanswered") was included in each page. Page order and question order within each survey page were randomized to minimize question order effects.

Finally, five items similar to those used in previous research (Ding et al., 2011; Leiserowitz, 2005; Smith & Leiserowitz, 2013) assessed policy support for climate change abatement. Each item was scored on a "forced choice" six-point scale, strongly oppose—oppose—somewhat oppose—somewhat support—support—strongly support.

3.3.3 *Data Cleaning*

1123 responses were obtained in October 2014. Data were cleaned by dropping all responses from participants who circumvented the screening tool to complete the survey more than once (19 participants for 40 observations, with 17 completing the survey twice 2 completing it three times), reducing the sample to 1083 unique observations.

Observations missing one or more attention check questions or missing values on three or more items were dropped from the sample to improve data quality. As a major part of the experiment focuses on the manipulation of psychological distance, and since the national origin and time in the US of foreign-born respondents is unknown, foreign-born responses were also

dropped. 64 respondents were not born in the US, 125 missed one or more attention-check questions, and 68 observations contained 3 or more missing values. As some observations represented more than one of these conditions, a total of 238 observations were dropped for a final sample size of 845.

Though assignment was random and balanced among all conditions, some unbalancing occurred as cases were dropped to form the final set, with the number of observations by condition ranging from 85 to 100. However, comparing the distribution by condition before and after the cases were removed passed a chi-square test of independence (χ^2=1.20, p=0.997).

3.3.4 *Manipulation Check for Fear*

A univariate analysis of variance of fear by condition did not support any of the advertisements generating more (or less) reported fear than the control condition ($F_{(8,836)}$=0.99, p=0.4443). A 2 X 2 X 2 (distance X collective efficacy X self-efficacy) analysis of variance testing the effects of experimental manipulations on perceived fear also failed to find effects ($F_{(7,744)}$=1.11, p=0.3553). These results are similar to Kantola, Syme, and Nesdale (1983) and are consistent with other findings that fear may not be a principal emotional reaction to climate change (Smith & Leiserowitz, 2013).

