

**Title:** Discounting or Ideology? Sources of Opposition to Climate Change-Related Action

Toby Bolsen\*

Georgia State University

[tbolsen@gsu.edu](mailto:tbolsen@gsu.edu)

Jason Reifler

University of Exeter

[jason.reifler@gmail.com](mailto:jason.reifler@gmail.com)

Matthew A. Shapiro<sup>+</sup>

Illinois Institute of Technology

[matthew.shapiro@iit.edu](mailto:matthew.shapiro@iit.edu)

## Abstract

Two distinct factors complicate efforts to take action to address the threat of climate change: 1) skepticism in some segments of the public as to whether average surface level temperatures are increasing, and 2) more widespread beliefs that the effects of climate change are distant, and therefore a low national priority. In other words, opposition to collective corrective measures and individual-level action may be driven either by an outright rejection of risks or by the significant temporal distance until those risks are realized. In this paper, we examine how people respond to appeals that vary both the nature of the outcomes associated with climate change continuing unabated and the time elapsed until those effects are realized. By varying the time horizon associated with global climate change, we aim to better understand the mechanisms that lead to discounting future risks caused by climate change. The large size of our sample ( $n=801$ ) allows us to further explore the impact of political ideology, which is a paramount driver for action on climate change, at least in the United States. These findings provide valuable insight into what sort of communication to the public promotes individual and collective action to combat climate change.

**Keywords:** climate change, discounting, political ideology, framing effects, collective action

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\* Authorship is equal and alphabetically listed.

<sup>+</sup> Corresponding author.

## **Introduction**

How does the time horizon of likely consequences associated with climate change affect citizens' support for collective action to mitigate catastrophic outcomes? The extant literature suggests that support for action is a function of risk-related beliefs, party identification, short-term weather fluctuations, values, and personality traits, but there is limited research examining how the proximity of disastrous consequences affects support for action to mitigate its impacts. We know that individuals privilege short-term over long-term benefits on a host of issues, specifically substance abuse, saving money, and membership in cults or gangs (Akerlof, 1991). More recently, this phenomenon has been identified in how we vote and respond to policy alternatives (Healy & Lenz, 2012; Healy & Malhotra, 2009; Jacobs & Matthews, 2012). Given the relatively static beliefs of the public about the temporal urgency of climate change (see Figure 1) in spite of increased scientific pronouncements that climate change is anthropogenic (Cook et al., 2013), the time is ripe for analyzing individual discounting preferences. Our analysis, though, is compounded by the highly politicized nature of climate change, and thus, we focus on discounting in conjunction with political ideology.

[Figure 1 here]

Our approach also attempts to show key differences between preferences for the present in the context of cost versus benefit frames, i.e., "sign effects". In the wake of research showing hyperbolic discounting with regard to environmental concerns (Viscusi et al. 2008), a burgeoning area of research highlights the importance of both the costs and benefits dimensions (Hardisty & Weber, 2009). We believe that the cost-benefit comparison is crucial in considering the implications for collective action, for policy making, and for the conveying of scientific phenomena to the public. That is, it sheds light on the political feasibility of climate change-related policies. By using an individual's discount rate as a moderating predictor of how a cost-related or a benefits-related deadline affects policy support and willingness to change one's actions with regard to climate change, we are able to understand how the framing of the issue affects support or opposition to a particular climate change-related policy.

The exposure to time parameters about dealing with climate change is likely to affect an individual's willingness to take personal steps and to support government efforts to mitigate the effects resulting from climate change in a number of ways. First, the information may have no

effect on willingness to take personal action or increase support for government action to reduce carbon emissions. Second, benefits-related information may affect these same outcome variables more than cost-related information, consistent with existing research on sign effects. Third, the information may have effects of some sort but only when conditioned by stronger drivers of climate change such as political ideology or one's personal discount rate. In this way, our study contributes substantially to our existing understanding of the determinants of collective action as well as the ways in which individuals may or may not discount future risks caused by climate change. Our expectations are muddled, though. As political scientists, we can argue that ideology is crucial; as behavioralists, the framing of the problem should be considered paramount; and as economists, the discount rate is predicted to nullify the effects of differentiated time parameters. We show below that all of these views are validated to a marginal extent.

## Theory & Hypotheses

Myopia and procrastination are, respectively, the cognitive and behavioral responses of a shared phenomenon. We assume that they occur together and that myopia has temporal priority, in line with Ainslie (1991, 1992) and Thaler and Lowenstein (1992). Facially, this might seem like a particularly strong assumption, as procrastination can also result from the ranking of alternatives, resulting in the delay of an action given limited resources. Yet, even in this scenario, and consistent with Akerlof (1991), each alternative action is ranked according to myopia and thus cannot be independent.

Procrastination is closely connected to how individuals assess risk across a range of issues.<sup>1</sup> Those who are more risk averse are more willing to put off action about climate change given that the outcomes are less than certain (Kousky et al, 2011), a point also reflected in how the public assesses the danger of living near nuclear power plants (Venables et al., 2009), how people misunderstand the risks of glacier bursts and subsequent flooding of their communities (Bird et al., 2009), how people outweigh the risks of living in a potentially risky situation

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<sup>1</sup> See Bickerstaff (2004) for a survey of the socio-cultural and risk perception literatures. We should be particularly sensitive to preexisting cultural models and concepts, given that they predict the extent of denial mechanisms and cognitive dissonance arising from climate change (Kempton, 1997; Stoll-Kleemann et al., 2007). More recently, Davidson (2010) advances this discussion for the Canadian case, calling for the inclusion of socio-economic factors into analyses of the public's risk assessment.

compared to its benefits (Figueiredo et al., 2009), or how people lack concrete or personally relevant affective images, particularly the likely negative implications for human health (Leiserowitz, 2007; Maibach et al., 2008).<sup>2</sup> All of these situations present outcomes that individuals recognize as having probabilities less than 1.

