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Testing Bi-Partisan Climate Change Messaging Using Prospect Theory

Sophie Robinson

A Thesis in the Field of Sustainability

for the Degree of Master of Liberal Arts in Extension Studies

Harvard University

May 2019

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Abstract

When we read a newspaper article or hear a story about climate change on the news, that message is likely crafted by the news team without consulting scientific research about how to deliver the story. As we have entered the age of consequences in a climate change world, more and more news articles are talking about what is going on. How that message is delivered will have a dramatic impact on how it is received. Message experiments provide evidence that can advance climate change communication. Often, results from message experiments are counter-intuitive, but are crucial for helping the story land in a helpful way to the intended audience.

Prospect theory describes a well-documented phenomenon by which people tend to psychologically weigh losses twice more than gains (Kahneman & Tversky, 1983; 1991). There has been some preliminary research applying prospect theory to climate change, but not in the context of political partisanship in the United States (Spence & Pidgeon, 2010). To assess changes in opinions about climate among both liberals and conservatives based on exposure to messages, 699 participants in this study completed an online survey using Amazon's Mechanical Turk (MTurk).

Respondents answered questions about various social issues including climate change and how likely they would be to support a candidate taking a particular stance on those issues on a scale of 1 (much more likely to vote for them) to 5 (much less likely to vote for them). The results of this research show that there is no significant difference between gain and loss frames in influencing how people would vote for a political

candidate who supports renewable energy. Although the gain frame might be more effective, the results were not statistically significant. However, both the gain frame and the loss frame scores were significantly higher than the control frame scores. Additionally, both Independents and Democrats had significantly higher scores than Republicans. There were two interesting demographic findings. The 55-64 year old age group had significantly lower scores than their younger peers, and rural living participants scored significantly lower than suburban or urban living participants.

This research shows that Prospect Theory framing may not be as important of a factor as the values relayed in the message. Since the control message was significantly lower than the gain and loss frames, which both used conservative values in the message, it appears that messages about conservative topics such as the economy may be more impactful than a gain versus loss frame. Future studies should focus on how to tease apart political value and content framing to see which frames are most significant for climate change policy support.

Acknowledgements

I would like to thank my thesis director, Jennifer Marlon, for guiding me through the thesis process. I have always admired the Yale Program for Climate Change Communication and am honored to get the opportunity to work with her. I would also like to thank several of the YPCCC colleagues, especially Matthew Goldberg for his guidance on creating the study on MTurk and comments on final drafts.

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Chapter I

Introduction

Climate change is a collective action problem—most people in the world (especially Americans) contribute to the problem, yet are unwilling to personally do anything about it. We know that people may not take action for numerous reasons such as cognitive dissonance, lack of control to fix the problem, scale of the problem, and the bystander effect (Marshall, 2015), but we don't know much about why people do take action. In the mainstream news media, the dominant messages about climate change are largely created for and delivered by liberals. This politicization of media about climate change has contributed to it becoming a very divisive political issue. There are few bi-partisan messages about climate change that focus on the economy or jobs.

Research by Scannel and Gifford (2011) suggested that when people feel personally impacted by climate change, they are more willing to take action. However, current data show that there must be other factors that play a role in determining beliefs, as there are very complex and often limited relationships between the locations of climate changes and perceived experiences and concern about climate change (Hamilton & Keim, 2009; Akerlof et al., 2013; Marquart-Pyatt, 2014). A simple comparison of maps showing where Americans are worried about climate change versus where impacts have occurred highlights the lack of overlap between the two (Figures 1 & 3). However, there is a strong correlation between climate change beliefs and political views (Shao & Goidel, 2016), as evidenced by the almost a perfect correspondence between where Americans

are worried about climate change and democratic voting districts (Figures 1 & 2). Understanding which messages are most effective in changing people's opinions about climate change is important if we want to influence opinion, policy and action.

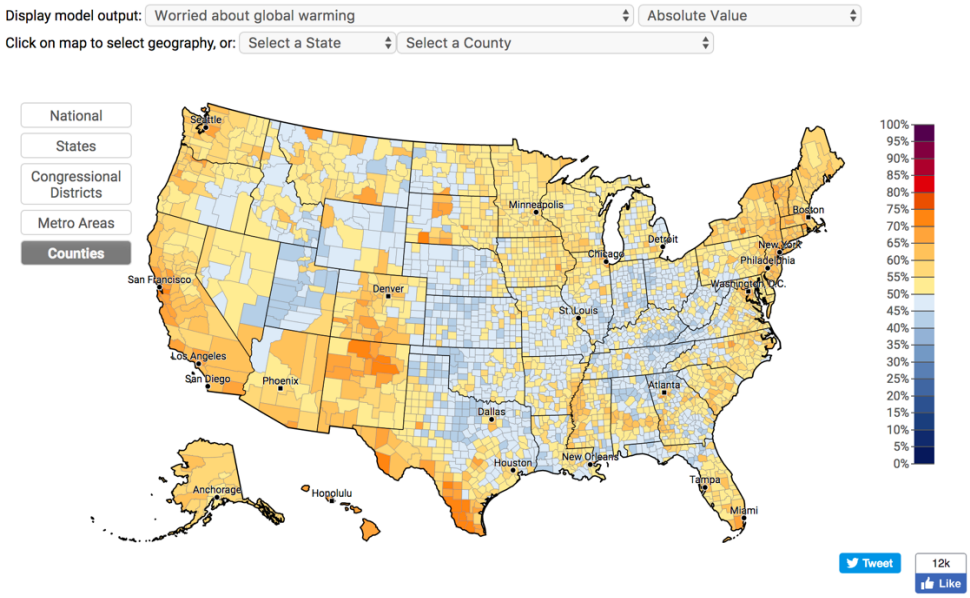


Figure 1. Americans level of worry about global warming (YPCCC, 2016).

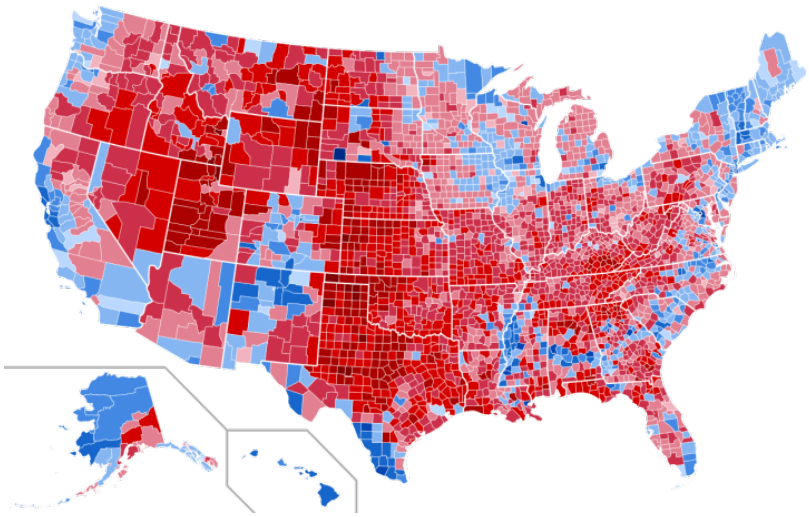


Figure 2. Map of Republicans (red) vs. Democrats (blue) in the 2016 election (Parr & Koczela, 2016).

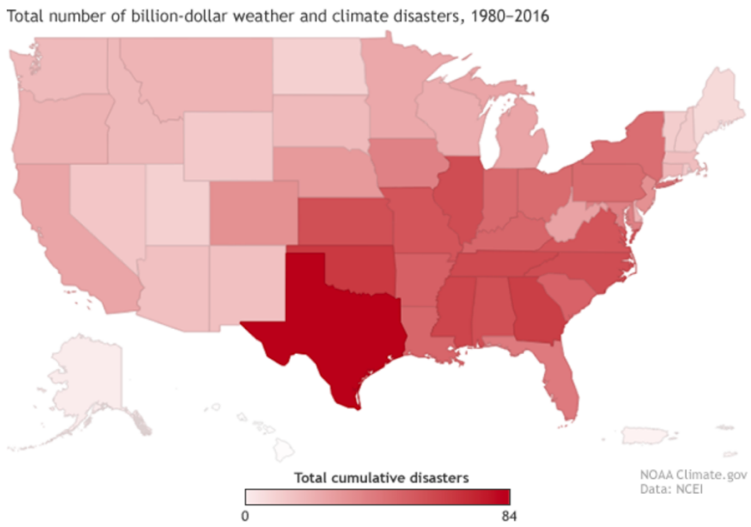


Figure 3. Billion-dollar weather/climate disasters per state from 1980-2016 (Smith, 2017).