3.4 RESULTS

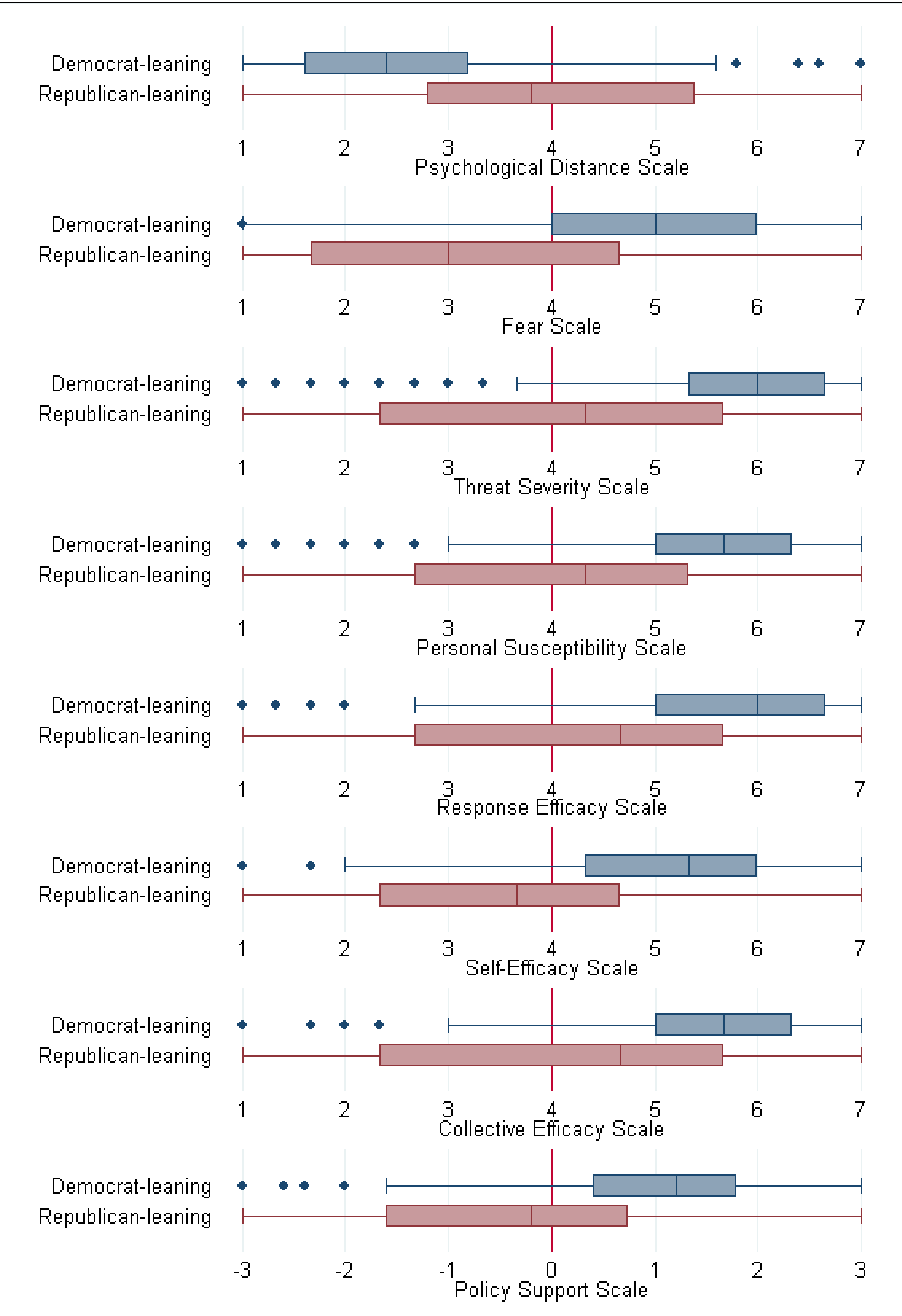
3.4.1 *Descriptive Statistics*

Age ranged from 18 to 81 years, with a mean of 36.4 years and standard deviation of 12.6 years. The sample is 58.1% (n=491) female. Respondents' political orientations are presented in Table 3.1**Error! Reference source not found.**. Democrats and Democrat-leaning respondents (hereinafter "Democrat-leaning") are overrepresented by approximately 2:1. These proportions are

consistent with those previously reported for MTurk samples (Berinsky et al., 2012). This variable is dichotomized for further analysis, with Democrat or Democrat-leaning coded as 0 and Republican or Republican-leaning coded as 1. The three respondents who declined to indicate a lean are not included in analyses using political orientation.

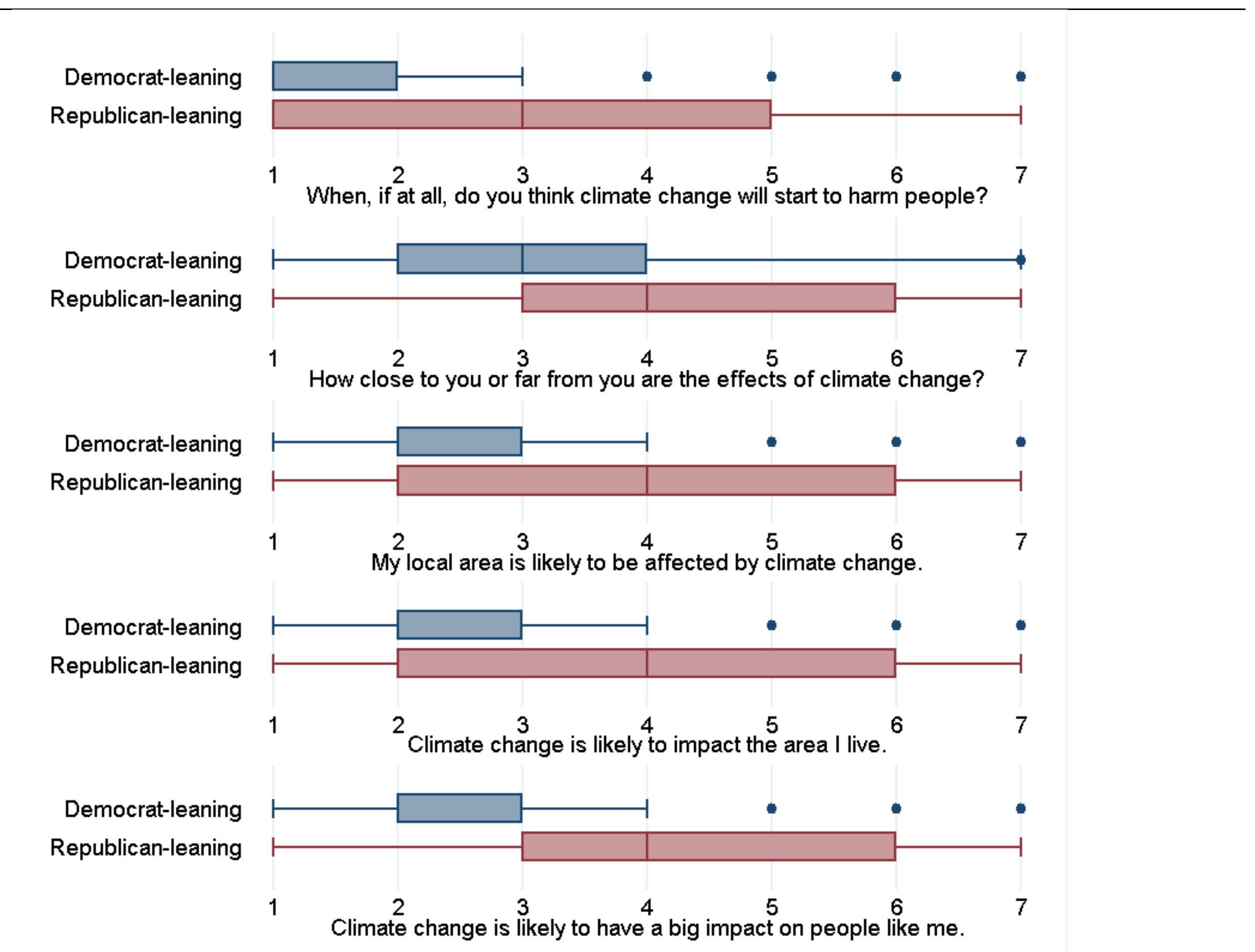
Table 3.1. Political orientation	**n (%)**
Strong Republican	49 (5.8%)
Not Strong Republican	94 (11.1%)
Leans Republican	123 (14.6%)
Undecided/Independent/Other	3 (0.4%)
Leans Democrat	246 (29.1%)
Not Strong Democrat	155 (18.3%)
Strong Democrat	175 (20.7%)
Total	**845 (100%)**