We believe that an individual's discount rate underlies these risk assessments, driving myopia and procrastination, and thus driving action in some form. This is the most appropriate explanation for the tension that exists within each of us between myopic and farsighted views. Indeed, it is in fact the indicator of this tension: we are more likely to postpone action which affects the future given our outlook about present versus future costs and benefits (Schelling, 1980; Fudenberg & Levine, 2006). Yet, we still claim that one's discount rate can lead to unique problems in the form of suboptimal decisions in general (Trope & Liberman, 2003; Lind, 1982; Traeger, 2009) and with regard to climate change (Rose, 2007; Liu, 2012; Brekke & Johansson-Stenman, 2008).<sup>3</sup> Specifically, if climate change has a looming deadline but one's (high) discount rate precludes action, future harm increases. Looming deadlines surrounding highly politicized issues are also expected to be impacted by political ideology. Climate change now falls squarely into this category (Bolsen et al., n.d.; Dunlap & McCright, 2008; Krosnick et al., 2000; McCright & Dunlap, 2011a, 2011b; Villar & Krosnick, 2010), and we see clear evidence in Sunstein's (2007) comparison of climate change policies with those targeting terrorism. While both policy areas deal with uncertainties about threats, terrorism is more salient and thus less ideologically contentious for the general public. This is primarily a function of personal experience: the events surrounding September 11, 2001 yielded experienced utility while most of what we know about climate change hinges on probabilities generated from climate models.<sup>4</sup> Compounding this are media reports which can demobilize the public and shake its confidence in the government or in climate scientists to deal with the problem (Boykoff & Roberts, 2007; Hart

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<sup>2</sup> When affective images are presented, they increase anxiety and attention but only in the short term (Lowe et al., 2006; Sampei & Aoyagi-Usui, 2009).

<sup>3</sup> See Broome (1994) for details of this discussion at a philosophical level, Schelling (1980) for a host of examples, and the Bureau of Economic Analysis for a recent example of how the discount rate is being juggled in aggregate

(<http://www.theatlantic.com/health/archive/2013/09/the-science-of-choice-in-addiction/280080/>).

<sup>4</sup> We acknowledge Birkland's (1998) notion that an individual can aggregate climate change-related weather to a point where s/he has a "focusing event" about climate change and thus produces experienced utility.

& Nisbet, 2011; Nisbet & Goidel, 2007). Finally, climate change as an action plan is primarily driven in the U.S. by liberals/Democrats, so differences across differentiated time parameters may be a function of political ideology more than concerns about taking action sooner rather than later. In other words, for climate change, political ideology is likely to be the primary influence. As such, we offer the following hypotheses:

H1: *Discounting is negatively related to action taken to combat climate change.*

H2: *Action taken to combat climate change increases when deadlines are matched with discounting; more immediate deadlines with less discounting and less immediate deadlines with more discounting.*

H3: *Political ideology is the strongest driver of support for action to combat climate change.*

H4: *Action taken to combat climate change increases when liberals vis-à-vis conservatives are presented with more immediate deadlines.*

We also tap framing theory (Chong & Druckman, 2007) and its power to explain how one's overall attitude toward any object is a function of the salience and weight attached to various considerations toward the object. Exposure to persuasive communications targeting attitude change can affect one's attitude toward a behavior by altering the salience associated with a particular consideration (i.e., a framing effect, see (Druckman, 2001, 2004)). For example, some attribute the lack of public engagement on the issue of climate change to ineffective frames in the debate over the issue (Malka et al., 2009). All of this notwithstanding, we invoke theory from Lubell et al. (2007) and Lubell (2002) to argue that exposure to our frames may shape the benefits and costs associated with the need for action – i.e., changing attitudes – but not necessarily have any effect on an individual's perceptions about the efficacy of one's action. Tapping research on sign effects, we claim that the effects of a benefits frame in conjunction with looming deadlines are likely to produce greater action to combat climate change than the effects of a costs frame in conjunction with looming deadlines.

Our focus on deadlines across the costs and benefits frames is, to our knowledge, the first ever attempt to understand the effects described by Kahneman and Tversky (1979), Thaler (1981), and Chong and Druckman (2007) in the context of climate change and its related policies. Given that the public is repeatedly inundated with both forms of information with

regard to climate change, we offer the following hypothesis in pursuit of a deeper understanding of how the problem might best be framed:

*H5: Action taken to combat climate change increases more through benefits frames vis-à-vis cost frames.*

We expect that such differences are present across each time parameter; i.e., conditioning by the benefits plus immediate frame will yield greater action than that of the costs plus immediate frame, benefits plus 1-year frame greater than costs plus 1-year frame, etc.

## **Method**

We bridge existing methods of studying how climate change is perceived by the American public with research on the social sources of values and cognitive biases that generate suboptimal decisions. To determine whether it is the treatments, personal levels of discounting, ideology, or some combination of these which affects intended action to combat climate change, we examine the size of the differences between treatments across measures of willingness to change one's personal behavior, support for relevant legislation, and support for increased budgeting to address climate change-related issues. We test our hypotheses in a large survey experiment involving 801 respondents recruited from Amazon.com Mechanical Turk's pool of workers in November 2013.<sup>5</sup> Participants who chose to participate were compensated with 50 cents for their participation.