Research Significance and Objectives

Researching which climate change messages are most compelling is essential to create effective messaging that will spur action. To further knowledge on this inquiry, I surveyed Americans about their opinions of climate change to evaluate the relative importance of gain versus loss frames for conservative messages about climate change focused on the economy. I conducted an online survey to test different climate change message frames and to determine whether gain or loss frames have a stronger influence on an individual's candidate preference in the context of voting.

My objectives were:

- To further our understanding of significant predictors of people's attitudes and beliefs about climate change;
- To inspire more informed policy, advocacy, and media messaging around climate change;

- To evaluate whether a gain or loss frame about the economic impacts of climate change enables further understanding; and
- To evaluate whether Republicans and Democrats respond differently to the frames.

Background

To understand climate change opinions in America, one must first understand how climate change messaging has been influenced by our political system. Public discourse, especially from members of the media and valued opinion leaders, underlies the formation and building of political will. A study by Brulle, Carmichael and Jenkins (2012) showed that elite cues and structural economic factors have the largest effect on levels of public concern about climate change. Those elite cues often come in the form of partisan media coverage or from politicians themselves. There is vast research about the politicization of climate change, but few studies that test which messages resonate the most with bi-partisan audiences (van der Linden, Leiserowitz, & Maibach, 2017; McCright & Dunlap, 2011).

Concern about climate change does not seem to track where it is actually happening, but rather political affiliation (Figures 1, 2 & 3). If political affiliation is the strongest predictor of concern about climate change, then research about how to influence American opinion about climate change must take partisanship into account. The rise of climate change as a political issue started gaining traction in 2006 with Al Gore's film *The Inconvenient Truth*, which identified Gore as the liberal climate expert.

Conservatives subsequently distanced themselves from him by denying the validity of his argument. It has also become a political issue because fossil fuel companies, once they had the initial buy-in from the Republican party, proceeded to inject billions of dollars into the political system to incentivize political candidates to deny and question the scientific consensus on climate change (Nisbet, 2014).

Once conservative political figures allegiance was bought by the fossil fuel companies and politicians began spreading messages that called the science of climate change into question, Republicans took their lead and soon the scientific issue of climate change became highly politicized. Research showed that people who score highly on hierarchical and individualist belief systems (characteristics correlated with conservative beliefs) are skeptical of climate change and other societal problems that would limit industry and require government oversight (Leiserowitz, 2006). Conversely, people who scored highly on egalitarian and communitarian ideals support policies that benefit society in general and the most impacted populations, which is why liberal messages about climate change often underscore values of justice and equality (Leiserowitz, 2006; Nisbet, 2014). Once climate change became an accepted indicator of party affiliation, it was an important component of group identity that, regardless of the scientific consensus, motivated individuals to "believe" or "not believe" in climate change (Kahan, 2012).

Some message testing has been done, but much of it is on small samples, based on unpublished findings and thus unreproducible methods, focus groups, or untested though experientially-based guidelines (Our Story, 2019). If message testing is based on large national datasets, it often has focused on trust in scientists as experts, and what scientists say and think—which, when there is a lack of trust in the scientists, results in a lack of

trust in the data (Leiserowitz, Maibach, Roser-Renouf, Smith, & Dawson, 2012). There is less research on other kinds of messages from experts other than scientists, even though other experts may be seen as more trustworthy (van der Linden, Leiserowitz, Feinberg, & Maibach, 2015).

Given the major differences between parties in the United States on climate change, it is crucial that messaging addresses the topic in ways that will engage the broadest audience across the political spectrum. Because climate change is already a trusted and accepted topic for liberals, bi-partisan messaging that includes a conservative audience must use conservative values. Ultimately, for policy changes that will address climate change, politicians on both sides of the political spectrum will need to embrace the climate change issue. Political strategy companies encourage candidates to find messages that appeal to their target audience by appealing to their interests and issues (CallHub, 2017). If conservative candidates are going to appeal to a conservative audience about climate change, they will need to understand which topics and values their voters care about.

We have known that burning fossil fuels leads to global warming since 1938 (Callendar, 1938). And for at least three decades, the science has been clear about the kinds of impacts that anthropogenic climate change will produce and that a large part of the solution is to stop burning fossil fuels (Intergovernmental Panel on Climate Change, 2018). The reality of climate change is no longer a scientific issue—although there are always more nuances to discover, the overall science is very clear about what is happening and what the future may look like if we do not change our consumption of fossil fuels (IPCC, 2018). However, due to intense political polarization in the United

States, the issue remains unresolved, stuck in political limbo. Addressing climate change on a global scale requires governmental action and intergovernmental agreement. Political science literature recognizes that to address climate change, political action is required (Vraga, 2017). For this to occur, communicators need to find better ways to engage the conservative party in the climate change discussion. Two of the focus areas that need to be considered in conservative climate messaging are the frame and the message.

For effective communicating, the first and most important tenet is to know your audience. It may seem like there are only two audiences on climate in America—Democrats and Republicans, but according to YPCCC there are "Six Americas:" six personalities when it comes to climate change beliefs. There are two extreme ends of the spectrum: Dismissive, who do not believe it is happening and may believe it is a hoax, to Alarmed, who are very concerned about the issue and support aggressive measures to curb it. In the middle are four types along the spectrum: Concerned, Cautious, Disengaged, and Doubtful (Roser-Renouf, Stenhouse, Rolfe-Redding, Maibach, & Leiserowitz, 2015). Identifying these cohorts will allow for more effective communication and public engagement of campaigns that can be tailored to their specific needs and concerns (Maibach, Leiserowitz, Roser-Renouf, & Mertz, 2011; Chryst et al., 2017).

Framing

Message frames are a critically important component of communication and perception. A message from the same messenger could be interpreted differently if

framed negatively (such as “the economy will suffer”) versus positively (such as “the economy will prosper”). According to prospect theory, people respond very differently to the framing of risk, and in general tend to favor evaluating potential gains versus losses than on final outcomes alone (Kahneman & Tversky, 1983; 1991). Specifically, Tversky and Kahneman (1991) showed that losses are psychologically twice as powerful as gains. They built on previous studies by Kahneman, Knetsch and Thaler (1986) by testing the preferences of gaining something and losing somthing in the context of selling or buying a mug. In a classroom setting, some of the participants were given a mug (“sellers”) and asked to indicate their preferences for keeping the mug, or selling it for various amounts from $0.50 to $9.50 in $0.50 increments. Other participants were given no mug (“choosers”) and a similar questionnaire that indicated if they would prefer to receive a mug or a sum of money to be determined later. The median value of the mug was approximately $7 for sellers and approximately $3.50 for the choosers—meaning the mug was evaluated as a gain by the choosers and a loss by the sellers (Kahneman, Knetsch, & Thaler, 1986).

In the complex context of climate change, however, these tendencies do not always play out in a straightforward manner. Winning and losing a mug or money has a very different psychological backdrop than climate change impacts. Spence and Pidgeon (2010) surveyed college participants in Britain to study how various gain versus loss framings of climate change would impact interpretation of a message. They found that participants who had been presented with a gain frame rated the information as more positive than participants who had been presented with a loss frame. However, gain frames produced perceptions that climate change was more severe than loss frames

(Spence & Pidgeon, 2010). This research suggests that applying prospect theory to climate change isn't straightforward and must incorporate other theories, as they did not find that loss frames were more powerful than gain frames, as Tversky and Kahneman (1991) might have predicted from a straightforward test of prospect theory.

To further complicate climate change message framing, there is mixed research about whether hopeful or fearful messages are most influential because we each have different emotional triggers that engage different reactions (Roberts, 2017). Research on fearful messages indicates that when paired with information about how to address the threat, messages are more likely to illicit action (Witte, 1992). Some people respond better to a promotional frame (with potential benefits emphasized) while others respond more to a prevention frame (with potential consequences emphasized) (Shome & Marx, 2009). When it comes to a complex issue like climate change, simple gain versus loss frames may not be sufficient to adequately predict how an individual may respond to specific message framing, especially given the political divide in the United States.

In addition to emotional framing, value framing is important to the reception of a message, especially across political parties. A study by Walsko, Ariceaga and Seiden (2016) explored partisan attitude changes about climate change with various moral frameworks. Liberals showed consistent pro-environmental attitudes across all conditions (because environmentalism is already accepted as a liberal issue), whereas conservatives displayed more pro-environmental attitudes after being presented with a binding moral frame. Specifically, the moral binding frame included loyalty and respect for authority, which are traditionally conservative values (Walsko, Ariceaga, & Seiden, 2016). Further studies have shown that when conservatives are exposed to messages that affirm their

value system, they are more likely to indicate a pro-environmental stance (Gifford, Kormos & McIntyre, 2011; Anwar, 2012).