Items representing repeated measures of the same construct were summed and averaged. Cronbach's alpha reliabilities were very good, ranging from 0.84 to 0.96 (Appendix A presents the full text of each item and α for each scale). Psychological distance is presented as a scale in Figure 3.8 and in its constituent items in Figure 3.9. Many items showed evidence of ceiling effects for political liberals—a large proportion of the sample scored at the extreme end of the scale for many items. For example, in the measure of temporal distance of climate change, 59.8% of Democrat-leaning respondents selected the lowest possible category (Figure 3.9). Similarly, for three of five policy support items, only 3.2 to 12.1 percent of Democrat-leaning respondents selected "strongly oppose," "oppose," or "slightly oppose". Perceived fear and response efficacy also showed ceiling effects for Democrat-leaning respondents (Figure 3.8).



5th, 25th, 50th, 75th, and 95th percentiles represented by bars. Dots indicate outliers.
Psychological Distance scale components detailed in Figure 3.8
For all other scales 1 = Strongly Disagree 7 = Strongly Agree

Figure 3.8. Box plots of scales by political orientation.



5th, 25th, 50th, 75th, and 95th percentiles represented by bars. Dots indicate outliers. Scales are ordered such that 1 is near, 7 is far. 1 = It already has/Very close to me/Strongly Agree; 7 = It never will/Very far from me/Strongly Disagree

Figure 3.9. Box plots of psychological distance items by political orientation**.**