To test the aforementioned hypotheses, we administered two parallel experiments employing identical time parameters but using different frames. In Experiment 1, respondents were presented with a cost frame while Experiment 2 presented respondents with a benefit frame. The baseline groups for Experiments 1 and 2 were presented with the following paragraphs of text, respectively:

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<sup>5</sup> We acknowledge that the use of Amazon.com MTurk workers inevitably raises questions about external validity; however, MTurk workers do not necessarily pose a problem for a study's external validity. Druckman and Kam (2011: 41) explain that "any convenience sample poses a problem only when the size of an experimental treatment effect depends on a characteristic on which the convenience sample has virtually no variance." Given that our sample is skewed toward well-educated individuals who are likely to hold crystallized attitudes on this issue, any treatment effects we uncover are likely a conservative estimate of the impact of the content of these communications on related attitudes and behaviors among the general population.

<Baseline Cost Treatment>

Many experts believe that we are close to a tipping point where climate changes may be irreversible. One difficulty is that climate scientists do not know exactly when we will reach that tipping point. Many economists believe that when greenhouse gas emissions are more expensive, people and businesses have an incentive to emit less. One way to make emissions more expensive is to tax them. Many economists believe that to significantly reduce greenhouse gas emissions we need to tax them.

<Baseline Benefit Treatment>

Many experts believe that we are close to a tipping point where climate changes may be irreversible. One difficulty is that climate scientists do not know exactly when we will reach that tipping point. Many climate scientists believe that greenhouse gas emissions are connected to extreme weather events (droughts, heavy rains, extreme temperatures, etc.). To preserve our way of life and limit extreme weather events, climate scientists believe that we need to make significant cuts in greenhouse gas emissions.

We have attempted to control for time uncertainties by removing all language which might frame the costs (Experiment 1) or benefits (Experiment 2) as less than certain. This is particularly important, given that people's preferences and discounting behavior becomes inconsistent when the probability of an outcome is less than 1 or if information about the future is considered uncertain (Keren & Roelofsma, 1995; Ellsberg, 2001).

Within each experiment, there is only one manipulation: the length of time between the present and the time within which action must be taken. Table 1 outlines the designs for the experiment, treatment group sample sizes, and reiterates our expectations regarding treatment effects relative to a baseline. Amazon.com MTurkers were randomly assigned to one of the treatment groups. For the immediate, 1-year, and 10-year treatment group members, the text for each of the baseline treatments presented above was addended with, respectively, "immediately", "within 1 year", and "within 10 years". Existing research shows that changes in discounting are most dramatic in the immediate to near-term (Frederick et al., 2002).

[Table 1 here]

In both experiments, we included as dependent variables one measure of an individual's intended behavioral change in response to the temporal proximity frames and two measures of an individual's attitude change. The first measure explores behavioral intentions to reduce one's own carbon emissions (1-7 scale, where 1=extremely unwilling, 7=extremely willing). The second and third measures tap support for a carbon emissions cap (1-7 scale, where 1=strongly

oppose, 7=strongly support) and support for an increase in the federal budget to deal with climate change (1-7 scale, where 1=decreased a great deal, 7=increased a great deal). Exact wording for the questions used to obtain our dependent and independent variables can be found in the Appendix.

In presenting the results, we report treatment effects as linear regression coefficients, controlling for each of the relevant explanatory variables as well interactions between the treatments and ideology and personal level of discounting. Ideology, scaled 1-7 from extremely conservative to extreme liberal (rescaled from -1 to +1, extreme liberal (-1) to extreme conservative (+1) to ease interpretability), is likely to be a strong predictor of our dependent variables and possibly without regard to treatment effects (Dunlap & McCright, 2008; Hart & Nisbet, 2011; Krosnick et al., 2000; McCright & Dunlap, 2011a, 2011b; Nisbet & Goidel, 2007; Villar & Krosnick, 2010). Our measure of discounting tendencies accounts for preference reversals by respondents. This is based on the assumption that, at some point in the future, people will opt to pay costs and/or receive benefits in an earlier period less than what would be paid/received in a later period, as shown in Kirby and Marakovic (1995) and Kirby (1997). The measure is based on a series of filter questions, as presented in Appelt et al. (2011) and Hardisty and Weber (2009), in which respondents are presented with choosing between receiving lottery winnings worth \$250 immediately or \$410 in one year. Those that select \$250 are asked no further questions, while those that have selected \$410 are then presented with choosing between \$250 immediately or \$390 in one year. If \$390 is selected the process continues with decreases in \$20 increments, as evidence of ever-increasing discount rates.

We report linear regression results, following the advice of Angrist and Pischke (2009), and rely on bootstrapped ( $n=2000$ ) standard errors to avoid imposing parametric assumptions on our inference. The reported results are robust to alternative functional forms, including ordered probit regression.

## Results

Use of the scaled discounting measure was problematic, as roughly half of all respondents selected \$250 now over \$410 in one year. We attribute this to insufficiently large monetary options, excessively distant time periods, or both. However, given the near-median

split of respondents across taking \$250 over \$410 in one year, we were able to construct and employ a high-discounting dummy variable for the subsequent analysis, where all those who chose \$410 are classified 1 (zero otherwise).