Messages can also be framed in terms of how physically or psychologically close they appear. Climate change is impacting people differently around the world—some are experiencing dramatic impacts now, while others will experience impacts later or perhaps never in their lifetime. Previous research has shown that people tend to respond more favorably when issues, especially environmental issues, are presented in terms of their immediate or local impacts that will directly impact the participant (Burke, 2010).

Pidgeon and Spence (2010) found an interesting nuance to the psychological distance framing of climate change, where participants who were asked to consider solely social impacts of climate change mitigation showed more positive reactions to climate mitigation than when they were asked to consider solely the personal impacts of climate change. They also found that distant climate change impacts were considered to be more severe than local impacts (Pidgeon & Spence, 2010).

Comparison of figures 1, 2 and 3 show that although physical or psychological distance may have an impact on belief, political affiliation seems to be a much larger determining factor. Perceived experience is construed, and one's level of personal concern may have more to do with what we see on TV or in the news than what is happening outside our own windows. This is important because if we can't connect the dots between what is happening in our backyard to our economic hardships due to climate change, it will reduce our risk perception. To bridge that divide, messages need to be focused on the real impacts people experience economically as well as environmentally.

Message

The last piece of climate messaging is the message itself, which needs to be tailored to a fierce partisan divide on climate. Most environmental messages, because they are typically designed by liberals, are primarily focused on "saving the planet that we are destroying." These messages have been enforced through media and have widened the partisan gap, discouraging conservatives to join the climate conversation. Some messages about climate change that have been adopted by conservative climate groups and that seem to have bi-partisan appeal focus on economics (republicEn, 2018; ConservAmerica, 2018).

The economics of climate change is a potentially effective message for a broad audience because it is a topic that is widely discussed by both Democrats and Republicans. There are two main ways to frame this topic: a positive or gain frame, highlighting the economic opportunities of addressing climate change (or rather, transitioning from fossil fuels to renewable energy), and a negative or loss frame, highlighting the economic risks and consequences of failing to more actively reduce climate change.

In the positive frame, the economic impacts of climate change are framed in an optimistic light. RepublicEn, a conservative group dedicated to grassroots base building to act on climate change focuses on messaging about "American free enterprise." On their website, they write, "Members of republicEn are conservatives, libertarians, and pragmatists of diverse political opinion. We stand together because we believe in American free enterprise. We believe that with a true level playing field, free enterprise can deliver the innovation to solve climate change. But America's climate policy needs to

change. Change requires that conservative leaders step-up and lead" (republicEn, 2018). In this framing, climate change presents an opportunity for Americans to innovate solutions and for conservative leaders to step up and take the opportunity to create change (and make a lot of money while doing so).

As climate change continues to cause more damage, our economy will shift from fossil fuels to renewable energy. Some news outlets and other media frame this shift optimistically. Samuelson (2017) in *Fortune* wrote:

> The solar and wind industries are each creating jobs at a rate 12 times faster than that of the rest of the U.S. economy, according to a new report. The study, published by the Environmental Defense Fund's (EDF) Climate Corps program, says that solar and wind jobs have grown at rates of about 20% annually in recent years, and sustainability now collectively represents four to four and a half million jobs in the U.S., up from 3.4 million in 2011.

Framing the shift from fossil fuels to renewables in such a positive light gives the reader the impression that climate change is a job creator—because it is.

The negative frame about how climate change impacts the economy is focused on the damage that climate change is already causing and how it will be worse in the future. *Science* published a frightening study looking at the economic damage of climate change. The authors looked at national data in six American economic hot spot locations and used models to predict the damage that those areas would face in the future. They found that the combined value of damage caused by climate change aggregated across sectors would cost approximately 1.2% of GDP per each additional 1 degree Celsius (Hsiang et al., 2017). This study spurred a number of articles from primarily liberal news outlets such as the *New York Times* (Plumer & Popovich, 2017) and *NPR* (Joyce, 2017) that included this negative frame of economic damage.

As we move from fossil fuels to renewables and as the impacts of climate change affect industries such as farming, skiing and tourism, all in addition to migration and displacement, a huge loss of jobs is expected. Poshen (2015) detailed the job loss impacts of climate change:

> Already, the overuse of resources has led to the sharp contraction or collapse of some industries in G20 countries, such as forestry in China, Indonesia and the western United States, or fishing in parts of Canada, with associated job losses ranging from tens of thousands to almost one million. There are also direct losses of jobs and incomes. For example, as a result of Hurricane Katrina in the United States in 2005, New Orleans lost some 40,000 jobs; the hardest hit were women, mostly African American.

Articles and media that frame the impacts of climate change as a job destroyer may motivate those who respond to punitive messaging to take action.

Research Question, Hypotheses and Specific Aims

My major research question focused on how gain versus loss frames about the economic angle of climate change affect attitudes toward political candidate support, and whether the effects are different in liberal versus conservative audiences. I proposed the following hypotheses: (1) The positive frame will lead to significant stronger desire to vote for a candidate who supports climate policy than the loss frame overall; and (2) this effect will be stronger for conservatives than liberals.

Specific Aims

To address this question and hypothesis, I:

1. Developed a strategic and comprehensive survey
2. Implemented the online survey
3. Determined which frames produced the most significant responses

Chapter II

Methods

To test my hypotheses, I followed standard experimental survey methods outlined below. In the first stage, I determined the characteristics of my required sample and designed the survey instrument. In the second stage, I implemented the survey and collected the data using Amazon Mechanical Turk (MTurk). In the last stage, I focused on data analysis to evaluate the hypotheses.

Development of Strategic and Comprehensive Survey

Participants completed an anonymous survey about their belief about social issues containing the following measures. Items are described in the order that they were completed.

Before starting the survey, participants completed the consent form. After the consent form, participants were asked to complete the survey to the best of their ability and were asked to type the word “START” as an attention check. After they entered any combination of letters in the “START” box, participants were asked the same five questions about various social issue topics including charter schools, the opioid crisis, campaign finance reform, tackling Wall street and climate change. All questions were answered on the same six-part sliding scale about how likely they would be to vote for a candidate who supports the topic. Mean values and standard errors were calculated for each of these questions based on the rank order scales exemplified below.

One example of a non-climate question was:

> Complete this sentence: After learning that a candidate supports addressing the opioid crisis by increasing penalties (such as jail time and fines) for users and sellers, you would be _____.
>
> 1. Much more likely to vote for them
> 2. Somewhat more likely to vote for them
> 3. Equally likely to vote for them
> 4. Somewhat less likely to vote for them
> 5. Much less likely to vote for them
> 6. I am unlikely to vote

The climate change question that survey takers received, with responses as the dependent variable, was:

> Complete this sentence: After learning that a candidate supports moving our economy from fossil fuels (coal, oil and natural gas) to renewable energy (such as solar and wind) to address global warming, you would be _____.
>
> 1. Much more likely to vote for them
> 2. Somewhat more likely to vote for them
> 3. Equally likely to vote for them
> 4. Somewhat less likely to vote for them
> 5. Much less likely to vote for them
> 6. I am unlikely to vote

After responding to these five questions, participants were exposed to a message, which was randomized between the gain frame, the loss frame, and the control (Table 1). The control message was about dog breeds and was tested to see how a non-climate change message impacted the dependent variable.

After message exposure, participants were asked to answer the dependent variable question again: "Complete this sentence: After learning that a candidate supports moving our economy from fossil fuels (coal, oil and natural gas) to renewable energy (such as solar and wind) to address global warming, you would be _____."

Table 1. Randomized messages.

Frame	Message
Gain	Over the next 50 years, Americans could gain roughly 10 million jobs from renewable energy industries such as solar and wind turbines, which is promoting American free enterprise. Many conservative leaders agree that renewable energy is a way to keep jobs in America and to tackle global warming.
Loss	Over the next 50 years, Americans could lose roughly 10 million jobs from extreme weather (such as increased fires, droughts, storms) due to global warming, which is hurting American free enterprise. Many conservative leaders agree that global warming is hurting jobs in America.
Control	Dogs have been selectively bred for thousands of years, sometimes by inbreeding dogs from the same ancestral lines, sometimes by mixing dogs from very different lines.

Following the dependent variable question, participants were asked four questions to gauge their perception of global warming threat. These questions were developed by the Yale Program for Climate Change Communication (YPCCC) (2018). An example of one of the questions is, "How important is the issue of global warming to you personally?" (1 = Extremely important, 5 = Not at all important).

After these climate focused questions, demographic information collected included ethnic background, age, gender, education level, location, yearly household income, political party affiliation and ideology. After the demographic information, participants were thanked for completing the survey and asked to enter their MTurk ID number to be paid. The full survey is presented in the Appendix.