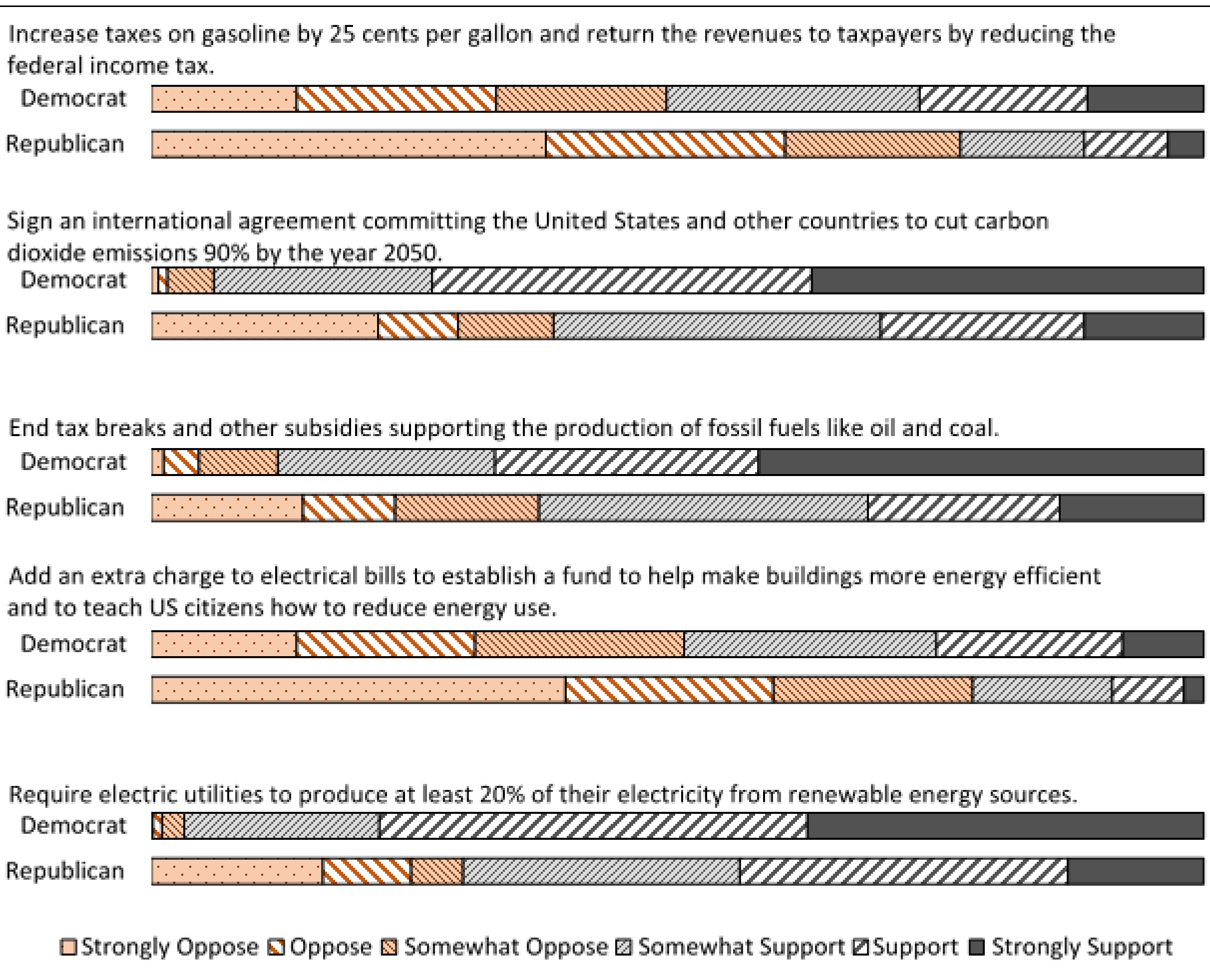


Figure 3.10. Policy preferences by political ideology.

3.5 HYPOTHESIS TESTS

H1a Increasing psychological distance has a negative main effect on mitigation policy support.

The three-way factorial analysis of variance showed no effects for the omnibus test ($F_{(7,740)}$=0.55, p=0.7949) or for main effect of the distance manipulation ($F_{(1,740)}$=0.00, p=0.9494). Adding political ideology to the distance, self-efficacy, and collective efficacy manipulations in a four-way factorial analysis of variance found no effects of the distance manipulation on policy support ($F_{(1,732)}$=0.48, p=0.4866)

Post-hoc examination of the data revealed that the trends for political liberals were in the hypothesized direction (Figure 3.11). That is, the point estimates of policy support among liberals were lower for every far condition than each matched near condition. An analysis of variance on the subpopulation of liberals was not significant with respect to the distance manipulation ($F_{(1,508)}$=3.01, p=0.0833). However, as previously noted, many items demonstrated ceiling effects with liberal respondents. The two policy items least popular with all respondents—increasing taxes on gasoline and adding a charge to electrical bills—were combined into a single scale (Cronbach's alpha =0.707) and examined. The resulting analysis of variance found a significant main effect of the distance manipulation on policy support for taxes among political liberals, with the near condition being associated with greater policy support ($F_{(1,508)}$=4.19, p=0.0411). The effect size was small (Cohen's f = 0.079).

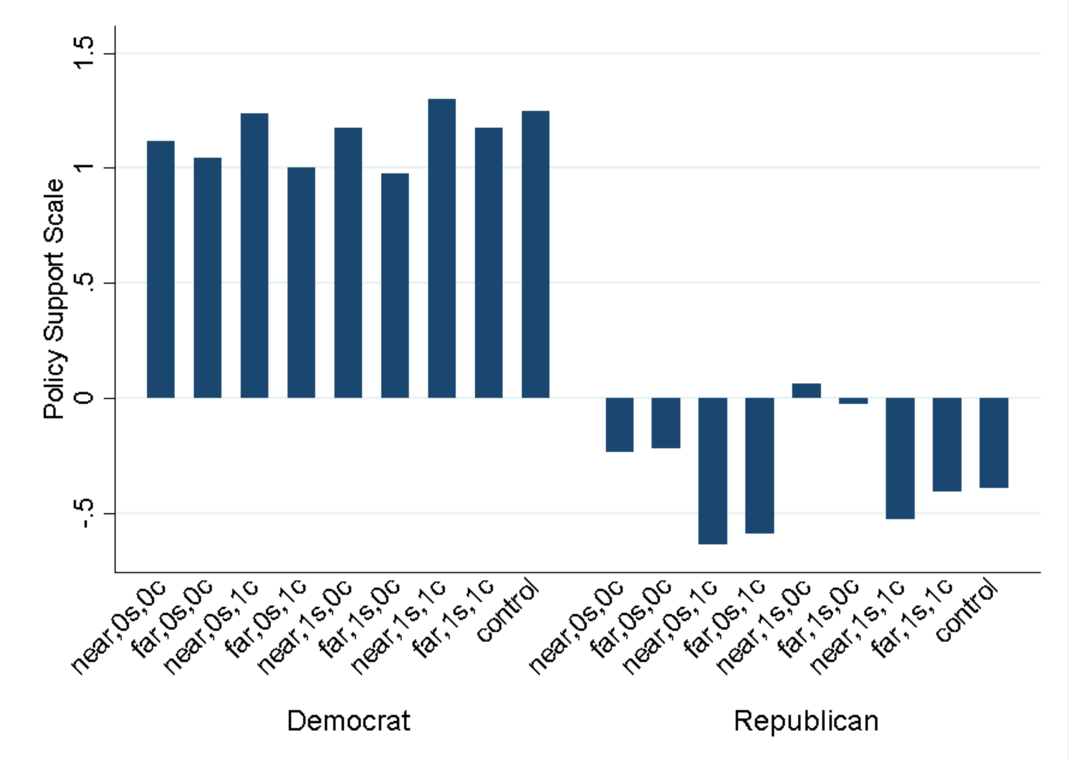
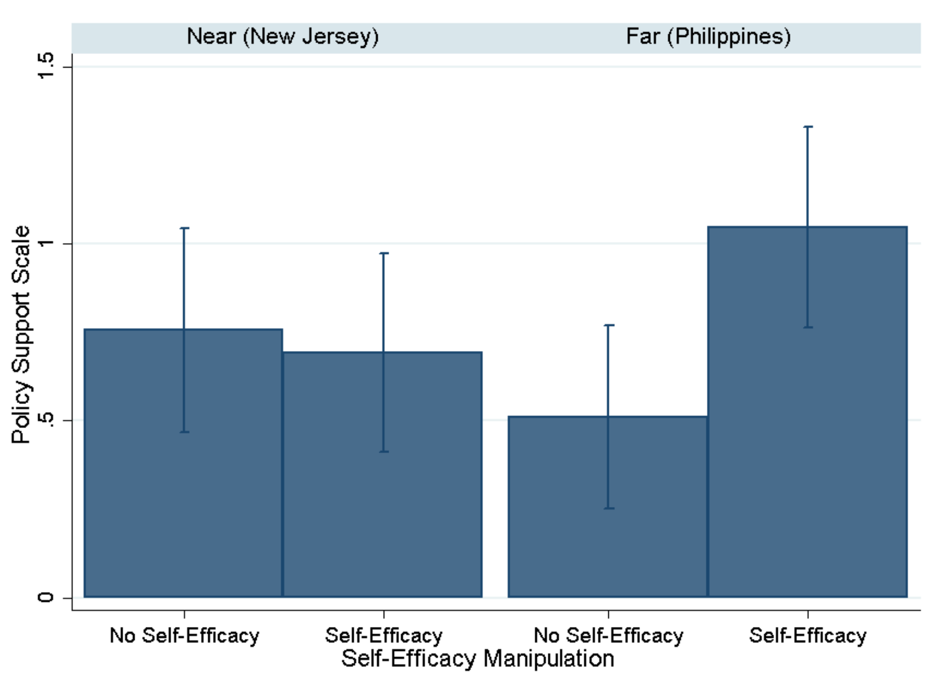


Figure 3.11. Policy support by condition and political orientation.

In further post-hoc examination, respondent locations were estimated with a geoIP lookup tool integrated with the survey software[12]. Restricting the sample to Gulf and Atlantic coast states (n=307) allowed examination of whether spatial proximity to shorelines at risk from hurricanes influenced policy support. The four-way factorial analysis of variance limited to respondents in Atlantic and Gulf coastal states revealed a significant interaction between the self-efficacy and distance manipulations ($F_{(1,291)}$=5.29, p=0.0222, Cohen's f=0.105, Figure 3.12). The interaction was such that in the near condition (New Jersey), the self-efficacy message ("You can help.") had no effect on policy support. But in the far condition (Philippines), policy support decreased in the

[12] GeoIP data uses the respondent's Internet Protocol address to estimate the location of their connection. Survey software company Qualtrics claims 90% accuracy at the state level.

absence of the self-efficacy message and increased in the presence of the self-efficacy message. A post-hoc Tukey comparison of means was significant between far X self-efficacy present (m=1.045, se=0.1441) and far X self-efficacy absent (m=0.509, se=.01314), p=0.030, but not significant between other pairwise comparisons.



$F_{(1,291)}$=5.29, p=0.0222, Cohen's f=0.105

Figure 3.12. Self-efficacy by distance interaction for respondents in Gulf and Atlantic coastal states (n=307).

H1b Perceived threat susceptibility and fear will decrease with increased psychological distance.

The manipulation check for fear established that there were no effects of any experimental manipulation on perceived fear. This hypothesis is also not supported for threat susceptibility. The three-way factorial analysis of variance was not significant for threat susceptibility ($F_{(7,744)}$=0.88, p=0.5194). The four-way factorial analysis of variance including political ideology was significant only for main effects of Republican political orientation on threat susceptibility ($F_{(1,736)}$=182.42,

$p<0.0001$) and fear ($F_{(1,736)}=169.69$, $p<0.0001$), with Republican-leaning respondents reporting significantly lower levels of both.

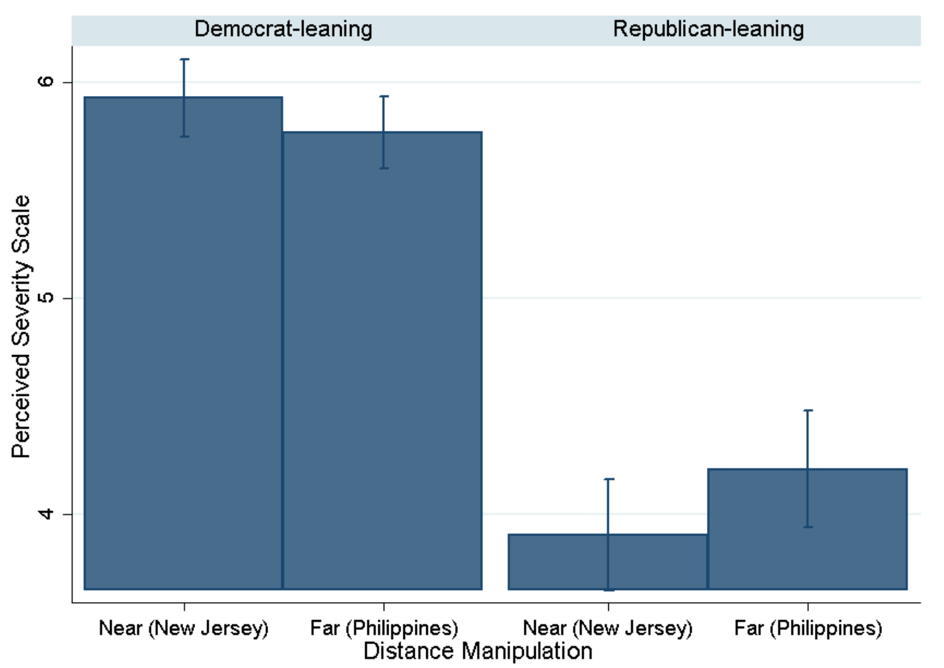
There are significant, strong correlations between perceived distance and susceptibility, $r(843)=-0.925$, $p<0.0001$ and distance and fear, $r(843)=-0.758$, $p<0.0001$, but there is no evidence that the distance manipulation affected perceptions of threat susceptibility or fear.

Another EPPM construct, perceived threat severity, did demonstrate an interaction effect between the distance manipulation and Republican-leaning political orientation in the four-way factorial analysis of variance ($F_{(1,736)}=4.18$, $p=0.0415$). The interaction is such that the distance manipulation had no effect on threat severity perceptions among Democrat-leaning respondents but the more distant condition increases threat severity perceptions for Republican-leaning respondents (Figure 3.13). The effect size was very small, Cohen's $f = 0.056$. Post-hoc pairwise comparisons were not considered because the interaction was ordinal: significant differences were between all pairings of Democrat-leaning with Republican-leaning, with the mean of Democrat higher than the mean of Republican across all pairings.

H2a Collective efficacy will have a stronger effect on policy support than self-efficacy alone, but

H2b Self-efficacy will still exhibit a main effect on policy support.

These hypotheses were not well supported. The three-way factorial analysis of variance was not significant at the omnibus level ($F_{(7,740)}=0.55$, $p=0.7949$), and while the four-way factorial analysis of variance was significant ($F_{(15,732)}=15.98$, $p<0.0001$), there were not significant main effects for the collective efficacy manipulation ($F_{(1,732)}=2.93$, $p=0.0874$) or self-efficacy manipulation ($F_{(1,732)}=1.66$, $p=0.1981$). Collective efficacy did interact with political orientation in an unexpected way, discussed in this section after the formal hypotheses.



$F_{(1,736)}$=4.18, p=0.0415, Cohen's f = 0.056

Figure 3.13. Interaction between distance manipulation and Republican political orientation on perceived severity.

There are strong correlations between collective efficacy perceptions and policy support, r(839)=0.688, p<0.0001, and between self-efficacy perceptions and policy support, r(839)=0.7112, p<0.0001.

H3. Psychological distance and efficacy conditions will interact.

No interactions were noted between the distance and efficacy manipulations for the three-way factorial or four-way factorial analyses of variance.

In a three-way factorial analysis of variance, there was a significant three-way interaction between the self-efficacy, collective efficacy, and distance manipulations on perceived psychological distance ($F_{(1,744)}$=4.39, p=0.037). However, this interaction became non-significant in the four-way interaction (adding Republican-leaning political orientation), $F_{(1,736)}$=2.56, p=0.1103.

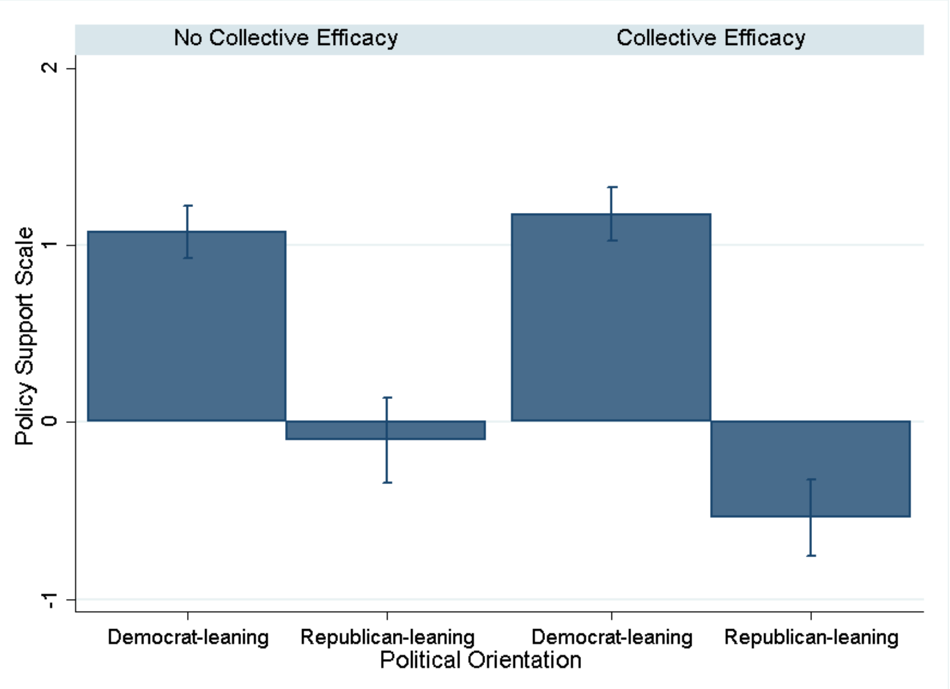
H4: Political orientation will moderate the effects of psychological distance on policy support such that strong Democrats (vs. strong Republicans) will show less attenuation of mitigation policy support with increasing psychological distance.

As noted for H1a, a difference in policy support for Democrat-leaning respondents was observed on two items, with policy support attenuating with the distance manipulation. But the distance manipulation showed no effect on Republican-leaning respondents.

An unanticipated interaction: Collective efficacy message backfires with Republican-leaning respondents. Few of the hypothesized relationships were supported in this experiment except in post-hoc analyses of subsets of the data defined by political orientation and location. However, the four-way factorial analysis of variance revealed an unexpected significant interaction between the collective efficacy manipulation and conservative political orientation, $F_{(1,732)}=7.52$, $p=0.0063$ (Figure 3.14). The interaction effect was such that for political conservatives policy support decreased in the presence of a collective efficacy message ("Everyone can work together to limit climate change.") The point estimates for conservatives in the no-collective-efficacy condition were not statistically different from zero (-0.104, 95% c.i. -0.343 to 0.135) but decreased to -0.539 in the collective efficacy condition (95% c.i. -0.755 to -0.324). The effect size was small (Cohen's f = 0.082).

Further analysis of the potential pathways for this effect revealed that the collective efficacy message had a perverse effect on collective efficacy beliefs for Republican-leaning respondents in the same two-term interaction (Collective efficacy X Republican) $F_{(1,736)}=4.15$, $p=0.0419$, Cohen's f=0.0581. Similarly, response efficacy perceptions were reduced for Republican-leaning respondents, $F_{(1,736)}=5.35$, $p=0.0210$, Cohen's f=0.067. Fear, self-efficacy, and

susceptibility were not significantly decreased by the interaction, although severity was close to significant ($F_{(1,736)}$=3.79, p=0.0519).



$F_{(1,732)}$=7.52, p=0.0063, Cohen's f = 0.082

Figure 3.14. Interaction between collective efficacy manipulation and Republican political orientation on policy support.

3.6 Discussion

This test of climate change fear appeals revealed a number of interesting findings and insights. First, the experimental conditions, all of which were framed as fear appeals, failed to generate significantly more fear than the control condition, regardless of political orientation. While remaining cautious of over-interpreting null results, these results are not unexpected given the similar failure of other tests of fear appeals for environmental threats. Together they highlight the difficulty of developing fear-inducing messages about climate change. Most relevant is Spence & Pidgeon (Spence & Pidgeon, 2010), who found several effects of a distance manipulation but no differences in fear perceptions. Similarly, Kantola, Syme, & Nesdale (1983) also failed to find a

change in perceived fear for a threat to the environment vs. control yet found other effects from the experimental conditions. These lines of evidence are further supported by survey data showing fear perceptions are not correlated with support for climate change mitigation policy (Smith & Leiserowitz, 2013). Finally, the extent to which even personal, health-related threats generate fear is hard to determine: A recent meta-analysis found 71% of fear appeals studies did not include a manipulation check for fear (Tannenbaum et al., 2015).

Second, decreasing psychological distance manipulation from third-person Philippines to first-person New Jersey did not have an effect on policy support unless analysis was restricted to Democrat-leaning respondents and to the two policy items that did not demonstrate ceiling effects, a tax on gasoline and a surcharge on energy bills. In this subset, the distance manipulation had a small effect. Thus, decreasing the psychological distance of climate change may increase support for difficult policies slightly for a group already known to support climate mitigation policies, but even then it appears likely to provide very limited impact as a communication strategy.

Third, the interaction of self-efficacy with the distance manipulation for residents of states bordering hurricane waters was not anticipated. Hurricane-coastal states were examined with the assumption that hurricane damage would be more salient to those respondents and therefore the near (New Jersey) image might have a more pronounced effect on susceptibility and thereby policy. Instead, the self-efficacy manipulation, which has produced robust effects in previous EPPM-based research (de Hoog et al., 2007; Peters et al., 2013; Witte & Allen, 2000), had no effect in the near condition and a significant effect in the far (Philippines) condition. The possibility of a Type I error should not be ruled out as this finding is not consistent with theory and no other easy explanations come to mind.

Finally, the unexpected finding that a collective efficacy message interacted with political orientation to decrease policy support among Republican-leaning respondents has several implications for communication policy. Previous correlational research has emphasized the importance of collective efficacy beliefs in predicting pro-social attitudes and behaviors, including for climate change (Meyer, 2013; Smith et al., 2007; Thaker, 2012). Indeed, the positive correlation between policy support and collective efficacy *beliefs* was higher for Republican-oriented respondents, $r(263)=0.753$, $p<.0001$, than for Democrat-oriented respondents $r(574)=0.439$, $p<.0001$. But clearly the message had a different effect than intended; it appears to have acted on policy support through suppressing collective efficacy and response efficacy beliefs.

Several explanations are suggested. First, Republican-leaning respondents may have interpreted the collective efficacy message as a cultural signal. The theory of cultural cognition proposes that people align with issues on a basis of identifying a position as consistent or inconsistent with their cultural group, not on the substance of an argument or information presented (Kahan & Braman, 2006; Kahan, 2010). Thus, cultural meanings embedded in the seemingly innocuous phrase "everyone can work together" may signal the source of the message has communitarian beliefs, while Republicans tend to have individualistic beliefs. Alternatively, the collective efficacy message boomerang may have been a function of the fear appeal approach by reminding respondents of the collective action dilemma, perhaps increasing fatalism by showing a catastrophe with a reminder that everyone must act together. Since all experimental treatments were fear appeals, this could not be evaluated. Further evaluation of collective efficacy messages in combination with other message frames, gain frames in particular, may clarify whether collective efficacy messages are incompatible with certain frames or whether cultural cognitions are to blame.

In sum, this research has revealed few advantages to a fear appeals approach to climate change communication and several potential pitfalls. In particular, well-intended collective efficacy messages may boomerang with conservative American audiences and decrease mitigation policy support, thereby increasing polarization on the topic when less polarization is so badly needed.

Appendix 3A. Items and Scales.

Items and Scales

Variable	Item	Scale	α
temporal	*When*, if at all, do you think climate change will start to harm people? *1-It already has….7-It never will*	Psychological Distance	0.928
spatial1	How close to you or far from you are the effects of climate change? *1-Very close to me….7-Very far from me*		
spatial2	My local area is likely to be affected by climate change. *(reverse coded)*		
spatial3	Climate change is likely to impact the area I live. *(reverse coded)*		
social1	Climate change is likely to have a big impact on people like me *(reverse coded)*		
fear1	Climate change scares me.	Fear	0.945
fear2	I am frightened of the effects of climate change.		
fear3	Thinking about climate change makes me anxious.		
sev1	I believe that climate change is significant.	Threat Severity	0.960
sev2	I believe that climate change is serious.		
sev3	I believe that climate change is severe.		
sus1	The effects of climate change will impact me personally.	Threat Susceptibility	0.943
sus2	It is possible that I will be affected by climate change.		
sus3	It is likely that I will be affected by climate change.		
reff1	Limiting the use of fossil fuels and increasing renewable energy will lessen climate change.	Response Efficacy	0.960
reff2	The effects of climate change will be reduced by reducing the use of fossil fuels and increasing renewable energy.		
reff3	Switching to renewable energy from fossil fuels will be effective at reducing climate change.		
seff1	I am able to limit climate change.	Self-Efficacy	0.838
seff2	My actions can contribute to lessening the effects of climate change.		
seff3	It's easy for me to support policies preventing climate change.		
ceff1	I am confident we can all work together to lessen climate change.	Collective Efficacy	0.920
ceff2	Climate change can be reduced by our collective efforts.		
ceff3	If we act collectively, we will be able to minimize climate change.		
	All 9 efficacy items combined	Overall Efficacy	0.960
	Some policies have been proposed to reduce climate change. Please rate the extent to which you support or oppose each policy described below.		
policy1	Increase taxes on gasoline by 25 cents per gallon and return the revenues to taxpayers by reducing the federal income tax.	Policy Support	0.824
policy2	Sign an international agreement committing the United States and other countries to cut carbon dioxide emissions 90% by the year 2050.		
policy3	End tax breaks and other subsidies supporting the production of fossil fuels like oil and coal.		
policy4	Add an extra charge to electrical bills to establish a fund to help make buildings more energy efficient and to teach US citizens how to reduce energy use.		
policy5	Require electric utilities to produce at least 20% of their electricity from renewable energy sources.		
qc1	Without regard to climate change, please do not select any answer for this.	Missed 1 or more: 85 (12.2%)	
qc2	Please indicate your careful reading of this survey by leaving this row unanswered.		
qc3	For quality control purposes please select disagree.		
qc4	Select the somewhat agree option in this question on climate change.		

Items spatial1-ceff3 use a 7-point response scale:
Strongly Disagree / Disagree / Somewhat Disagree / Neither Agree nor Disagree / Somewhat Agree / Agree / Strongly Agree
Scales were created by averaging constituent items with pairwise deletion of missing data.

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VITA

Tim Scharks returned to school for advanced studies in public policy and management after several years as a tenured geography instructor at a community college in addition to extensive experience teaching undergraduate courses at 4-year schools. His interests in teaching physical geography to undergraduates led to his present research on environmental communication, specifically the communication of climate change risks. This dissertation represents a personal interest in the role of fear in climate change communication but he is optimistic that other emotional appeals may be less problematic and more effective.

After graduation, Tim plans to continue his research and teach in an academic setting but is also considering working at an environmental conservation non-governmental organization.