The results of tests for each of the aforementioned hypotheses are presented in Tables 2, 3, and 4. Before continuing, though, we note that there are no main effects of differentiated time parameters on any of our dependent variables. In other words, there is no distinguishable effect from presenting the climate change problem as a looming concern at any level or at no level at all. We believe that these null effects are a function of the highly politicized nature of climate change; i.e., looming deadlines cannot have an effect in the presence of such an ideologically charged issue. This will be examined formally through a test of H4 below.

[Table 2 here]

[Table 3 here]

[Table 4 here]

Our results are divided in two, the first part addressing the effects of discounting while the second focuses on political ideology. Comparisons are then made across these two sets of effects in order to assess which is most prevalent in affecting change in efforts to combat climate change. To begin, the effects of being a high discounter are consistent with H1: depending on the modeling specification, intended personal action decreases 0.27 to 0.30 points (out of a 7-point scale) for high discounters, support for a budget increase decreases 0.15 to 0.16 points, and support for legislation decreases 0.17 to 0.19 points. Yet, there is no evidence supporting H2. As shown in column 4 of Tables 2, 3, and 4, more immediate deadlines matched with less discounting or less immediate deadlines matched with more discounting do not lead to higher levels of action to combat climate change. There is in fact no effect at all from this interaction.

With regard to H3, political ideology is indeed the stronger driver of action to combat climate change, with conservatives predicted to take significantly less action relative to liberals. Differences in the effects of ideology compared to high-discounting range from being three-fold greater for personal action to being ten-fold greater for support for budget increases and legislative action. These results show conclusively that ideology does in fact matter most. Yet,

when comparing the effects of ideology conditioned by looming deadlines, we accept with reservations the hypothesis presented in H4. That is, the effects on climate change-related action are limited to policy support. More importantly, the effect – presented in column 3 of Tables 3 and 4 and shown graphically in Figures 2 and 3 – is driven primarily by conservatives. That is, conservatives presented with less looming deadlines are more supportive of budgeting and legislative changes to address climate change than conservatives presented with more immediate deadlines.

[Figure 2 here]

[Figure 3 here]

Finally, there is marginal/inconsistent support for H5. The cost experiment dummy variable yields on its own insignificant results in terms of effects on personal action and budget increase. Only with regard to legislative support is there any evidence of sign effects. Given the strength of ideology in driving changes in our dependent variables and consistent with our earlier analysis of the effects of ideology crossed with time parameters, we also present in column 5 of Tables 2, 3, and 4 evidence that sign effects are moderated by ideology. For all three dependent variables, the results are positive, but they are significant only when predicting budget increases. We conclude, thus, that political conservatism yields increased (albeit marginal) support for climate change action when it is conditioned by a cost frame. Correspondingly, political liberalism produces increased support for action when it is conditioned by the benefit frame. The implication is that sign effects are present but only when examined in the context of political ideology. This exploratory finding is the first of its kind to show the connection between ideology and costs versus benefits framing effects.

## **Discussion**

In this paper, we consider whether deadlines are affected by differentiated costs, differentiated benefits, or both. The answer: none of the above. We found that there were no significant effects from differentiated time parameters on willingness to act, policy support, and changes in the federal budget. We also found no evidence of sign effects. Our results show that these conditions become important when moderated especially by political ideology. Differentiated time parameters had little effect across an individual's discounting tendencies;

however, ideology did produce significant effects on our dependent variables across treatments: as the problems related to climate change are expressed as more distant problems, conservatives tend to have higher values than liberals. This is not necessarily surprising given the already strong evidence of “boomerang effects” and other ideologically-driven phenomena (Bolsen et al., n.d.; Hart & Nisbet, 2011).

We have accounted for economic, psychological, and political factors to understand the role of myopia and procrastination for climate change-related policies. The real novelty of this research, though, is in its accounting for the role of politics and policy failure in what is essentially a collective action problem. We expected that the association between people’s discount rates and their judgments about a looming deadline would suffice, as we should be inclined to prevent more future harm. Our null results in the main effects are contrasted with the strong, moderated effects of political ideology. Given the extremely politicized nature of the climate change issue and the strong correlation between beliefs about climate change and party affiliation, the primary issue for research on this subject is the apolitical presentation of climate change to the American public. Framing the issue in terms of costs or benefits has a negligible effect on the public’s support or opposition to climate change-related policies. In contrast to claims that the government can engage in soft paternalism through “nudging” when so inclined (Thaler & Sunstein, 2008), the issue of climate change is so politicized that frames have little effect except for when moderated by ideology.

We suspect that, as described in Healy and Lenz (2012), we can circumvent politicization through a focus on the end heuristic dynamic. Policies that are most likely to succeed are preceded by structural events such as the September 11, 2001 hijackings or the Fukushima power plant meltdowns. If we are able to convey to the public information along the lines that climatologists agree that extreme weather events are the result of climate change, the period immediately following each extreme weather event provides an opportunity for policy change. This would support the end heuristic.<sup>6</sup>

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<sup>6</sup> In the U.S., though, the size of the country means that extreme weather patterns differ across the geography. To claim that floods and droughts are part of the same problem – and to make the connections across time, which would counter the need for immediacy in action following such events – is a serious challenge.