Implementation of Survey

The survey was created on Qualtrics and distributed online on MTurk. The consent form and survey was passed through the Harvard IRB. A preliminary test of 50 participants was completed on November 7th, 2018 to ensure there were no major errors in the survey. Once these data were evaluated as complete, the second round of 649 participants completed the survey on November 9th, 2018, for a total of 699 participants. Participants were paid $1 for the completing the survey, which took approximately 10 minutes to complete. Data were collected using MTurk and were exported in a .csv file to SPSS for analysis.

The 699 participants who completed the survey were from across a wide range of demographics, which did not represent typical American demographics. More males (N = 394) than females (N = 290) took the survey, with only a few gender non-binary participants (N = 3). The majority of participants identified as White (N = 519), followed by Asian (N = 56), then African American or Black (N = 50), then Spanish, Hispanic or Latino (N = 38), then Two or more races (N = 21), and Other (N =3). Across the age spectrum, there was age diversity but with most in the 25-44 years old range: 18-24 years old (N = 68), 25-34 years old (N = 320), 35-44 years old (N = 173), 45-54 years old (N = 61), 55-64 years old (N = 48), 65+ years old (N = 17). Ideologically, there were over twice as many Democrats (N = 313) as Republicans (N = 128), with many Independents (N = 212). Yearly household income varied: Less than $25,000 (N = 113), $25,000-$39,999 (N = 161), $40,000-54,999 (N = 131), $55,000-69,999 (N = 101), $70,000-84,999 (N = 62), $85,000-99,999 (N = 44), $100,000+ (N = 75). Education level also varied: Did not graduate high school (N = 3), High school, graduate, GED, or alternative

(N = 103), Some college, or Associate's degree (N = 237), Bachelor's (college) degree or equivalent (N = 278), and Graduate or professional degree (e.g., Master's degree, MD, PhD, JD, MBA) (N = 66). Participants lived in various locations: Suburban area (N = 354), Rural area (N = 137), Urban area (N = 196).

Determining Most Significant Messages

Once the data were collected, they were inspected to assess potential errors and to report some data as "missing" to avoid falsely reporting the results. No participants failed the attention check, although some wrote lowercase letters instead of uppercase "START" or wrote "yes start." For our dependent variable, participants who answered "I am unlikely to vote" were reported as missing (N = 10) for that question. For questions 14 and 15 from the YPCCC about climate change concern, responses of "I don't know" were also reported as missing. Finally, for the political ideology question, responses of "Other" or "No party/ not interested in politics" were reported as missing. Some of the questions were recoded so that higher values represented stronger positive support for an issue—for example, the social issue questions were recoded from 1 being "Much more likely to vote for them" to 1 being "Much less likely to vote for them."

Chapter III

Results

My results are reported in two categories: the main findings, which specifically addresses my hypotheses, and additional findings, which were extrinsic to my hypotheses or main research question, but were interesting and may warrant further research.

Main Findings

Descriptive statistics and correlations between political orientation and the message exposure, across all participants, are presented in Table 2.

Table 2. Adjusted means of difference for party and condition.

Condition	Party	*M*	*SE*	*N*
Control	Democrat	2.784	.036	100
	Republican	2.583	.052	47
	Independent	2.726	.041	74
Gain Frame	Democrat	2.810	.036	97
	Republican	2.750	.055	43
	Independent	2.873	.041	76
Loss Frame	Democrat	2.769	.033	116
	Republican	2.686	.058	38
	Independent	2.808	.045	62

My hypothesis about the main effect was not supported. Although the trends were in the predicted direction, there was no significant difference between a gain and loss frame (p = .184), (Figure 5), although both the gain (M_{diff} = 4.38, SE = .04, p = .001) frame and loss frame (M_{diff} = 4.29, SE = .043, p = .042) were significantly higher than the control frame (M_{diff} = 4.17, SE = .04).

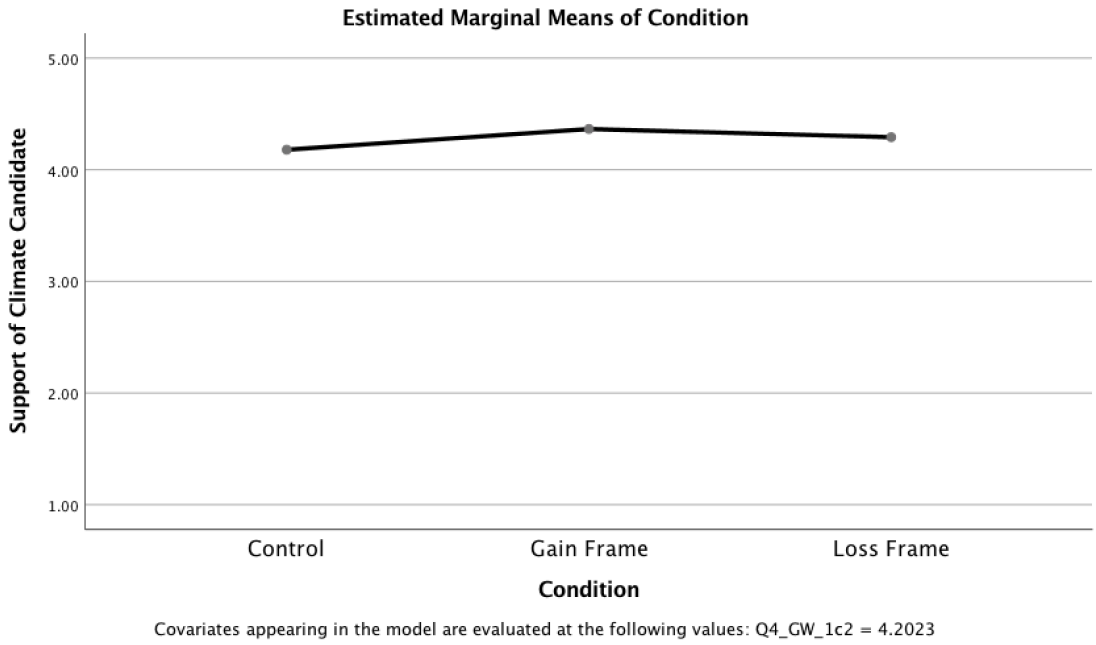


Figure 4. Estimated marginal means of condition.

Contrary to my hypothesis, the interaction between condition and party was not significant, p = .865 (Figure 4). However, there were some interesting unexpected findings around party and demographic information. Democrats (M_{diff} = 2.79, SE = .02) had a significantly higher score than Republicans (M_{diff} = 2.67, SE = .03), p = .028. Independents (M_{diff} = 2.8, SE = .02) were not significantly different from Democrats (M_{diff}

= 2.79, *SE* = .02), *p* = .416, but Independents (M_{diff} = 2.8, *SE* = .02) did score significantly higher than Republicans (M_{diff} = 2.67, *SE* = .03), *p* = .005.

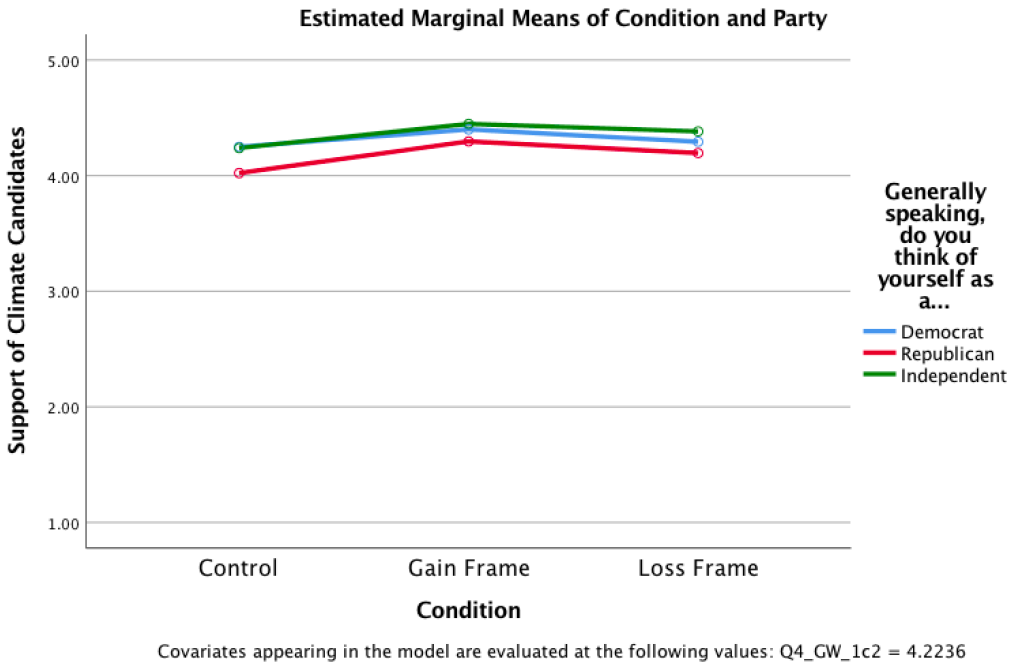


Figure 5. Estimated marginal means of condition and party.