It should also be noted that our attempts to examine the role of looming deadlines are only in terms of a standard asymptotic discount curve but not with regard to a hyperbolic one. The distinction is crucial and reported elsewhere,<sup>7</sup> but we have yet to understand the exact extent to which hyperbolic discounting is occurring with regard to climate change because we are not framing the treatments as such. Yet, this line of inquiry is relevant if we are to understand intergenerational equity concerns as highlighted in Portney and Weyant (1999). Still, what is interesting about the issue of climate change with regard to hyperbolic discounting is not simply how individuals would address the cost-reducing opportunities of acting on climate change at some point in the future relative to the present. Rather, at any point in time – even this very second – new information can be released from experts which moves future expected events to the present.<sup>8</sup> While we have not captured in our study information from each respondent which measures their discount rate with regard to climate change, future work can attempt to assess hyperbolic discounting in connection to different time proximity treatments.

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<sup>7</sup> See Karp (2005) for example.

<sup>8</sup> This is different from our treatment which states that scientists make a call for action immediately.

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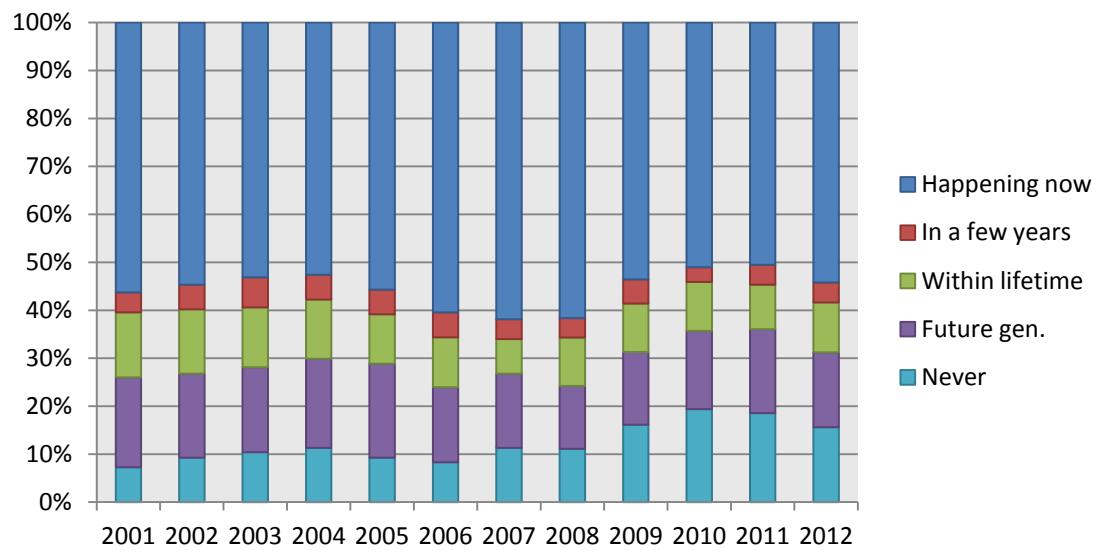
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## Figures and Tables

Figure 1. Public Opinion & Timing of Climate Change Effects



Source: Gallup Poll (March 8-11, 2012),  $n=1,024$  adults nationwide;  
<http://www.pollingreport.com/enviro.htm>

Note: In response to the following question (options rotated): “Which of the following statements reflects your view of when the effects of global warming will begin to happen? They have already begun to happen. They will start happening within a few years. They will start happening within your lifetime. They will not happen within your lifetime, but they will affect future generations. OR, They will never happen.”

Table 1. Experimental Design and Predictions

	<b>Temporal Proximity + Cost Frame</b>	<b>Temporal Proximity + Benefit Frame</b>
	<i>Experiment 1 (E1)</i>	<i>Experiment 2 (E2)</i>
<b>Control</b>	<ul style="list-style-type: none"> <li>Baseline for E1 treatments (<i>n</i>=98)</li> </ul>	<ul style="list-style-type: none"> <li>Decrease relative to E2 baseline</li> <li>Baseline for E2 treatments</li> <li>Increase relative to E1 control (<i>n</i>=88)</li> </ul>
<b>Immediate Timeframe</b>	<ul style="list-style-type: none"> <li>Decrease relative to E1 baseline (<i>n</i>=92)</li> </ul>	<ul style="list-style-type: none"> <li>Decrease relative to E2 baseline</li> <li>Increase relative to E1 immediate timeframe (<i>n</i>=106)</li> </ul>
<b>1-year Timeframe</b>	<ul style="list-style-type: none"> <li>Decrease relative to E1 baseline (<i>n</i>=118)</li> </ul>	<ul style="list-style-type: none"> <li>Decrease relative to E2 baseline</li> <li>Increase relative to E1 1-year timeframe (<i>n</i>=91)</li> </ul>
<b>10-year Timeframe</b>	<ul style="list-style-type: none"> <li>Largest decrease relative to E1 baseline (<i>n</i>=108)</li> </ul>	<ul style="list-style-type: none"> <li>Largest decrease relative to E2 baseline</li> <li>Increase relative to E1 10-year timeframe (<i>n</i>=100)</li> </ul>

Table 2. Main and Moderated Treatment Effects on Personal Action

	Personal action (1)	Personal action (2)	Personal action (3)	Personal action (4)	Personal action (5)
High-discount dummy	-0.30*** (0.09)	-0.29*** (0.08)	-0.29*** (0.08)	-0.27 (0.21)	-0.28*** (0.08)
Cost experiment dummy	-0.03 (0.09)	-0.06 (0.08)	-0.07 (0.08)	-0.06 (0.08)	-0.01 (0.11)
Time parameter	0.04 (0.04)	0.03 (0.03)	0.05 (0.04)	0.03 (0.05)	0.03 (0.03)
Ideology		-0.91*** (0.08)	-1.10*** (0.21)	-0.91*** (0.08)	-1.03*** (0.13)
Time parameter X Ideology			0.07 (0.07)		
Time parameter X High-discount				-0.00 (0.07)	
Cost experiment X Ideology					0.21 (0.18)
Intercept	5.58*** (0.13)	5.40*** (0.12)	5.35*** (0.14)	5.39*** (0.15)	5.37*** (0.13)
<i>N</i>	801	801	801	801	801
$\chi^2$	11.44***	128.54***	121.44***	116.88***	121.45***
R <sup>2</sup>	0.01	0.16	0.16	0.16	0.16

\*p<.10, \*\*p<.05, \*\*\*p<.01

Note: Cell entries are unstandardized linear regression coefficients with bootstrapped standard errors in parentheses.

Table 3. Main and Moderated Treatment Effects on Budget Increase

	Budget increase (1)	Budget increase (2)	Budget increase (3)	Budget increase (4)	Budget increase (5)
High-discount dummy	-0.17 (0.11)	-0.16* (0.09)	-0.16* (0.09)	-0.04 (0.22)	-0.15* (0.09)
Cost experiment dummy	-0.04 (0.11)	-0.10 (0.09)	-0.11 (0.09)	-0.10 (0.09)	0.00 (0.11)
Time parameter	0.06 (0.05)	0.03 (0.04)	0.07 (0.05)	0.05 (0.06)	0.02 (0.04)
Ideology		-1.65*** (0.08)	-2.09*** (0.22)	-1.65*** (0.08)	-1.88*** (0.12)
Time parameter X Ideology			0.16** (0.08)		
Time parameter X High-discount				-0.04 (0.08)	
Cost experiment X Ideology					0.42** (0.17)
Intercept	4.92*** (0.17)	4.58*** (0.14)	4.48*** (0.15)	4.52*** (0.17)	4.54*** (0.14)
<i>N</i>	801	801	801	801	801
$\chi^2$	3.76	376.03***	372.49***	374.07	401.23***
R <sup>2</sup>	0.00	0.33	0.33	0.33	0.33

\*p<.10, \*\*p<.05, \*\*\*p<.01

Note: Cell entries are unstandardized linear regression coefficients with bootstrapped standard errors in parentheses.

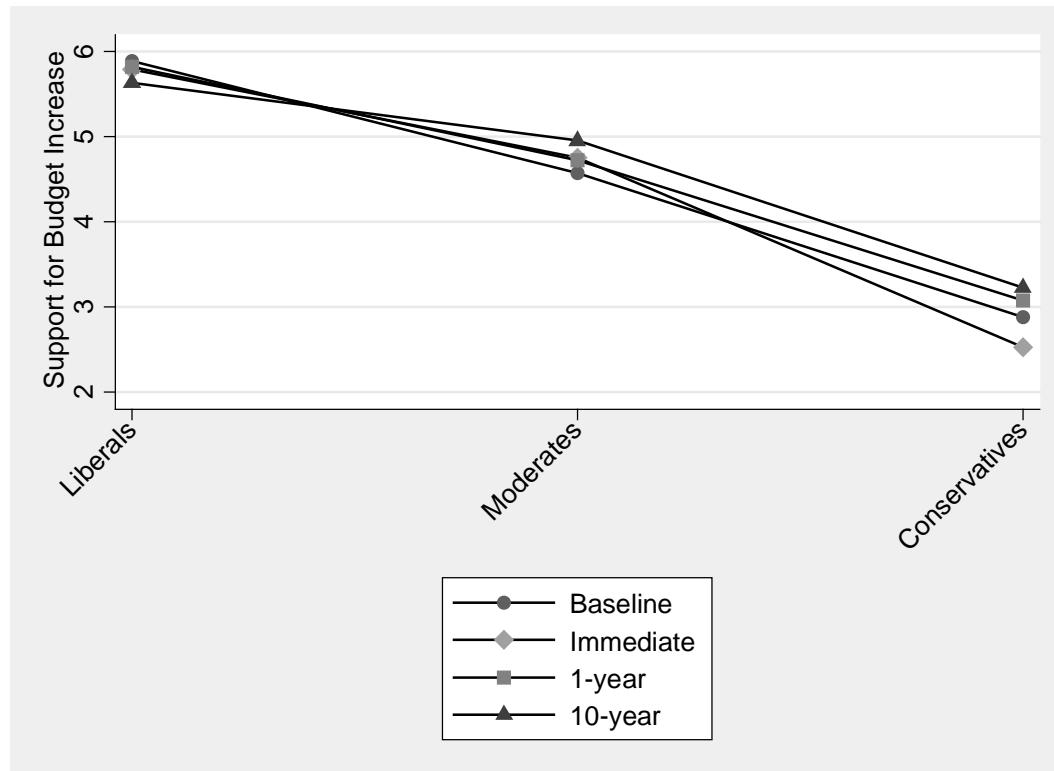
Table 4. Main and Moderated Treatment Effects on Legislative Support