Additional Findings

For exploratory purposes, additional univariate ANOVA's were run for each of the demographic questions (age, gender, ethnic background, education level, living environment and yearly household income level) as well as the YPCCC questions to determine how background information or climate change concern impacted the dependent variable. The ANOVA's were run the same as the first ANOVA for the main finding with the addition of different demographic information as additional fixed factors. Results are shown using plot charts below.

Six Americas findings. The Six Americas segmentation proportions were substantially different than national data from the YPCCC (Chryst et al., 2017). The MTurk survey takers in this study were more alarmed than the March 2018 national average (Figure 6).

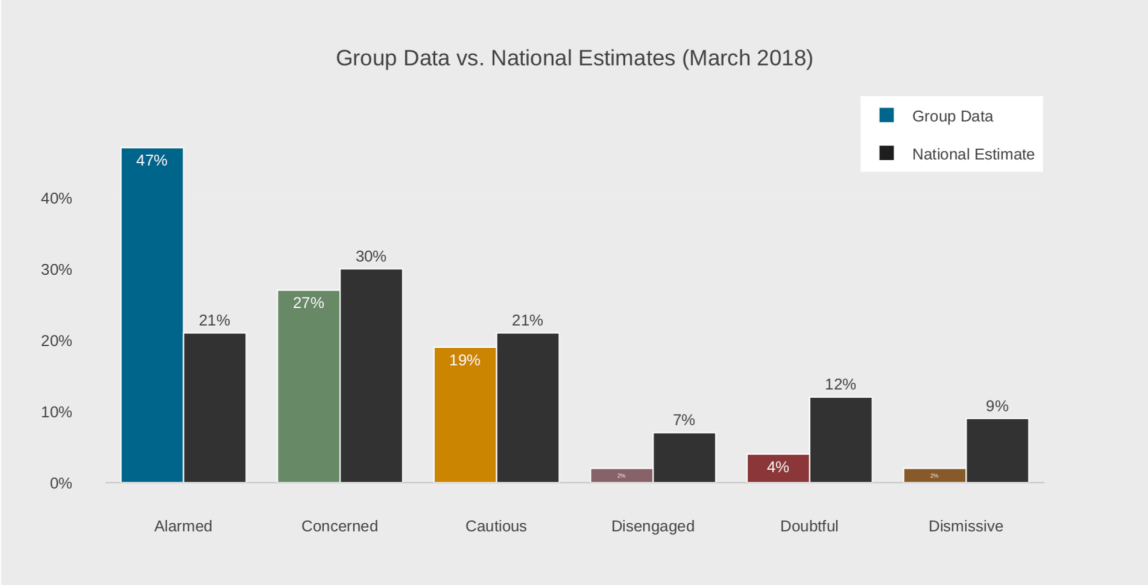


Figure 6. Group data vs. national estimates.

Demographic findings. The demographic findings were quite varied across ethnic background, age, gender, education level, location, yearly household income, political party affiliation and ideology.

There were no significant differences of condition between ethnic backgrounds, yearly household income levels, gender or education level. There was not a significant difference of condition and age groups, but there was a significant difference between the age groups in general (Figure 7). 18-24 year olds (M_{diff} = 4.35, SE = .07), 25-34 year olds (M_{diff} = 4.27, SE = 4.27), 35-44 year olds (M_{diff} = 4.28, SE = .04), and 45-54 year olds

(M_{diff} = 4.39, SE = .09) all scored significantly higher than 55-64 year olds (M_{diff} = 4.08, SE = .17), $p < .05$. No other significant age differences were found.

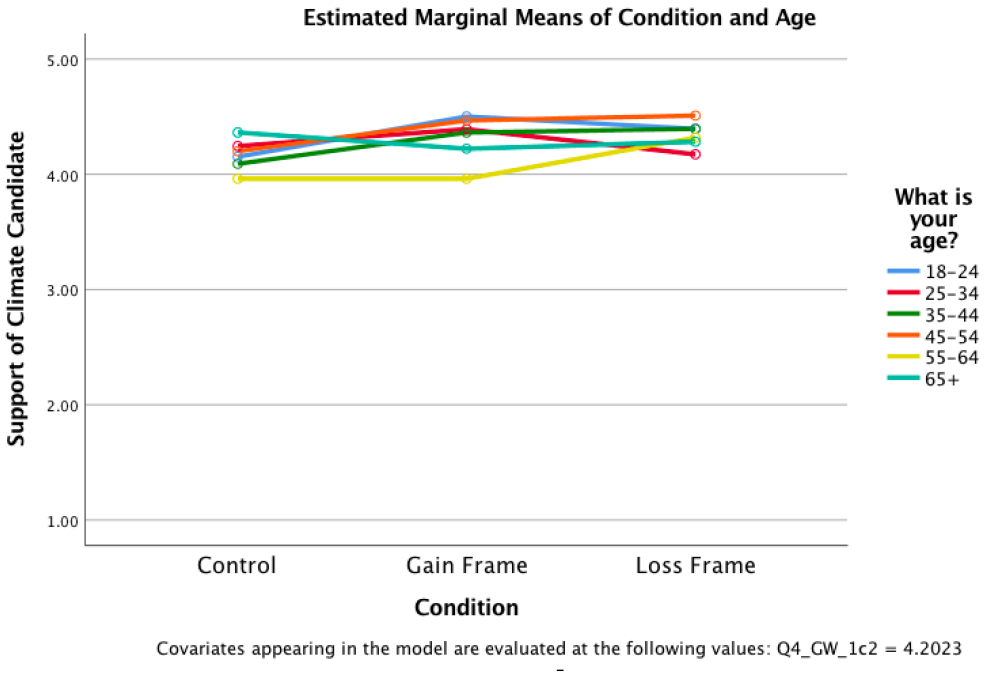


Figure 7. Estimated marginal means of condition and age.

There was a significant difference in where people lived (Figure 8). People who lived in rural areas scored significantly lower on climate candidate support (M_{diff} = 4.16, SE = .05) than people who lived in urban (M_{diff} = 4.33, SE = .04, p = .012) or suburban (M_{diff} = 4.30, SE = .03, p = .025) areas. There was no significant difference between suburban and urban areas.

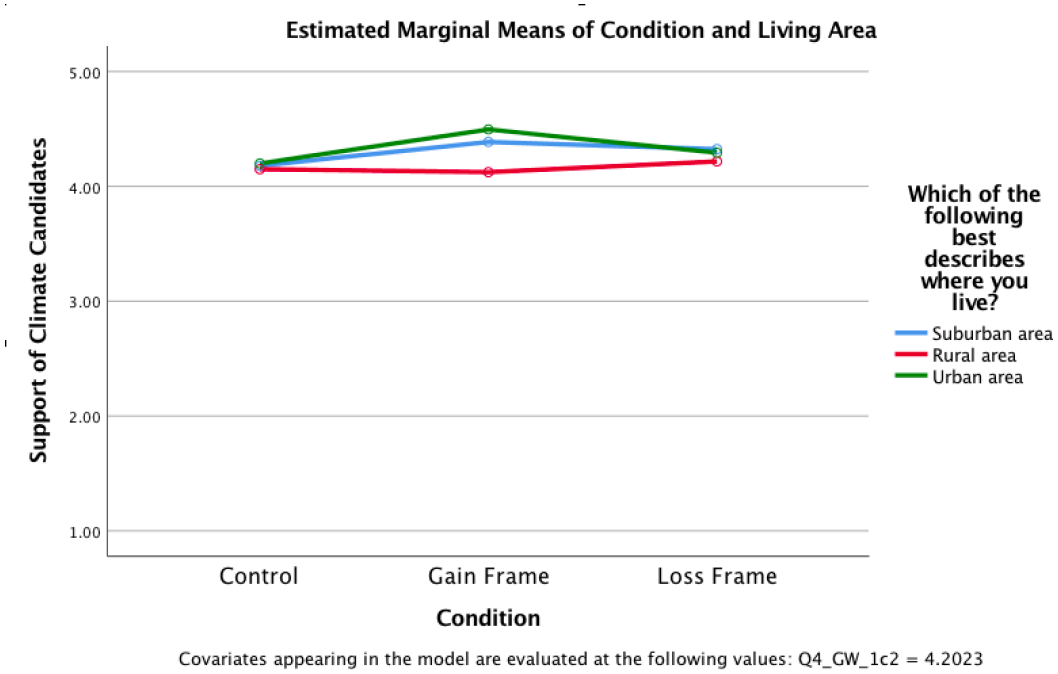


Figure 8. Estimated marginal means of condition and living area.

There was also a significant effect of ideology, in which very conservative participants scored significantly lower ($p < .05$) than all other categories for all three conditions (Figure 9). No other effect of ideology was significantly different than the other, even very liberal compared to somewhat conservative.

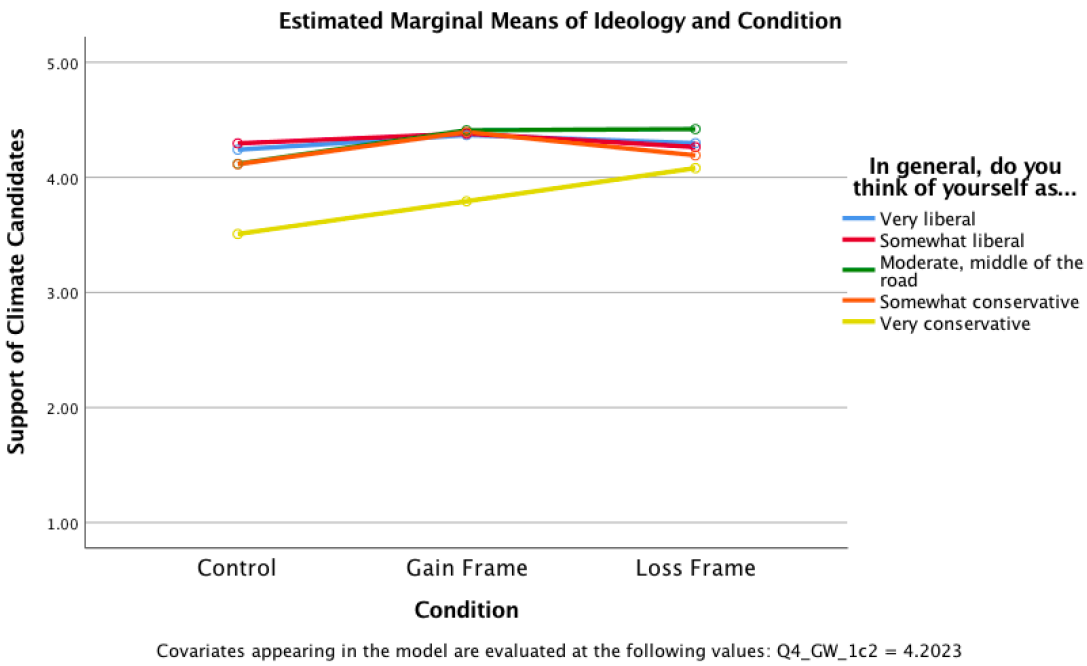


Figure 9. Estimated marginal means of ideology and condition.

Chapter IV

Discussion

While the data did not support either of my hypotheses, they did shed some light on some really interesting interactions. My hypothesis was two-fold: I predicted that the positive frame would be more significant than the loss frame overall, and that this effect would be stronger for conservatives than liberals. Although the graph of political party and condition (Figure 5) suggested that my hypotheses might be true, the results were not statistically significant. As it relates to the prospect theory, in this study, climate change is an exception to the rule and needs further data to draw conclusions.

Conclusions

There are several conclusions we can draw from the data. The most important finding is that gain versus loss framing did not seem to have a significant impact on whether or not people would be more likely to vote for a renewable energy supportive candidate—the gain frame and the loss frame were not significantly different from each other, either across party lines or not. Overall, Democrats and Independents had higher scores than Republicans—which is consistent with the partisan divide. Also, the gain and loss frames produced higher scores than the control message, likely because they both contained conservative values. The YPCCC questions shed some interesting light on MTurk users and what kind of pool of participants we had versus a more representative sample of American opinions about climate change. And finally, the demographic results

were useful to see what does or does not have a significant impact on potential voting habits. Knowing, for example, that people who live in rural environments tend to believe in climate change less means that targeted rural outreach would be a better use of resources than messaging targeted to city dwellers.

Prospect Theory

These data showed that there is no significant difference between gain and loss frame when it relates to how people would vote for a political candidate who supports renewable energy. Unlike Spence & Pidgeon (2010), I did not find a significant difference between the gain and loss frame at all, nor as a function of political party. If the study had larger numbers, the results may have been significant, but with only 699 participants, there was no significant difference between the frames.

The lack of gain versus loss frame significance may also be explained by the fact that both the gain and loss frames were worded with conservative values. Both the gain and loss frames had significantly higher scores than the control, which did not use any conservative values. When conservatives are exposed to messages framed with conservative values such as the economy, free enterprise, or upholding conservative leader's views, they are much more likely to be supportive of the issue (Freestone, 2018).

Since both the gain and loss frames used conservative values, these data suggest that the value framing may be more important than a gain versus loss frame, which is a very significant finding. If we want to influence messaging to a bi-partisan audience, using conservative values in that framing may be the change that is needed for better bi-partisan support for addressing climate change.

Six Americas questions. When the national averages of the YPCCC's "Six America's" were compared to the data from participants in this study, we found that these MTurk participants were generally more concerned about climate change and more liberal than the national average. This may be in large part due to the fact that twice as many democrats took this survey than Republicans. The finding of these MTurk users being more liberal than the national average is also well documented by other studies as well and might be able to be explained by more liberal populations tending to be more interested in social sciences and data driven analysis in general (Boas, Christenson and Glick, 2018).

Demographic Information

There were some interesting findings based on demographic information. Notably, there was a significant difference between age groups and where people lived. The 55-64 year old age group had significantly lower scores than their younger peers. This finding is not incredibly surprising given previous research that supports similar results. Pew Research Center found that millennial Republicans are twice as likely to believe in anthropogenic climate change than their baby boomer peers (Funk & Hefferon, 2018). This finding may be because young people will feel the impacts of climate change more than older people, and that it is now taught in elementary schools, whereas the problem was largely undiscovered until the 1980's (Carswell, 2014). Bruce Gibney (2017) argues in his book *A Generation of Sociopaths: How the Baby Boomers Betrayed America* that baby boomers have left younger generations daunting consequences such as

climate change and failing infrastructure by refusing to incur small sacrifices. Boomers ensured they would live longer and prosper, even at the expense of future generations. They also grew up in the cold war era, where the constant threat of nuclear catastrophe was a constant existential threat that was never actualized (Smiley, 2017). Interestingly, in the current study, the 65+ category had higher scores, consistent with the younger cohort, leaving just the 55-64 year old age group isolated as the lowest scoring group. That may have occurred because there were only 17 participants in the 65+ age category, so due to the small numbers and liberal leaning MTurk users, those factors could have negated the age effect.

There was also an interesting significant difference between where people live. Rural living participants scored significantly lower than suburban or urban living participants, which was also not an exceptional finding. The Pew Research Center studied differences between rural, suburban and urban areas and found that inhabitants of rural communities were more politically conservative, were older, had lower socioeconomic status, were less diverse and were less educated than their counterparts from other living environments—all factors that have been found to decrease belief in anthropogenic climate change (Parker et al., 2018; Ballew, Marlon, Wang, Leiserowitz & Maibach, 2018; Pearson, Ballew, Naiman, & Schuldt, 2017).

Rural living environments also present specific challenges that suburban and urban environments do not. The National Climate Assessment (2014) broke down different climate impacts by region in the United States. They included a section about rural communities across all parts of the U.S., focusing on the specific difficulties that they will encounter. They found that rural communities face unique challenges in part

because fossil fuel extraction jobs are primarily in rural communities, which contributes to resistance to moving away from those energy sources. Additionally, rural communities are generally less economically diverse than urban communities, which means that changes in sectors from climate change will have disproportionally large impacts on economies that rely on climate stability (National Climate Assessment, 2014). Because rural communities have special challenges, messaging about climate change must be carefully crafted—otherwise, it will not be trusted information.

Climate change is clearly more complicated than a simple hypothetical game of money now or later—prospect theory was not able to predict how people would feel about the gains of a renewable energy economy versus the losses of a climate change economy. Factors such as age, political affiliation or where people live played an important role in determining support for political candidates who say they will move our economy from fossil fuels to renewable energy. Framing the message with conservative values seems to be very important to the message changing conservative audience opinions on climate change. Future research should dig further into climate change communication complexities to help determine which messages are most effective for which audiences because it is clear that one message does fit all.

Research Limitations

This research began to examine several factors that inform people's opinions and beliefs about climate change, but was constrained. The study was limited because all questions were framed with conservative values, to keep the study simple and to avoid potentially confounding factors. Future studies could break down categories further by

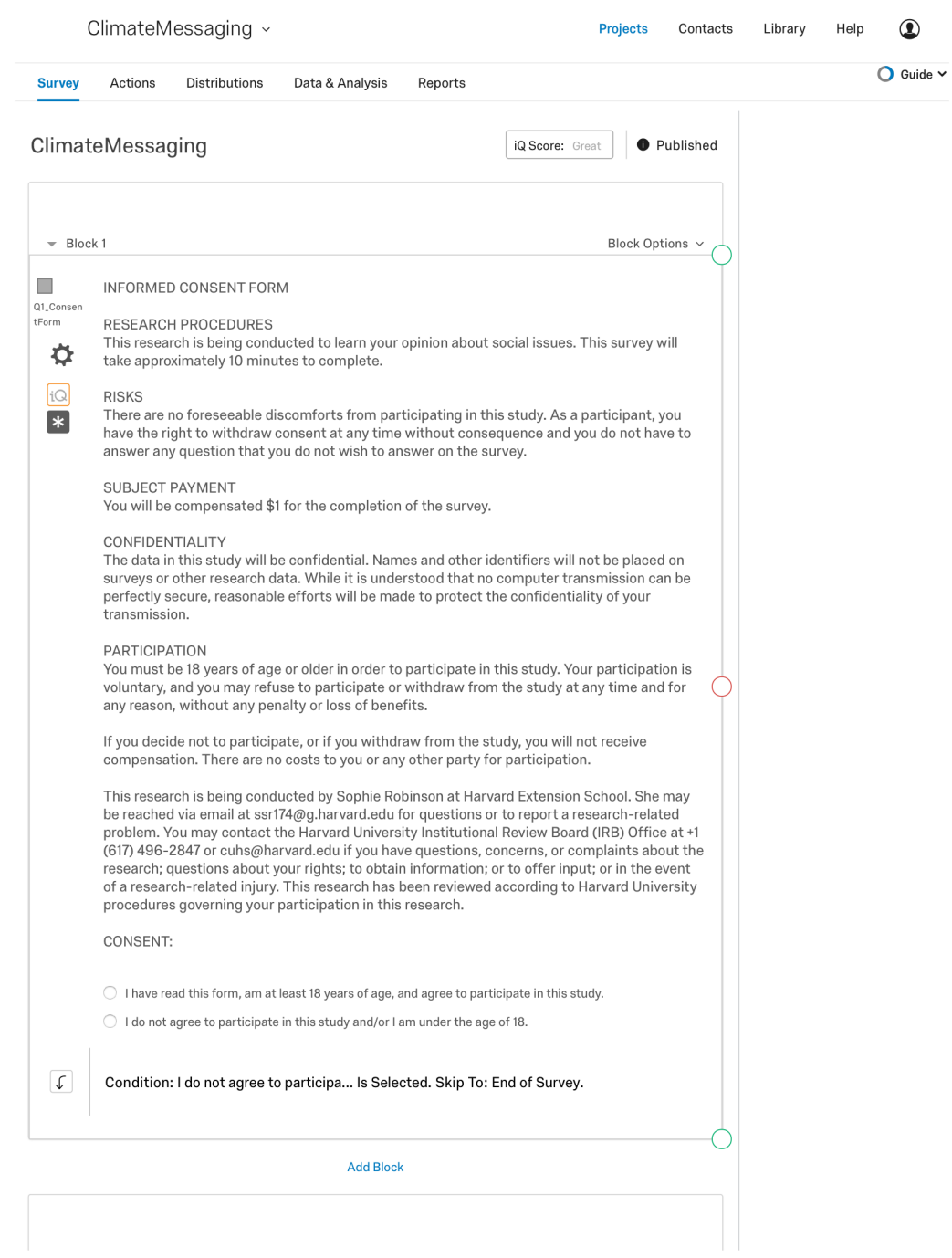
testing for liberal value framed questions in addition to conservatively framed questions. Another large limitation was scope—in this research, I was only able to study answers from participants who are accessible through the MTurk online survey platform. For more accurate and complete data, the survey should be conducted across the United States on multiple platforms to get a more representative sample of American citizens.

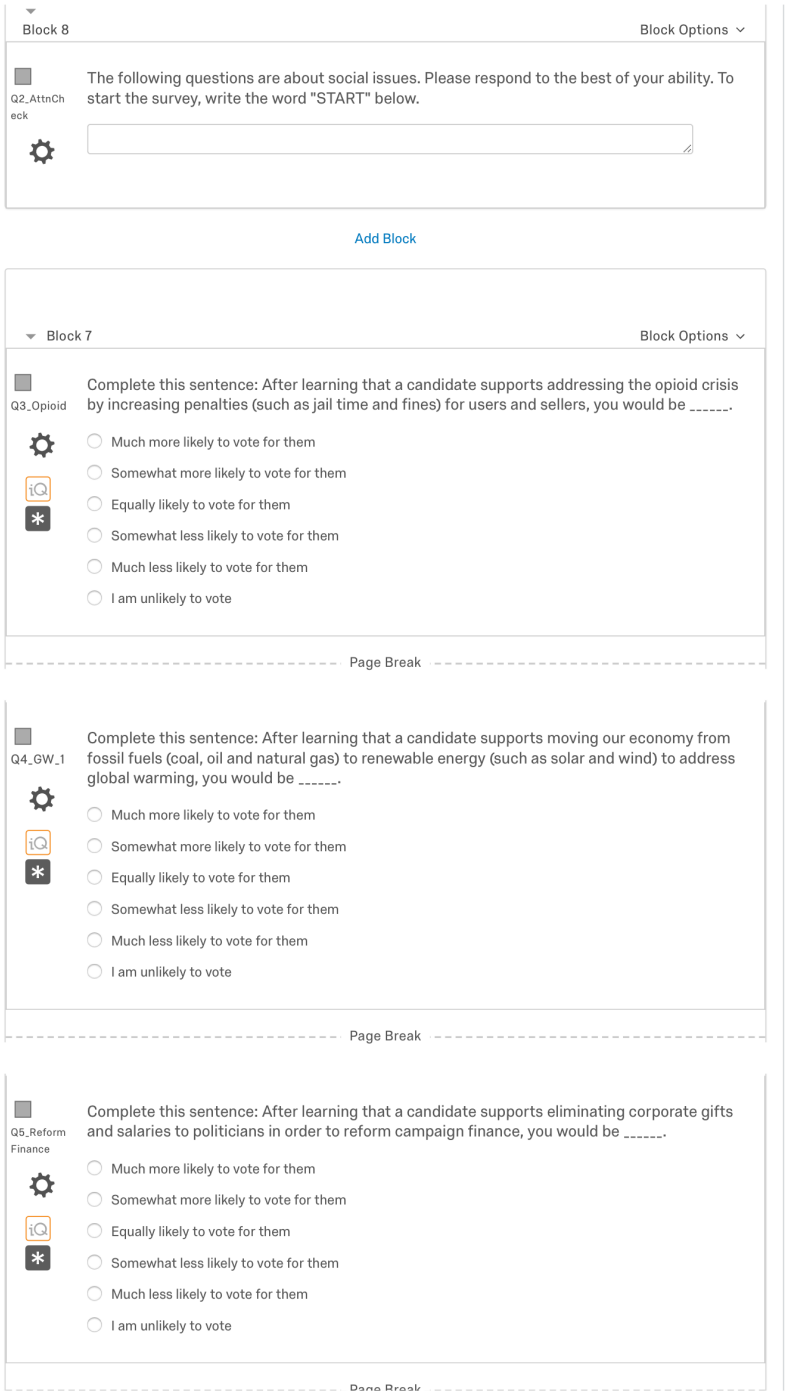
It would also be interesting to see how this survey would do in other countries, to determine how United States partisanship compares to partisanship in other countries. Understanding the differences in partisanship between countries might help us better understand what factors contribute to climate change partisanship. Are the only countries that experience political partisanship about climate change also heavy fossil fuel producing countries?

The research was also constrained by which questions were asked on the survey—due to time and financial constraints, only a certain number of questions could be asked, and some questions or answers that could be key findings might be missing from lack of previous research. Using a survey method also constrained the specific language used in the questions, and some questions might be worded more carefully to avoid unintended miscommunication. Further research on understanding opinions and attitudes about climate change across political audiences is important to successfully address the problem.

Appendix

Full Qualtrics Survey




Block 8
Block Options
Q2_AttnCheck
The following questions are about social issues. Please respond to the best of your ability. To start the survey, write the word "START" below.
Add Block
Block 7
Block Options
Q3_Opioid
Complete this sentence: After learning that a candidate supports addressing the opioid crisis by increasing penalties (such as jail time and fines) for users and sellers, you would be _____.
Much more likely to vote for them
Somewhat more likely to vote for them
Equally likely to vote for them
Somewhat less likely to vote for them
Much less likely to vote for them
I am unlikely to vote
Page Break
Q4_GW_1
Complete this sentence: After learning that a candidate supports moving our economy from fossil fuels (coal, oil and natural gas) to renewable energy (such as solar and wind) to address global warming, you would be _____.
Much more likely to vote for them
Somewhat more likely to vote for them
Equally likely to vote for them
Somewhat less likely to vote for them
Much less likely to vote for them
I am unlikely to vote
Page Break
Q5_Reform Finance
Complete this sentence: After learning that a candidate supports eliminating corporate gifts and salaries to politicians in order to reform campaign finance, you would be _____.
Much more likely to vote for them
Somewhat more likely to vote for them
Equally likely to vote for them
Somewhat less likely to vote for them
Much less likely to vote for them
I am unlikely to vote

Q6_CharterSchool

Complete this sentence: After learning that a candidate supports giving more public school funding to charter schools, you would be _____.

- Much more likely to vote for them
- Somewhat more likely to vote for them
- Equally likely to vote for them
- Somewhat less likely to vote for them
- Much less likely to vote for them
- I am unlikely to vote

Page Break

Q7_FinancialCrisis

Complete this sentence: After learning that a candidate supports penalizing (such as jail time and fines) wall street bankers who knowingly sought personal gain at the expense of the economy during the 2008 financial crisis, you would be _____.

- Much more likely to vote for them
- Somewhat more likely to vote for them
- Equally likely to vote for them
- Somewhat less likely to vote for them
- Much less likely to vote for them
- I am unlikely to vote

Page Break

Add Block

Control Block Options

Q8_Control

Dogs have been selectively bred for thousands of years, sometimes by inbreeding dogs from the same ancestral lines, sometimes by mixing dogs from very different lines.

Page Break

Add Block

Loss Frame Block Options

Q9_Loss

Over the next 50 years, Americans could lose roughly 10 million jobs from extreme weather (such as increased fires, droughts, storms) due to global warming, which is hurting American free enterprise. Many conservative leaders agree that global warming is hurting jobs in America.

Page Break

Add Block

Gain Frame Block Options

Q10_Gain

Over the next 50 years, Americans could gain roughly 10 million jobs from renewable energy industries such as solar and wind turbines, which is promoting American free enterprise. Many conservative leaders agree that renewable energy is a way to keep jobs in America and to tackle global wamring.

Page Break

Add Block

Block 6 Block Options

Q11_GW_2

Complete this sentence: After learning that a candidate supports moving our economy from fossil fuels (coal, oil and natural gas) to renewable energy (such as solar and wind) to address global warming, you would be _____.

- Much more likely to vote for them
- Somewhat more likely to vote for them
- Equally likely to vote for them
- Somewhat less likely to vote for them
- Much less likely to vote for them
- I am unlikely to vote

Page Break

Q12_SASSY1

How important is the issue of global warming to you personally?

- Extremely important
- Very important
- Somewhat important
- Not too important
- Not at all important

Page Break

Q13_SASSY2

How worried are you about global warming?

- Very worried
- Somewhat worried
- Not very worried
- Not worried at all

Page Break

Q14_SASSY3

How much do you think global warming will harm you personally?

- A great deal
- A moderate amount
- Only a little
- Not at all
- Don't know

Page Break

Q15_SASSY4

How much do you think global warming will harm future generations of people?

- A great deal
- A moderate amount
- Only a little
- Not at all
- Don't know

Page Break

Q16_RacialBackground

Which race or ethnic background best describes you? Please choose one.

- African American or Black
- Asian
- Spanish, Hispanic, or Latino
- White
- Two or more races
- Other

Page Break

Q17_Age

What is your age?

- 18-24
- 25-34
- 35-44
- 45-54
- 55-64
- 65+

Page Break

Q18_Gender

What is your gender?

- Male
- Female
- Non-binary

Page Break

Q19_EducationLevel

What is the highest level of school you have completed?

- Did not graduate high school
- High school graduate, GED, or alternative
- Some college, or Associate's degree
- Bachelor's (college) degree or equilivent
- Graduate or professional degree (e.g., Master's degree, MD, PhD, JD, MBA)

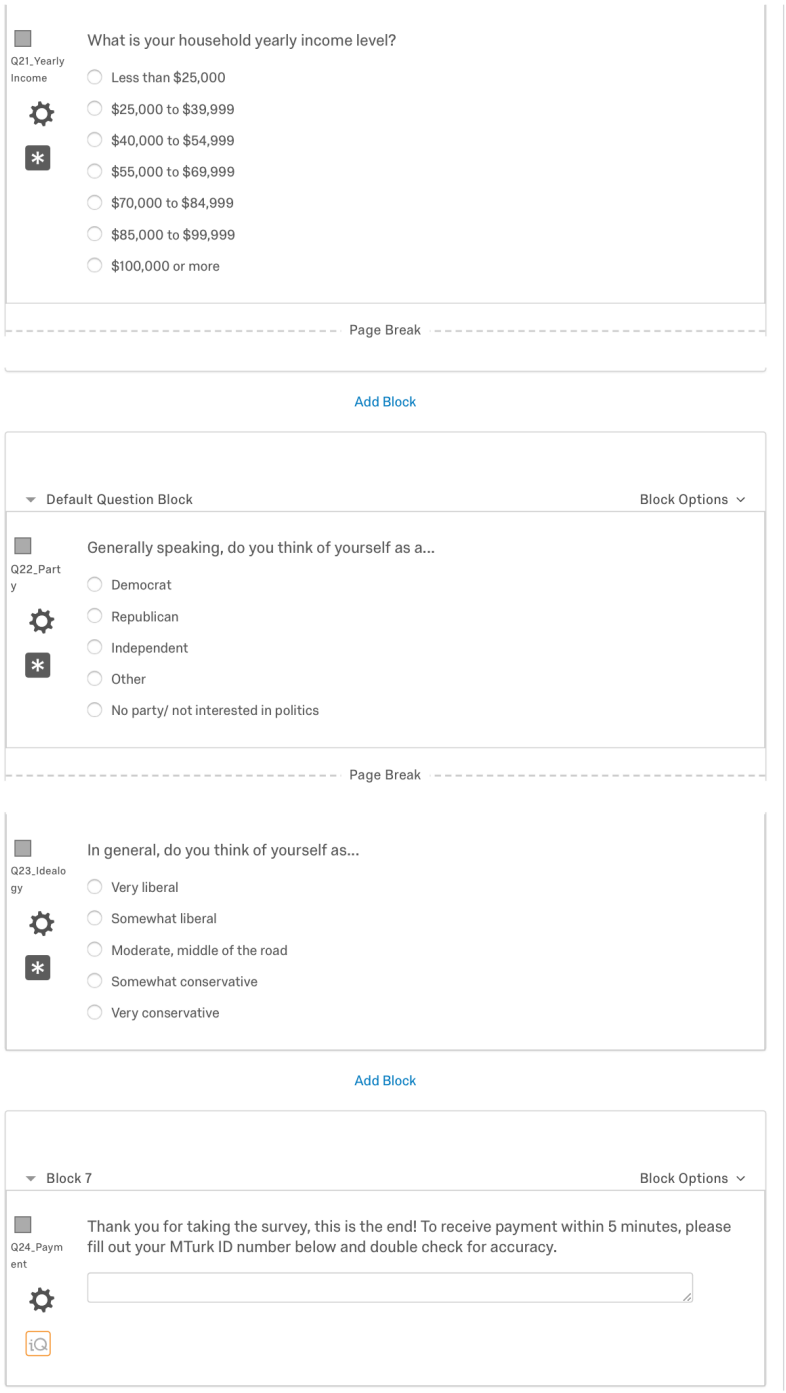
Page Break

Q20_AreaLive

Which of the following best describes where you live?

- Suburban area
- Rural area
- Urban area

Page Break


Q21_Yearly Income
What is your household yearly income level?
Less than $25,000
$25,000 to $39,999
$40,000 to $54,999
$55,000 to $69,999
$70,000 to $84,999
$85,000 to $99,999
$100,000 or more
Page Break
Add Block
Default Question Block
Block Options
Q22_Party
Generally speaking, do you think of yourself as a...
Democrat
Republican
Independent
Other
No party/ not interested in politics
Page Break
Q23_Idealogy
In general, do you think of yourself as...
Very liberal
Somewhat liberal
Moderate, middle of the road
Somewhat conservative
Very conservative
Add Block
Block 7
Block Options
Q24_Payment
Thank you for taking the survey, this is the end! To receive payment within 5 minutes, please fill out your MTurk ID number below and double check for accuracy.

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