	Legislative support (1)	Legislative support (2)	Legislative support (3)	Legislative support (4)	Legislative support (5)
High-discount dummy	-0.19* (0.11)	-0.18* (0.09)	-0.18* (0.09)	-0.18 (0.24)	-0.17* (0.09)
Cost experiment dummy	-0.11 (0.11)	-0.17* (0.09)	-0.17* (0.09)	-0.17* (0.09)	-0.09 (0.13)
Time parameter	0.06 (0.05)	0.03 (0.04)	0.06 (0.06)	0.03 (0.06)	0.03 (0.04)
Ideology		-1.70*** (0.09)	-2.03*** (0.25)	-1.70*** (0.09)	-1.86*** (0.14)
Time parameter X Ideology			0.13 (0.09)		
Time parameter X High-discount				-0.00 (0.09)	
Cost experiment X Ideology					0.28 (0.19)
Intercept	5.52*** (0.17)	5.17*** (0.14)	5.09*** (0.17)	5.17*** (0.18)	5.14*** (0.15)
<i>N</i>	801	801	801	801	801
$\chi^2$	4.81	326.41***	316.67***	325.16***	342.53***
R <sup>2</sup>	0.00	0.32	0.32	0.32	0.32

\*p<.10, \*\*p<.05, \*\*\*p<.01

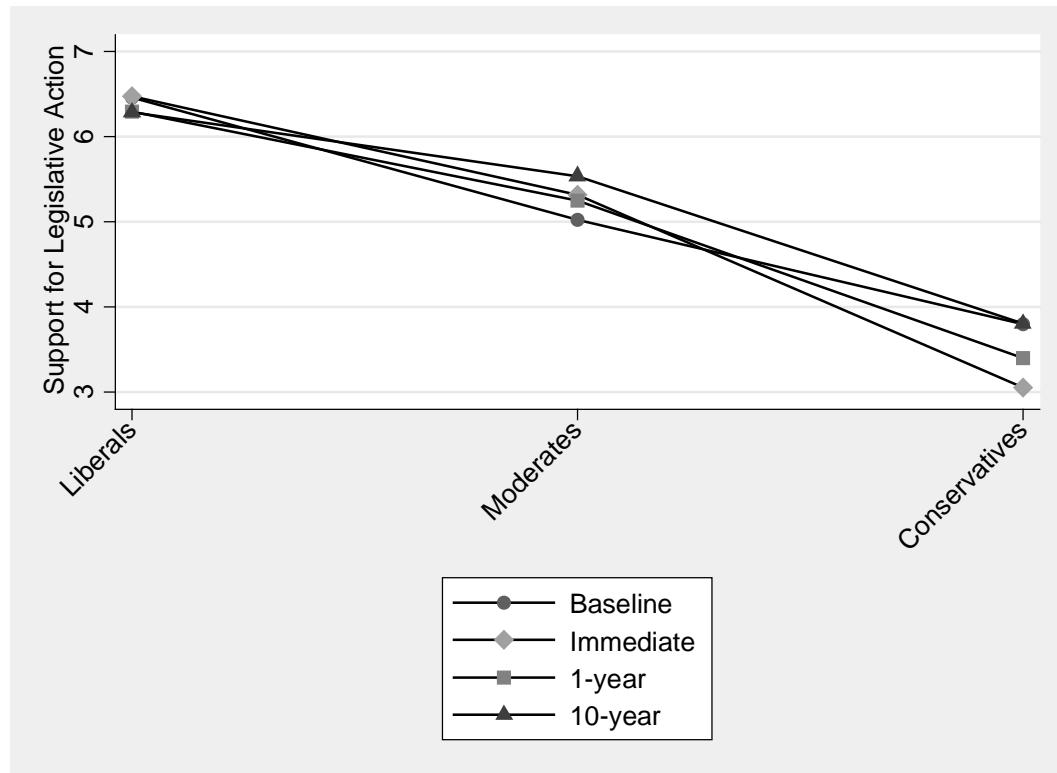
Note: Cell entries are unstandardized linear regression coefficients with bootstrapped standard errors in parentheses.

Figure 2. Marginal Effects of Ideology and Time Parameters on Budget Increase



Note: 7-point political ideology variable rescaled to create 3-point scale (1-2=liberal, 3-5=moderate, 6-7=conservative).

Figure 3. Marginal Effects of Ideology and Time Parameters on Legislative Support



Note: 7-point political ideology variable rescaled to create 3-point scale (1-2=liberal, 3-5=moderate, 6-7=conservative).

## Appendix

### *Explanatory Variables*

#### <Personal Discounting>

Imagine you just won a lottery, worth \$250, which will be paid to you immediately. However, the lottery commission is giving you the option of receiving a different amount, paid to you one year from now.

Which would you prefer, receiving \$250 immediately or receiving \$410 one year from now?

[If \$410, then next question]

Which would you prefer, receiving \$250 immediately or receiving \$390 one year from now?

[If \$390, then next question]

Which would you prefer, receiving \$250 immediately or receiving \$370 one year from now?

[If \$370, then next question]

Which would you prefer, receiving \$250 immediately or receiving \$350 one year from now?

[If \$350, then next question]

Which would you prefer, receiving \$250 immediately or receiving \$330 one year from now?

[If \$330, then next question]

Which would you prefer, receiving \$250 immediately or receiving \$310 one year from now?

[If \$310, then next question]

Which would you prefer, receiving \$250 immediately or receiving \$290 one year from now?

[If \$290, then next question]

Which would you prefer, receiving \$250 immediately or receiving \$270 one year from now?

#### <Ideology>

When it comes to politics, would you describe yourself as liberal, conservative, or neither liberal nor conservative?

*very conservative   somewhat conservative   slightly conservative   middle of the road   moderate;   slightly liberal   somewhat liberal   very liberal*

## **Treatments**

### <Baseline Cost Treatment>

Many experts believe that we are close to a tipping point where climate changes may be irreversible. One difficulty is that climate scientists do not know exactly when we will reach that tipping point. Many economists believe that when greenhouse gas emissions are more expensive, people and businesses have an incentive to emit less. One way to make emissions more expensive is to tax them. Many economists believe that to significantly reduce greenhouse gas emissions we need to tax them

### <Immediate Timeframe Cost Treatment>

Many experts believe that we are close to a tipping point where climate changes may be irreversible. One difficulty is that climate scientists do not know exactly when we will reach that tipping point. Many economists believe that when greenhouse gas emissions are more expensive, people and businesses have an incentive to emit less. One way to make emissions more expensive is to tax them. Many economists believe that to significantly reduce greenhouse gas emissions we need to tax them **IMMEDIATELY.**

### <1-year Timeframe-Cost Treatment>

Many experts believe that we are close to a tipping point where climate changes may be irreversible. One difficulty is that climate scientists do not know exactly when we will reach that tipping point. Many economists believe that when greenhouse gas emissions are more expensive, people and businesses have an incentive to emit less. One way to make emissions more expensive is to tax them. Many economists believe that to significantly reduce greenhouse gas emissions we need to tax them **WITHIN 1 YEAR.**

### <10-year Timeframe-Cost Treatment>

Many experts believe that we are close to a tipping point where climate changes may be irreversible. One difficulty is that climate scientists do not know exactly when we will reach that tipping point. Many economists believe that when greenhouse gas emissions are more expensive, people and businesses have an incentive to emit less. One way to make emissions more expensive is to tax them. Many economists believe that to significantly reduce greenhouse gas emissions we need to tax them **WITHIN 10 YEARS.**

<Baseline Benefit Treatment>

Many experts believe that we are close to a tipping point where climate changes may be irreversible. One difficulty is that climate scientists do not know exactly when we will reach that tipping point. Many climate scientists believe that greenhouse gas emissions are connected to extreme weather events (droughts, heavy rains, extreme temperatures, etc.). To preserve our way of life and limit extreme weather events, climate scientists believe that we need to make significant cuts in greenhouse gas emissions.

<Immediate Timeframe-Benefit Treatment>

Many experts believe that we are close to a tipping point where climate changes may be irreversible. One difficulty is that climate scientists do not know exactly when we will reach that tipping point. Many climate scientists believe that greenhouse gas emissions are connected to extreme weather events (droughts, heavy rains, extreme temperatures, etc.). To preserve our way of life and limit extreme weather events, climate scientists believe that we need to make significant cuts in greenhouse gas emissions **IMMEDIATELY**.

<1-year Timeframe-Benefit Treatment>

Many experts believe that we are close to a tipping point where climate changes may be irreversible. One difficulty is that climate scientists do not know exactly when we will reach that tipping point. Many climate scientists believe that greenhouse gas emissions are connected to extreme weather events (droughts, heavy rains, extreme temperatures, etc.). To preserve our way of life and limit extreme weather events, climate scientists believe that we need to make significant cuts in greenhouse gas emissions **WITHIN 1 YEAR**.

<10-year Timeframe-Benefit Treatment>

Many experts believe that we are close to a tipping point where climate changes may be irreversible. One difficulty is that climate scientists do not know exactly when we will reach that tipping point. Many climate scientists believe that greenhouse gas emissions are connected to extreme weather events (droughts, heavy rains, extreme temperatures, etc.). To preserve our way of life and limit extreme weather events, climate scientists believe that we need to make significant cuts in greenhouse gas emissions **WITHIN 10 YEARS**.

## **Dependent Variables**

### <Willingness to Take Personal Action>

To what extent are you willing to take personal action to reduce your own carbon emissions?

*extremely unwilling      moderately unwilling      somewhat unwilling      neither willing nor unwilling      somewhat willing      moderately willing      extremely willing*

### <Support for Carbon Emissions Cap>

To what extent do you oppose or support the U.S. government passing legislation to address the issue of global climate change?

*strongly oppose      moderately oppose      slightly oppose      neither oppose      slightly support      moderately support      strongly support  
nor support*

### <Federal Budget Allocation>

Do you believe that the amount of the federal budget allocated to deal with climate change should be decreased or increased?

*decreased a great deal      decreased a moderate amount      decreased a little      neither increased nor decreased      increased a little      increased a moderate amount      increased a great deal*

## **Appendix: Recruitment Text (for Amazon.com Mechanical Turk)**

Project listing details:

At the Mercy of our Discount Curves

Requester: Georgia State Political Research Study

HIT Expiration Date: [TBD]

Time Allotted: 20 minutes

Reward: \$0.50

HITs Available: 800

Description: This short survey asks participants to answer survey questions about politics and their personal background.

Keywords: Politics, opinion, questionnaire, survey, research

Qualifications Required: Location is US

*If subjects are interested after reading the above, they click on a link that takes them to the following page which will explain how they can participate in the survey.*

*Amazon.com does not provide any personal information about the participants. As part of the survey, subjects create their own confirmation code, which they enter into the Mechanical Turk system. We then cross-reference the survey data with Mechanical Turk to pay subjects.*

Participant instructions:

To complete this task, you will have to:

1. Go to the address below. (IMPORTANT: be sure to open the link in a new window. Otherwise, you might not be able to enter your code below) [Subjects will take the survey in Qualtrics, a secure online survey platform].

[URL]

2. Complete the survey on that website. It should take no more than 15 minutes.
3. Carefully read and answer the questions.
4. After completing the survey, you will need to create a unique confirmation code. You will need to input the code you created in the box below in order to collect your reward.

If you choose to participate, click on the following link:

Take the survey now.

Once you complete the survey, please provide your confirmation code below: