Misperceived Social Norms and Willingness to Act Against Climate Change

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Abstract: We document the individual willingness to act against climate change and study its behavioral determinants in a large representative sample of US adults. The willingness to act against climate change is measured through an incentivized donation decision. We find that individual beliefs about social norms, economic preferences such as patience and altruism, as well as universal moral values positively predict pro-climate donations. However, we document systematic misperceptions of social norms. Respondents vastly underestimate the prevalence of climate-friendly behaviors and norms among their fellow citizens. Correcting these misperceptions in an experiment causally raises the individual willingness to act against climate change as well as individual support for climate policies. The effects are strongest for individuals who are skeptical about the existence and threat of global warming. The widespread underestimation of climate norms could thus significantly discourage climate action, so that correcting it becomes an important goal for climate policy.

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1 Introduction

Climate change is one of the greatest threats facing humanity today (Oswald and Stern, 2019). Its social and economic implications range from increased mortality and violence to reduced human productivity and economic growth (IPCC, 2022; Auffhammer, 2018; Carleton and Hsiang, 2016). The estimated economic impacts are enormous. Studies indicate that climate change could lower global GDP by 23% by 2100 and further exacerbate existing inequalities (Burke et al., 2015; Diffenbaugh and Burke, 2019). While many countries around the world have committed to meeting the 1.5 or 2 degree targets set out in the Paris Agreement, progress towards these goals has been slow (UNEP, 2019). In fact, it has become increasingly likely that global temperatures may rise well above the 2 degree target throughout the course of this century, with potentially catastrophic impacts for both human society and ecosystems. Given the threat posed by climate change, it is important to understand what determines people's individual willingness to fight climate change, namely their willingness to engage in climate-friendly, sustainable, but potentially costly behavior. Understanding the determinants of these individual 'climate preferences' can help us to design effective policies against climate change that complement existing regulatory frameworks, such as carbon taxation.

In this paper, we shed light on the behavioral determinants of climate preferences. We explore the role of economic preferences, universal moral values, and, in particular, beliefs about social norms. We also design a norm intervention to examine whether informing individuals about the prevalence of climate norms raises their willingness to act against climate change and their support for climate policies. Our central contribution is to show that people in the US substantially underestimate other Americans' willingness to act against climate change. Correcting these misperceptions is possible, encourages climate-friendly behavior, and is particularly effective among those who are most skeptical about the existence and threat of global warming.

To study individual willingness to fight climate change and the role of perceived social norms, we administer a survey to a large, quota-based, representative sample of 8,000 US adults. We elicit individual willingness to fight climate change using an incentivized donation decision. More specifically, respondents are asked to divide $450 between themselves and a charitable organization that fights global warming. This decision captures the central trade-off that individuals face when deciding whether to take climate action, namely the notion that protecting the climate comes at a cost. The more money the respondents are willing to forgo and donate, the higher their willingness to act against climate change. We incentivize the decision by implementing the choices of a random subset of participants. To shed light on the potential determinants of climate preferences, we obtain detailed, individual-level information on perceived social

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norms, fundamental economic preferences, and moral values. We measure perceived social norms by asking respondents to estimate (i) the share of the US population that *tries* to fight global warming ('perceived behavior') and (ii) the share of the US population that thinks people in the US *should try* to fight global warming ('perceived norms'). To elicit economic preferences, we administer an experimentally validated survey to measure patience, willingness to take risks, altruism, trust, positive reciprocity, and negative reciprocity (Falk et al. 2018a,b). We further administer the Moral Foundations Questionnaire to obtain a measure of the relative importance of universal versus communal moral values (Haidt and Joseph 2004; Haidt 2012; Graham et al. 2013; Enke 2020).

A natural question that arises is whether it is possible to raise individual willingness to fight climate change. While it is difficult to alter some behavioral determinants such as fundamental economic preferences or moral values, at least in the short run, beliefs about social norms are likely to be considerably more malleable. We therefore conduct a survey experiment to study the extent to which information provision can raise individual willingness to fight climate change. Respondents are randomized into a control condition or one of two treatments. The 'behavior treatment' provides respondents with truthful information about the proportion of the US population who try to fight global warming (62%), while the 'norms treatment' informs respondents about the true share of the US population who think that people in the US should try to fight global warming (79%). These low-cost information treatments have the potential to correct misperceptions about prevalent behaviors and norms and may shift individual willingness to fight global warming.

Several findings emerge from our study. In a first step, we document large heterogeneity in individual willingness to fight climate change. In particular, climate preferences are systematically related to perceived social norms, economic preferences, as well as universal moral values. Conditional on a large set of covariates, perceived social norms strongly predict individual willingness to fight global warming. A one-standard-deviation increase in the perceived share of Americans trying to fight global warming is associated with a $12 higher donation amount, while a corresponding increase in the perceived share of Americans who think that people in the US should try to fight global warming is associated with a $14 higher donation. These results are consistent with individuals being 'conditional cooperators' (Fischbacher et al., 2001). Put differently, respondents may be more willing to fight climate change if they believe that a higher proportion of their fellow citizens do the same. Among the economic preferences that we measure, patience, altruism, and positive reciprocity positively predict individual willingness to fight global warming. Similarly, universal moral values are positively associated with larger donations. Individuals with universal moral values are more willing to fight climate change compared to individuals who endorse communal, in-group-oriented val-

ues. Mitigating climate change can be viewed as a global cooperation problem affecting present and future generations all around the world. It is therefore plausible that more patient and prosocial individuals as well as individuals with universal moral values more strongly value climate protection. Our finding that fundamental human traits, such as altruism, positive reciprocity, and moral universalism, are strong predictors of individual willingness to fight climate change helps us to understand the frequently observed cultural and political dissent on climate change (Dunlap et al., 2016; Hornsey et al., 2018). In our data, economic preferences and universalism together explain about 40% of the large partisan gap in willingness to fight climate change.

In a second step, we document a large heterogeneity in beliefs about prevalent behaviors and norms in the US. We find that respondents on average misperceive the prevalent social norms. 67% of respondents in our sample underestimate the true share of Americans who try to fight global warming, and 76% underestimate the true share of Americans who think that people in the US should try to fight global warming. The average perception gaps are sizable. For example, while 79% of Americans say that one should try to fight global warming, this fraction is perceived to be just 61%. We document similar patterns for six specific climate-friendly actions, such as restricting meat consumption and avoiding flights or fossil-fueled cars. This systematic underestimation of climate norms is concerning because it could hamper individual willingness to act against climate change.

Indeed, in a third step, we find that correcting these misperceptions with the help of our treatments boosts individual willingness to fight climate change. Being informed about the true share of Americans who try to fight global warming raises donations by $12 (or 4.7%), while being informed about the true share of Americans who think that people in the US should try to fight global warming increases donations by $16 (or 6.3%). The effect sizes are strong considering the minimalist nature of the interventions. A heterogeneity analysis reveals that the positive treatment effects on the donation amount are primarily driven by the subgroup of respondents whose prior beliefs lie below the actual shares. Reassuringly, we do not observe a back-firing effect among respondents with prior beliefs above the actual shares. For them, the estimated treatment effects are also positive, albeit insignificant. We further explore whether the information treatments differentially affect individuals who are more or less skeptical about the existence and threat of human-caused climate change. We find that the information treatments are more effective for 'climate change deniers', who may have been surprised to learn that they hold minority views. Additional analyses reveal that the larger effects among climate change deniers are not driven by baseline differences in beliefs about the prevalence of social norms. The results are promising as they suggest that simple, low-cost informational interventions may be well-suited to reach skeptical subgroups of the pop-

ulation who are otherwise difficult to reach and convince. As a result, social norm interventions could also reduce polarization. For example, informing Americans that most other Americans try to act against climate change, reduces the sizable baseline difference in climate donations ($142) between those who believe in human-caused climate change and those who do not by 27%.

Finally, we study whether the treatments causally affect individual support for climate policies (e.g. a carbon tax, subsidies for green energy, pollution regulation) and find that both treatments significantly raise support for climate policies. Again, the estimated treatment effects are stronger for the subgroup of the population who we classify as 'climate change deniers'.

Our findings have important implications for climate politics. Misperceptions of climate norms prevail in the US and can form a dangerous obstacle to climate action. However, at the same time, they can provide a unique opportunity to promote and accelerate climate-friendly behavior. Correcting these misperceptions can encourage climate-friendly behavior and is a relatively simple, scalable, and cost-effective intervention. Moreover, it is particularly effective for climate change deniers, who are commonly difficult to reach but crucial for building up a broad alliance against climate change. Our results suggest that social norms should play a pivotal role in the policy response to climate change. Policies that foster social norms should complement formal regulations. For example, while carbon taxation is an effective tool to curb CO_2 emissions, muted public support for such environmental policies has so far been a significant political constraint. Fostering social norms might alleviate these political constraints by increasing support for environmental policies.

Related literature   Our study builds on and contributes to several strands of the literature. Our central contribution is to show that climate norms are misperceived, these misperceptions are likely to significantly discourage individual climate action, and correcting them can promote climate-friendly behavior. Misperceptions of social norms have been documented in other settings where social norms are in a phase of transition, giving rise to a phenomenon referred to as *'pluralistic ignorance'* (Allport, 1924; Miller and McFarland, 1987). The majority of a population may privately endorse a norm but incorrectly assume that it is not endorsed by others. This incorrect belief may discourage people from endorsing the norm in public, thereby confirming other people's pessimistic beliefs. For instance, Kuran (1991) argues that a misperception of others' attitudes delayed the collapse of the communist regime in the Soviet Union. More recently, Bursztyn et al. (2020) study the role of misperceived social norms regarding female labor force participation in Saudi Arabia. Our evidence suggests that pluralistic ignorance is also present and relevant in the context of climate norms. Thereby, we contribute to recent

work which shows that misperceptions about others' behavior, traits, and attitudes are widespread (Bursztyn and Yang, 2021). In the context of climate change, related research in psychology and political science documents that people tend to underestimate how many of their fellow citizens believe that climate change is real and dangerous (Geiger and Swim, 2016; Leviston et al., 2013; Mildenberger and Tingley, 2019; Ballew et al., 2020; Pearson et al., 2018).

More generally, we contribute to the literature studying the role of social norms in human behavior in general and climate-friendly behavior more specifically (e.g., Durlauf and Young, 2001; Bicchieri, 2006; Fehr and Fischbacher, 2004; Krupka and Weber, 2013; Bowles, 2004; Young, 2015; Nyborg et al., 2016; Nyborg, 2018; Cialdini et al., 1990; Constantino et al., 2020). We show that individual beliefs about prevalent climate behaviors and norms strongly predict the individual willingness to fight climate change, corroborating earlier correlative analyses that find a positive association between norm perception and environmental behavior (e.g., Farrow et al., 2017; van Valkengoed and Steg, 2019). Relatedly, field experiments have shown that informational interventions that raise people's awareness about their neighbors' energy consumption or water use causally affect energy or water demand (see, e.g., Allcott 2011; Costa and Kahn 2013; Ferraro and Price 2013; Bergquist et al. 2019). In contrast to these studies, we provide descriptive evidence that climate-related norms are often misperceived and causal evidence that correcting these misperceptions leads to a significant increase in the individual willingness to fight climate change, as well as increasing individual support for climate-friendly public policies.

We also contribute to the literature examining the relationship between individual traits and human behavior. Fundamental economic preferences such as time preferences, risk preferences, or prosociality have been shown to predict a wide range of human behaviors (see, e.g., Barsky et al., 1997; Dohmen et al., 2009, 2011; Falk et al., 2018a; Figlio et al., 2019). They have also been shown to predict a set of specific pro-environmental behaviors such as individual willingness to save energy or invest in energy-efficient technology (see, e.g., Newell and Siikamki, 2015; Schleich et al., 2019; Fischbacher et al., 2021; Lades et al., 2021).[1] Here, we examine the relationship between economic preferences and individual willingness to fight climate change – as measured through an incentivized donation decision – in a large, representative sample of US adults. The decision to give up money to protect the climate reflects a central trade-off that individuals face when deciding whether to engage in climate-friendly behavior. This allows us to abstract from ancillary factors that are likely to shape specific pro-environmental decisions but are context-specific (e.g., the riskiness of investments

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[1]See, e.g., Drews and van den Bergh (2016), Gifford (2011), or Swim et al. (2009) for broad reviews of other determinants of climate behavior and climate policy support.

in energy-efficient technology). Likewise, we explore the relationship between universal moral values and individual willingness to fight climate change. Recent advances in moral psychology posit that people's moral values can be partitioned into different moral foundations and that holding universal moral values predicts individual behaviors such as voting or support for polices such as environmental protection (Haidt and Joseph, 2004; Haidt, 2012; Graham et al., 2013; Enke et al., 2019; Enke, 2020; Welsch, 2020, 2021). We show that universal moral values predict climate preferences over and above what can be predicted by economic preferences such as social preferences. Holding universal moral values might be particularly relevant in the context of climate change, where local behavior has consequences for people around the globe.

Finally, our finding that correcting widespread misperceptions about climate norms is particularly effective among people who are most skeptical about climate change relates to a body of literature on political polarization, particularly in the US context (Iyengar et al., 2019; Alesina et al., 2020). Views on climate change and climate policy strongly differ across political groups in the US (Dunlap et al., 2016; Hornsey et al., 2018; Doell et al., 2021). While decreasing political polarization is recognized as a crucial step to foster a broad support for climate policies, it often proves difficult in practice as liberals and conservatives tend to react most favorably to factual information that is in line with their existing beliefs or allegiances (Druckman and McGrath, 2019; Ditto et al., 2019; Bénabou and Tirole, 2016; Alesina et al., 2018). The depolarizing effect of our intervention suggests that social norm interventions that correct strong initial misperceptions of social norms could be a successful tool in reducing polarization.

2   Study Design

To study individual willingness to fight climate change and its behavioral determinants, it is important to obtain a reliable and inter-personally comparable measure of individual willingness to fight climate change as well as detailed information on its potential determinants, such as perceived social norms, fundamental economic preferences, and moral values. To make inferences about the US population, a large representative sample is required. Establishing a causal relationship between perceived social norms and climate behavior further requires exogenous variation in the perception of norms. This section explains how we design the sampling approach and survey to meet these requirements.

2.1   Sample and survey procedures

We collect survey data from a quota-based, representative sample of 8,000 study participants in the US. To be eligible to participate in the study, respondents had to reside in the

US and be at least 18 years old. The data collection was carried out in two waves. The first wave of data ($N = 2,000$) was collected in March 2021. This wave of data forms the basis for the descriptive analysis presented in this paper, and informs the treatments embedded into wave 2. The second wave of data ($N = 6,000$) was collected in April 2021 and it contains the information experiment that allows us to study the causal relationship between perceived social norms and individual willingness to fight climate change. To collect the data, we collaborated with the professional survey company *Pureprofile*, which is frequently used in social science research. All survey participants were part of the company's online panel and participated in the survey online. The online surveys were scripted in the survey software Qualtrics. In both waves, the median time to complete the survey was 18 minutes. Respondents could only participate in one of the two waves. We screen out participants who do not pass an attention check (see Appendix B.1) or speed through the survey with a duration of less than three minutes. Both exclusion criteria are pre-registered.

We used a stratified sampling approach to ensure that the samples represent the adult US population in terms of gender, age, education, and region. Comparing our samples to data from the American Community Survey 2019, we note that the distribution of demographic characteristics in our samples closely matches the distribution of characteristics in a nationally representative sample (see Appendix Table A.1).

The survey contains several modules. In the following, we explain how we measure individual willingness to fight climate change (Section 2.2) and proceed with describing our measures of potential determinants (Section 2.3). We then present the information intervention embedded into wave 2 (Section 2.4). We also measure individual support for climate policies, political engagement, climate change skepticism, and a range of background characteristics (Section 2.5). The exact wording of the main survey blocks is provided in Appendix B.

2.2 Measuring individual willingness to fight climate change

To measure individual willingness to fight climate change, we use an incentivized donation paradigm. Respondents are asked to divide $450 between themselves and *atmosfair*, a charitable organization that fights global warming and offsets CO_2 emissions.[2] The more money that a respondent is willing to donate, the higher their willingness to fight climate change. The measure is quantitative and inter-personally comparable,

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[2]Throughout the survey, we use the term "global warming" instead of the preferred scientific term "climate change" as the former is less likely to be confused with short term or seasonal weather changes or ozone depletion, a misunderstanding that still occasionally arises (Lorenzoni et al., 2006). To avoid confusion, we define global warming as follows at the beginning of the survey: "*Global warming means that the world's average temperature has considerably increased over the past 150 years and may increase more in the future.*" Throughout this article, we use the terms global warming and climate change interchangeably.

and it captures the central trade-off underlying most individual-level decisions to fight climate change: mitigating climate change comes at a cost, whether in terms of money, time, or convenience. The amount of \$450 was chosen because, by donating the full amount, respondents could offset the annual CO_2 emissions of an average US citizen.[3] We explain this to respondents in order to put their contribution decision into context and render it meaningful and tangible.[4]

Before respondents make their decision, the instructions provide further information on *atmosfair*. Participants are informed that the charity actively contributes to CO_2 mitigation by promoting, developing, and financing renewable energies worldwide. Further information is provided on the charity's annual expenditure dedicated to the fight against global warming (\$12 million) as well as its low overhead costs (5%). To minimize rounding, respondents can indicate their responses using a slider ranging from \$0 to \$450. The incentive scheme is probabilistic: 25 participants are chosen at random and their decisions are implemented accordingly.[5]

2.3 Measuring behavioral determinants

Perceived social norms Social norms are behavioral rules that express the collectively shared understanding of what is typical and morally acceptable behavior. They set the standards of conduct, shape individual behavior, are decentrally enforced, and could thus create a potent momentum either in favor of or against climate action (Bicchieri, 2006; Krupka and Weber, 2013; Nyborg et al., 2016; Bursztyn and Jensen, 2017). We thus hypothesize that individual willingness to fight global warming is determined by individual perceptions of other people's behavior (*'perceived behavior'*) as well as individual perceptions of what other people believe should be done (*'perceived norms'*).[6] Beliefs about the choices that other people make reflect the perceived behavioral standard or norm in a community, which is particularly relevant when people condition their cooperation on the action of others ('conditional cooperation', Fischbacher et al., 2001). Beliefs about what other people consider appropriate reflect the perceived moral rules

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[3]At the time of the survey, it cost about \$28 to offset 1 ton of CO_2 emissions. The World Bank estimates that a typical US resident causes about 16 tons of CO_2 emissions per year.

[4]We are primarily interested in understanding *differences* in willingness to act against climate change across groups. This is why design parameters that could potentially affect the *level* of our measure are secondary for almost all of our later analyses. Instead, we prioritize the simplicity and tangibility of the decision situation. See the related literature on estimating the willingness to pay for climate action for a different approach (e.g., Aldy et al., 2012; Diederich and Goeschl, 2014; Johnson and Nemet, 2010).

[5]Charness et al. (2016) review the advantages and disadvantages of implementing the decisions of a subset of participants versus those of all participants. The literature documents little difference between the two methods in estimating differences between groups, which is our primary goal here.

[6]The former are sometimes referred to as descriptive norms or empirical beliefs, while the latter are also sometimes referred to as second-order normative beliefs, injunctive norms, or prescriptive norms (Cialdini et al., 1990; Bicchieri, 2006).

or principles in a community. People might have a preference to adhere to the prevalent rules to protect their reputation or self-image (Bursztyn and Jensen, 2017; Falk, 2021).

Before eliciting respondents' perceptions about prevalent social norms, we first ask respondents about their own behavior and normative views which allow us to establish prevalent behaviors and endorsement of norms in a representative sample of US adults. Specifically, we ask all respondents whether they "try to fight global warming" (yes/no) and whether they believe that "people in the US should try to fight global warming" (yes/no).

To measure *perceived* social norms, we then ask all respondents to estimate what proportion of the US population "try to fight global warming" ('perceived behavior') and what proportion think that "people in the US should try to fight global warming" ('perceived norms'). Before making their guesses, respondents are informed that we have gathered survey evidence on whether people try to fight global warming and whether they think that people in the US should try to fight global warming. More specifically, it is explained that we have surveyed a large sample of the US population and that the survey results "represent the views and attitudes of people in the United States". For ease of comprehension, respondents are not asked to estimate proportions but rather estimate the number of people to whom the statement applies out of 100 people we asked:

- *Out of 100 people we asked, how many stated that they try to fight global warming?*

- *Out of 100 people we asked, how many stated that they think that people in the United States should try to fight global warming?*

To determine whether individual perceptions are correct, we can compare participants' guesses with the actual shares of wave 1 respondents answering affirmatively to the questions whether they "try to fight global warming" and whether they think that "people in the US should try to fight global warming". We incentivize the guesses that respondents make to induce and reward careful and accurate responses. In particular, every respondent can earn a $1 bonus if their guess in a randomly-selected belief question differs at most by three from the true value.[7] The resulting measures of perceived behaviors and perceived norms are simple, yet quantitative, incentivized, and inter-personally comparable. Together, they capture the two key facets of social norms that have been identified as important drivers of human behavior in many contexts.

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[7]The perceived behavior and the perceived norms question are the central but not the only belief questions in the survey. In total, we ask fifteen different belief questions, all of which are incentivized by the reward scheme, see below.

The abstract wording of our central perceived social norm measures ("fight global warming") is likely to capture a broad range of climate-relevant behaviors. To shed light on more specific and context-dependent norms, we use an analogous procedure to ask respondents to estimate what proportion of the US population reports engaging in a set of concrete climate-friendly behaviors ('perceived behaviors') and what proportion of the US population says that one should engage in those behaviors ('perceived norms'). The set of concrete behaviors includes restricting meat consumption, avoiding flights, using environmentally-friendly alternatives to fossil-fueled cars, using green electricity, adapting shopping behavior to the carbon footprint of products, and politically supporting the fight against global warming. Guesses are incentivized using the same reward scheme.

Economic preferences   Economic preferences have been shown to predict a range of important decisions and they are likely to be important determinants of individual willingness to fight climate change. To explore the relationship between economic preferences and the propensity to fight global warming, we obtain detailed individual-level measures of economic preferences following the methodology used in the Global Preferences Survey (Falk et al. 2018a,b). This experimentally validated survey relies on a range of qualitative and quantitative survey items and allows us to construct preference measures for six fundamental preferences: *patience*, *willingness to take risks*, *altruism*, *trust*, *positive reciprocity*, and *negative reciprocity*. The latter two capture the willingness to reward kind or punish unkind actions, respectively. More information on the survey items and how the composite measures are computed can be found in Appendix C. For ease of interpretation, each preference measure is standardized to have a mean of zero and a standard deviation of one.

Universal moral values   Moral universalism captures the tendency to extend altruistic and moral concerns to individuals who are socially distant (Singer, 2011; Crimston et al., 2016; Enke, 2020). Given the global nature of climate change, there are strong reasons to hypothesize that individual willingness to fight global warming is determined by the relative importance of universal versus communal moral values. Moral Foundations Theory (MFT) posits that people's moral concerns can be partitioned into five distinct foundations: care/harm, fairness/reciprocity, in-group/loyalty, authority/respect, and purity/sanctity. "Universal" values – captured by the care/harm and fairness/reciprocity foundations – apply irrespective of the people involved. "Communal" values – captured by the in-group/loyalty and authority/respect foundations – are tied to certain groups or relationships (Haidt and Joseph, 2004; Haidt, 2012; Graham et al., 2013; Enke, 2020). We administer the Moral Foundations Questionnaire (MFQ) to measure the distinct foun-

Figure 1: Information treatments in wave 2

a) Behavior treatment   **b)** Norms treatment
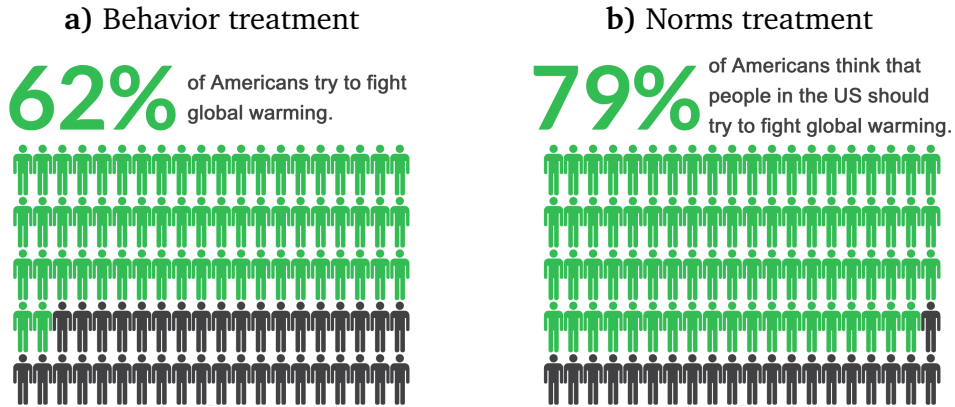
Notes: Panels a and b provide a visual summary of the information provided to participants in the behavior and the norms treatments, respectively. The exact wording of the survey instructions is provided in Appendix B.

dations and calculate the relative importance of universal moral values following the approach proposed by Enke (2020). More information on how the standardized measure is constructed can be found in Appendix C.

2.4   Shifting perceived social norms

Given the threat posed by global warming, it is important to understand which interventions could increase individual willingness to fight climate change. While it is difficult to alter fundamental human traits such as altruism, patience, or moral values in the short term, beliefs about social norms are likely to be more malleable.[8] As we will show in Section 3.2, respondents on average misperceive the prevalence of social norms in the US. Based on this finding, we embed an information experiment into wave 2. The exogenous variation induced by this experiment allows us to study whether the perceived prevalence of social norms causally affects individual willingness to fight global warming.

The experiment starts by eliciting respondents' beliefs about prevalent behaviors and norms, using the abstract belief measures introduced in Section 2.3. Then, we provide randomly-selected participants with truthful information about the actual proportions of the US population who (i) "try to fight global warming" (*'behavior treatment'*) or (ii) think that "people in the US should try to fight global warming" (*'norms treatment'*).

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[8]Economic preferences such as altruism and patience are also malleable, especially during the childhood period, and can be affected through educational interventions in the case of patience (Alan and Ertac, 2018) or through an enriched social environment in the case of altruism (Kosse et al., 2019; Rao, 2019). While it is possible that such interventions can lead to an increased willingness to fight climate change, these interventions are more difficult to implement on a larger scale.

Estimates of both shares are derived from wave 1. More specifically, we randomize respondents in wave 2 into one of three treatments. Appendix Figure A.1 summarizes the structure of the experiment.

1. Behavior treatment   In this treatment, respondents are informed about the share of the US population who "try to fight global warming". Respondents are first informed about the fact that "we recently surveyed 2,000 people in the United States and asked them whether they try to fight global warming. Respondents come from all parts of the population and their responses represent the views and attitudes of people in the United States." On the following page, respondents learn that 62% of Americans try to fight global warming. To ensure that participants pay attention, the information is revealed piece by piece, and respondents need to spend a minimum of 5 seconds on the final screen before being able to proceed. A graph on the final screen expresses the information visually, making it salient and tangible (see Figure 1a).

2. Norms treatment In an analogous manner, respondents in the norms treatment learn that 79% of Americans think that people in the US should try to fight global warming (see Figure 1b).

3. Control   No information is provided to participants in the control condition.

Subsequently, we elicit individual willingness to fight climate change with the incentivized donation decision (see Section 2.2), which constitutes our main outcome measure. This study design allows us to assess whether providing respondents with accurate information about prevalent behaviors or norms can shift individual climate behavior.

Respondents randomized into the behavior or norms treatment are likely to revise their beliefs about prevalent behaviors or norms in the US. Such a shift in beliefs may lead to a change in individual willingness to fight climate change. Since – as we will show – individuals systematically underestimate the share of Americans trying to fight global warming as well as the share who think that Americans should try to fight global warming, we posit that the information interventions are likely to increase individual willingness to fight climate change. We opt for the dual approach of shifting both perceived behavior and perceived norms, as both are regarded as central drivers of human behavior. However, conceptually, these two entities are closely related. A change in perceived behavior may also lead to a change in perceived norms and vice versa. We explore this question in further detail in Section 3.3.

To study belief revisions, we assess participants' posterior norm perception by including the beliefs measures for the six concrete climate-friendly behaviors (e.g., restricting meat consumption, avoiding flights or fossil-fueled cars; see Section 2.3) as a

post-treatment module. For the purpose of the analysis, we compute a perceived behavior index and a perceived norms index by calculating the average across the six climate-friendly behaviors/norms items. We then standardize each index to have a mean of zero and a standard deviation of one among control group respondents. Conceptually, individual perceptions about the prevalence of concrete behaviors/norms are strongly related to the more general behavior/norm of "trying to fight global warming". We can thus use those questions to test for and detect belief revisions without repeating our main questions, thereby mitigating experimenter demand effects and consistency bias in survey responses (Haaland et al., forthcoming).

2.5   Additional measures

Climate change skepticism   The public and political debate on climate change has been shaped by a denial of its existence, dangers, or human origin. This phenomenon is particularly relevant in the US where climate change skepticism is widespread and has often formed a key obstacle to effective responses against climate change (Dunlap and McCright, 2011; Leiserowitz et al., 2013). The subgroup of climate change deniers thus holds particular political relevance, and the survey includes a diverse set of items that allow us to measure respondents' skepticism. We ask respondents to indicate how much trust they have in climate science, whether they think scientists agree that global warming is happening, how worried they are about global warming, whether they think it will harm people in the US, and whether they think that climate change is human-caused (see Appendix B). These questions are asked at the beginning of the survey to ensure that the responses are not affected by the information treatments. We use this information to explore the heterogeneity of treatment effects.

Policy support and political engagement   In addition to eliciting individual willingness to fight climate change, we collect detailed information on the extent to which individuals support different climate polices (e.g., a carbon tax, subsidies for green energy, pollution regulation) and are willing to engage politically (e.g., volunteer time, attend protest, contact government officials). We pose a total of 18 questions adapted from a detailed politics module developed as part of the Climate Change in the American Mind Project (Howe et al., 2015). Respondents can express their policy support and individual political engagement on a four-point Likert scale (see Appendix B), which we recode in our analysis to ensure that larger values indicate more policy support and political engagement. For ease of interpretation, we aggregate individual items into a policy support index (7 items), a political engagement index (11 items), and a joint index comprising all 18 items. Each index is standardized to have a mean of zero and

a standard deviation of one among control group respondents. The questions are posed after the information treatments in wave 2, which allows us to study whether shifting beliefs about prevalent behaviors and norms causally affects policy support and willingness to engage politically.

Background characteristics We collect detailed information on individual background characteristics. Those include age, gender, education, employment status, household income, the number of children, and whether the respondent thinks of themselves as being closer to the Republican or Democratic party. We use those variables as additional control variables in the analysis.

3 Results

3.1 Willingness to fight climate change and its determinants

To measure climate preferences, we use an incentivized donation decision in which respondents divide \$450 between themselves and a charitable organization that fights global warming. We use this measure to study which factors predict those preferences. For the purpose of this descriptive analysis, we focus on survey data collected in wave 1 ($N = 2,000$), which did not contain any treatment manipulation. Appendix Figure A.2 displays the distribution of individual willingness to fight global warming, as measured through the incentivized donation decision. On average, respondents are willing to donate \$225 of the \$450. There is a considerable degree of heterogeneity across respondents, with 6% donating \$0, 12% donating \$450, and the remaining 82% donating some value in between.[9]

We explore which factors predict individual willingness to fight climate change. For this purpose, we regress the donation amount (in \$) on (i) individual beliefs about prevalent behaviors or norms, (ii) our measures of fundamental economic preferences (i.e., patience, risk-taking, altruism, positive reciprocity, negative reciprocity, and trust), (iii) universal moral values, and (iv) a range of background characteristics. Given that beliefs about prevalent behaviors and norms are conceptually related and highly correlated in our data ($\rho = 0.67$), we estimate two separate regression models, including one belief measure at a time. For the purpose of this analysis, the belief measures are

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[9]The incentivized pro-climate donation strongly predicts other climate-related choices. Table A.6 shows that the donation measure is strongly correlated with respondents' self-reported climate-friendly behaviors. For example, respondents who avoid taking flights contribute on average \$75 more to the climate charity than those who do not, which corresponds to 33% of the baseline mean. Likewise, Table A.7 shows that the measure strongly correlates with respondents' self-reported willingness to contribute 1% of their income *every month* to fight global warming – another measure of willingness to act against climate change that we included in the wave 1 survey.

standardized to have a mean of zero and a standard deviation of one. The results are reported in columns 1 and 2 of Table 1, respectively.

First, perceived behaviors and norms are strong predictors of climate preferences. Controlling for the large set of covariates, a one-standard-deviation increase in perceived behavior is associated with a $12 higher donation amount ($p < 0.001$), while a corresponding increase in perceived norms is associated with a $14 higher donation ($p < 0.001$).[10] These results are consistent with norm perceptions playing an important role in determining individual willingness to fight global warming. This could, for example, be the case if individuals are 'conditional cooperators' or if they have a preference for complying with existing social norms. Whether or not this relationship can be interpreted as causal is a question we turn to in Section 3.3.

Second, the results presented in Table 1 further reveal that climate donations are fundamentally related to economic preferences. Altruism and positive reciprocity – both of which are facets of prosociality – positively predict the donation amount. The magnitudes of the estimated coefficients are sizable. For example, a one-standard-deviation increase in altruism is associated with a $52 higher donation amount. Similarly, patience positively predicts donation decisions. These patterns are plausible given that climate action benefits other people around the world as well as future generations. We find no statistically significant associations between climate preferences and risk preferences, negative reciprocity, or trust.

Third, we find a strong positive association between universal moral values and climate preferences. A one-standard-deviation increase in relative universalism – namely the extent to which individuals endorse universal moral values that apply equally to all humans rather than communal or ingroup-restricted values – is associated with a $23 higher donation amount. Climate change is a global problem and individuals whose moral values apply irrespective of the people involved are more likely to make larger donations, presumably because they are more likely to take the welfare of other people outside of their community into account.

Finally, demographic characteristics also significantly predict individual willingness to fight climate change. Democrats on average contribute about $45 more than Republicans, female respondents about $16 more, and household income is also positively associated with the donation amount. However, higher education negatively predicts climate donations. Further analyses reveal that this effect is entirely driven by Republicans among whom a college education is associated with a $27 lower donation amount (see

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[10]We note that both belief measures have a standard deviation of 22 percentage points. The coefficients can therefore also be interpreted as follows: A 10 percentage point increase in the behavior belief is associated with a $5.50 higher donation amount, while a corresponding increase in the norms belief is associated with a $6.50 higher donation amount.

Table 1: Determinants of climate change behavior

	Donation ($)	
	(1)	(2)
Perceived social norms		
Behavior belief	12.237***	
	(3.154)	
Norms belief		14.500***
		(3.058)
Economic preferences		
Altruism	51.267***	51.734***
	(3.477)	(3.448)
Patience	15.195***	15.192***
	(3.105)	(3.096)
Risk	-1.411	-0.792
	(3.373)	(3.354)
Positive reciprocity	9.571***	7.877**
	(3.239)	(3.258)
Negative reciprocity	-3.338	-2.540
	(3.214)	(3.185)
Trust	1.071	0.831
	(3.233)	(3.203)
Moral foundations		
Relative universalism	23.772***	23.420***
	(3.301)	(3.290)
Sociodemographics		
Democrat	45.143***	44.160***
	(6.241)	(6.246)
Age	0.685	0.702
	(1.035)	(1.034)
Age (squared)	-0.007	-0.006
	(0.011)	(0.011)
Female	16.943***	16.520***
	(6.367)	(6.331)
Log income	9.965***	9.895***
	(3.741)	(3.726)
College degree	-15.320**	-15.953**
	(6.522)	(6.504)
Employed	8.453	8.868
	(6.661)	(6.638)
Parent	4.659	4.695
	(6.498)	(6.478)
R^2	0.281	0.284
N	1,975	1,975
Mean of dep. var.	225.21	225.21

Notes: This table shows OLS regression estimates using respondents from wave 1, where the dependent variable is the amount donated to the charitable organization that fights global warming. Perceived social norms, economic preferences, and universal moral values are standardized. "Democrat", "Female", "College degree", "Employed" and "Parent" are binary indicator variables. "Log income" is coded as the log of the income bracket's midpoint.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors in parentheses.

Appendix Table A.2).[11]

3.2 Misperceived social norms

Having established individual factors predictive of willingness to fight climate change, we now explore the distribution of beliefs about behaviors and norms in more detail. Given that these beliefs are potentially malleable, it holds particular importance to establish whether there are systematic misperceptions of prevalent behaviors and norms. For the purpose of this analysis, we again rely on the survey data collected in wave 1.

Figure 2 depicts the distribution of perceived social norms. Panel A.1 displays perceived behavior, i.e., the distribution of individual beliefs about the share of the US population that tries to fight global warming. Panel A.2 displays perceived norms, i.e., the distribution of beliefs about the share of Americans who think that people in the US should try to fight global warming. The average belief is indicated by a vertical red line, whereas the actual share is marked by a dotted blue line.

Figure 2 reveals a considerable degree of heterogeneity in individual beliefs. Both panels further reveal that respondents vastly misperceive the prevalence of climate-friendly behaviors and norms among their fellow citizens. On average, respondents believe that 51% of Americans try to fight global warming, while the actual share is 62% (p-value < 0.001). The majority of participants – namely 67% – underestimate the level of climate-friendly behavior in the US. Similarly, respondents on average believe that 61% of Americans think that people in the US should try to fight global warming, while the actual share is 79% (p-value < 0.001). Again, most participants (76%) underestimate this share. We find larger misperceptions among respondents who are older, have a lower income, have a lower education, or are Republicans (see Appendix Table A.4).

We document the same systematic underestimation of climate norms for the set of concrete climate change behaviors for which we elicited perceived social norms. For example, these behaviors include restricting meat consumption, avoiding flights and cars, or adapting a sustainable shopping style.[12] Panel B.1 of Figure 2 contrasts the actual share of respondents who report engaging in a specific behavior with the average perceived share. Analogously, Panel B.2 contrasts the actual share of respondents who report that they think people in the US *should* engage in a specific behavior with the average

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[11]We are not the first to document a negative education gradient among Republicans (Hamilton, 2011; Newport and Dugan, 2015). It has been hypothesized that highly-educated individuals are cognitively better equipped to rationalize and internalize the views of their cultural community, which for Republicans might correspond to climate change skepticism (Kahan et al., 2012; but see Van Der Linden et al., 2017).

[12]Reassuringly, we show that these concrete beliefs measures are strongly correlated with the abstract measure which indicates that the abstract measure serves well as a summary measure (see Appendix Table A.5).

Figure 2: Perceived social norms: fight global warming

A: "Fight global warming"

Panel A.1: Behavior belief   **Panel A.2:** Norms belief

— Average belief   -- Actual share

B: Concrete behaviors

Panel B.1: Behavior beliefs   **Panel B.2:** Norm beliefs

☐ Actual   ☐ Perceived
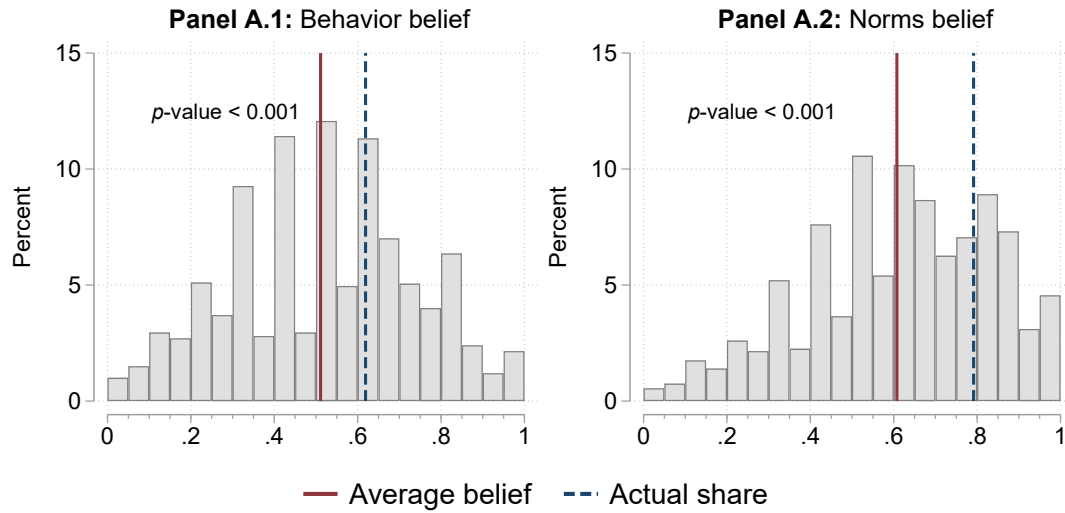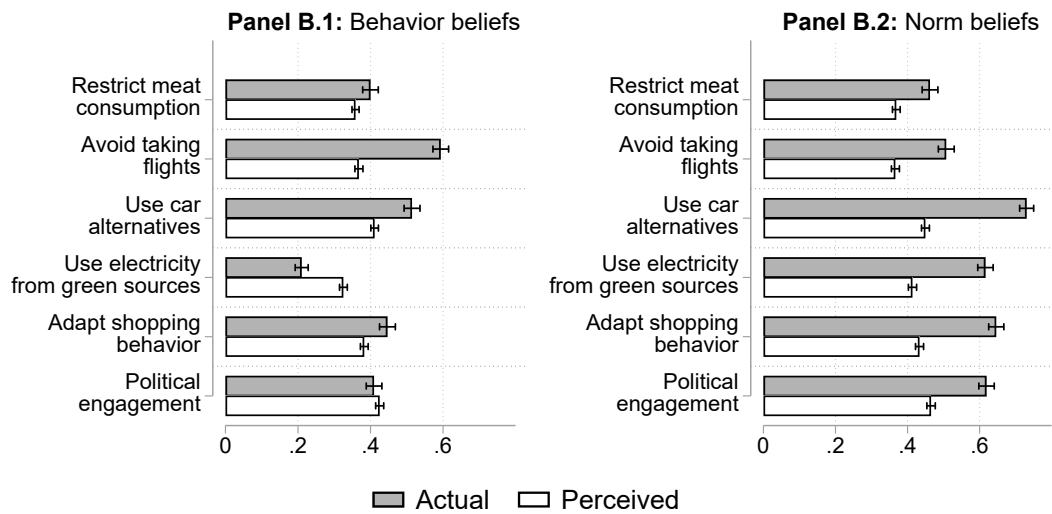
Notes: This figure shows the distribution of perceived social norms in wave 1. Panel A.1 shows the distribution of people's beliefs about the share of Americans who say that they try to fight global warming. Panel A.2 shows the distribution of people's beliefs about the share of Americans who say that one *should* fight global warming. The average belief across respondents (solid red) as well as the actual shares (dashed blue) are indicated in Panel A.1 and A.2 as vertical lines. Panel B.1 shows the share of respondents who indicate that they engage in different concrete climate-friendly behaviors ("Actual"), and the average belief about the share of Americans that engage in these concrete behaviors ("Perceived"). Panel B.2 shows shows analogous averages for the share of Americans who say that one should engage in these concrete behaviors ("Actual") as well the average belief about the share of Americans who say one should engage in these concrete behaviors ("Perceived").

perceived share.[13] For almost all behaviors, we find that Americans underestimate how many other Americans engage in climate-friendly behavior or think this should be done. For example, 51% of Americans report regularly using environmentally-friendly alternatives to their private car, such as walking, cycling, taking public transport, or car-sharing. But, on average, this fraction is perceived to be only 41%. Likewise, 73% of Americans think that one should regularly use these climate-friendly alternatives. Again, Americans strongly underestimate this share, and on average they believe that only 45% of other Americans think so.

Taken together, while many Americans try to fight global warming and a vast majority actually agrees that people in the US should try to fight global warming, most Americans underestimate the degree to which other Americans engage in climate-friendly behaviors and share those normative views. This underestimation of climate norms is likely to hamper individual willingness to fight climate change.

3.3 Correcting misperceived social norms

As established in the previous sections, beliefs about prevalent behaviors and norms strongly predict individual willingness to fight climate change. At the same time, there are systematic misperceptions of the actual share of Americans fighting or thinking that one should fight climate change. Can information interventions that inform respondents about the true shares affect individual willingness to fight climate change? The information experiment embedded in wave 2 allows us to study this question. Respondents are randomized into (i) a 'behavior treatment', in which they are informed that 62% of Americans try to fight global warming, (ii) a 'norms treatment', in which they are informed that 79% of Americans think that people in the US should try to fight global warming, or a (iii) a control group. Appendix Table A.3 presents the balancing of characteristics across the three groups. We cannot reject the null hypothesis that the average characteristics of the three groups are the same and conclude that the randomization was successful. Appendix Figure A.3 displays the wedge between wave 2 respondents' beliefs about prevalent behaviors and norms and the actual shares. As can be seen from both figures, wave 2 participants also vastly underestimate the true shares, providing us with an ideal opportunity to exogenously correct inaccurate perceptions. The average gap between the perceived and actual shares is 10 percentage points in the case of perceived behaviors and 17 percentage points in the case of perceived norms.

To estimate the causal impact of the information treatments, we regress willingness to fight climate change – as measured through the incentivized donation decision (in

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[13]See Figures A.4 and A.5 for the full distribution of beliefs.

$) – on treatment indicators and a set of control variables.[14] The results are reported in column 1 of Table 2 and reveal that the impacts of the information treatments are sizable and highly statistically significant. Being informed about the true share of Americans who try to fight global warming leads to a \$12 increase in donations (p-value = 0.012), while being informed about the true share of Americans who think that people in the US should try to fight global warming increases donations by \$16 (p-value < 0.001). The effects correspond to a relative increase of 4.7% and 6.3%, respectively. While the point estimate of the coefficient for the norms treatment is somewhat larger than the point estimate of the coefficient for the behavior treatment, we note that the two are not significantly different from each other (p-value = 0.39). Given that not all respondents misperceive prevalent behaviors and norms at the baseline and some respondents might not fully revise their beliefs in light of the information provided, both effect sizes suggest a powerful impact of perceived social norms on individual willingness to fight climate change.[15]

Using the posterior norm perception module, we provide evidence that the treatments indeed shift posterior beliefs in the way that one would expect. To study belief revisions, we regress the posterior beliefs about concrete climate-friendly behaviors and norms on the treatment indicators and the same set of control variables. As explained in Section 2.3, the set of concrete behaviors includes different actions such as reducing meat consumption or avoiding flights. The two posterior belief indices are standardized, and the results are reported in columns 2 and 3 of Table 2, respectively. Both information treatments successfully shift beliefs, which are revised upwards by 0.24 to 0.37 standard deviations. We also observe spill-over effects. Information about prevalent behavior also shifts beliefs about prevalent norms and vice versa. As remarked earlier, the treatments should not be interpreted as separate manipulations of orthogonal concepts but rather as statistically independent yet conceptually-related treatments with a common effect: they both strengthen perceived social norms.

Before exploring the heterogeneity in treatment effects in more detail, we briefly discuss why we think that it is unlikely that our results are driven by experimenter demand effects. Similar to other online survey experiments in the literature (e.g., Stantcheva, 2021; Kuziemko et al., 2015; see Haaland et al., forthcoming, for a survey), we mini-

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[14]The set of control variables includes controls for gender (indicator), age (continuous), log income, college degree (indicator), employment (indicator), party affiliation (indicator), and census region (three indicators). Appendix Table A.8 presents results of the regressions without control variables. The estimated coefficients are very similar in magnitude and significance.

[15]We can derive the treatment effect per standardized change in beliefs under the assumption that respondents fully update their beliefs to the information provided, which implies an average belief increase of 0.47 standard deviations in the behavior treatment and 0.82 standard deviations in the norms treatment. The behavior treatment thus has a \$24.8 effect and the norms treatment a \$19.2 effect on climate donations per standardized belief change. Both figures likely underestimate the true effect because most respondents presumably only partially update their beliefs.

Table 2: Treatment effects on climate donations and posterior beliefs

	(1) Donation ($)	(2) Behavior belief (post.)	(3) Norms belief (post.)
Behavior treatment	11.725**	0.279***	0.235***
	(4.675)	(0.030)	(0.030)
Norms treatment	15.674***	0.370***	0.350***
	(4.701)	(0.031)	(0.030)
N	5,991	5,988	5,976
Control group mean	249.31	0	0
z-scored	No	Yes	Yes
Controls	Yes	Yes	Yes

Notes: This table shows OLS regression estimates using respondents from wave 2. The dependent variable is the donation to the climate charity (in $). It is regressed on binary indicators that take the value of 1 for respondents in the behavior treatment and norms treatment, respectively. "Behavior belief" is an index of six post-treatment beliefs about the share of Americans engaging in concrete climate-friendly behaviors to fight global warming. "Norms belief" is an index of six post-treatment beliefs about the share of Americans who say that one should engage in concrete climate-friendly behaviors to fight global warming. Both indices are standardized to have a mean of zero and a standard deviation of one in the control group. All regressions include controls for gender (indicator), age (continuous), log income, college degree (indicator), employment (indicator), party affiliation (indicator), and census region (three indicators).

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors in parentheses.

Table 3: Treatment effect heterogeneity: Prior above/below actual share

	Dependent variable: Donation ($)			
	Prior < actual share		Prior ≥ actual share	
	(1)	(2)	(3)	(4)
Behavior treatment	14.931**		5.231	
	(5.875)		(7.701)	
Norms treatment		19.111***		4.747
		(5.387)		(9.623)
N	2,579	3,054	1,399	946
Control group mean	243.09	241.67	260.69	273.71
Controls	Yes	Yes	Yes	Yes

Notes: This table shows OLS regression estimates using respondents from wave 2. The dependent variable is the donation to the climate charity (in $). It is regressed on binary indicators that take the value of 1 for respondents in the behavior treatment and norms treatment, respectively. We run separate analyses for respondents with prior norm perceptions strictly below the actual share (columns 1-2) and equal to or above the actual share (columns 3-4). We consider beliefs about others' behavior in the behavior treatment and beliefs about others' norms in the norms treatment. Given that the actual shares are different for the two beliefs, we do not pool all three treatment groups in this analysis. Instead, we only use respondents in the control condition and the behavior treatment in the analysis presented in columns 1 and 3, and only use respondents in the control condition and the norms treatment in the analysis presented in columns 2 and 4. All regressions include the set of controls described in Table 2.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors in parentheses.

mize the potential threat arising from experimenter demand by informing participants at the beginning of the survey about the fact that the survey is anonymous and that no conclusions can be drawn about their identity from their answers. We further note that all respondents – irrespective of their treatment status – were primed to think about prevalent behaviors and norms, as those beliefs were elicited for the full sample before the treatment manipulation. The use of incentives for our main outcome measure further mitigates potential concerns. More generally, empirical evidence suggests that experimenter demand effects hold limited quantitative importance in online surveys (de Quidt et al., 2018; Mummolo and Peterson, 2019).

3.4   Treatment effect heterogeneity

By prior   We explore heterogeneity in treatment effects across different subgroups. First, we examine whether the treatments are more effective for respondents whose priors are below the actual shares. Table 3 separately displays the treatment effects for respondents whose prior beliefs are below the true shares (Panel A) and those whose prior beliefs are equal to or above the true shares (Panel B). As can be seen from this table, the positive treatment effects that we document for the full sample are almost entirely driven by those individuals whose priors are below the actual shares. Among them, the behavior treatment increases donations by $15 (p-value = 0.011), whereas the norms treatment increases donations by $19 (p-value < 0.001). Reassuringly, we do not observe a back-firing effect. For respondents whose priors are equal to or above the actual shares, the estimated coefficients are positive albeit smaller in magnitude and insignificant.[16] However, we note that we cannot reject the null hypothesis that the treatment effect coefficients are the same for both subgroups.

By political affiliation   Political polarization of climate change attitudes has proven to be an obstacle for climate action in the US where climate policies are often among the most contentious policy issues (Dunlap et al., 2016; Hornsey et al., 2018). We therefore ask whether our information treatments differentially affect Democrats and Republicans in the US. Indeed, we observe a sizable gap of about $75 between Democrats' and Republicans' average donations in the control condition of wave 2. Appendix Table A.12 shows that information about other Americans' behavior reduces this gap by 11$. Republicans tend to respond more strongly to the provided information than Democrats,

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[16]Appendix Figure A.6 displays non-parametric estimates of the moderating role of pre-treatment beliefs for our information treatments (Xu et al., 2017; Hainmueller et al., 2019). As can be seen from this figure, the effects of the behavior and the norms treatment are stronger among respondents with low pre-treatment beliefs. Moreover, both treatments have a weakly positive effect across the whole belief distribution.

although the interaction effect is insignificant ($p = 0.249$). The table also shows that the norms treatment has almost identical effects on Democrats and Republicans. We obtain largely identical results when additionally controlling for treatment heterogeneity by priors (see Appendix Table A.13). These analyses suggest that – if at all – the treatments tend to have a depolarizing effect. However, ultimately, the comparison between Democrats and Republicans only weakly reflects respondents' baseline attitudes towards climate change. We will turn to this issue in the next paragraph.

By climate change skepticism   We explore whether the information treatments lead to a stronger increase in individual willingness to fight climate change for respondents who are skeptical about the existence and threat of human-caused climate change. From a policy perspective, this subset of the population is particularly relevant as it is typically difficult to reach and convince that climate change matters.

We split our sample based on five indicators that capture different facets of climate change skepticism: having low trust in climate science, believing that the presence of climate change is still scientifically debated, not being worried about climate change, not perceiving it as a threat for the US, and believing that climate change is mainly the result of natural causes. In the control condition, those classified as "climate deniers" donate about 57\$ to 150\$ (depending on the indicator) less to the climate charity (see Appendix Table A.14).

Next, Figure 3 compares the treatment effects across respondents who express skepticism about climate change and those who do not. For all indicators and both treatments, we observe that the point estimates of the treatment coefficients are larger in magnitude for climate change deniers. In the behavior treatment, most coefficients are also statistically different from each other across the two subgroups. For example, the behavior treatment increases donations by \$24 for those who report not being worried about global warming and by \$39 for those who do not believe that climate change is human-caused. By contrast, we do not find a statistically significant impact of the behavior treatment for respondents who do report being worried or who do believe that climate change is human-caused. These differences in effect sizes are statistically significant at the 5% level (see also Table A.9). As a consequence, the behavior treatment reduces the baseline differences between climate change "believers" and "deniers" by 17–27% depending on the measure used to classify respondents into these groups. In the norms treatment, the differences are more muted.

Climate change deniers tend to have more pessimistic prior beliefs about the prevalence of climate norms in the US. However, we observe largely identical results even if we control for treatment heterogeneity by priors (see Table A.10). Thus, the same information appears to have differential informational value for climate change deniers –

Figure 3: Treatment effect heterogeneity by climate change skepticism

Panel A: Behavior treatment | Panel B: Norms treatment

Trust in science?
Scientific consensus about global warming?
Worried about global warming?
Global warming is a threat?
Global warming is human-caused?

Donations ($)

◆ Yes (believes in climate change)   ● No (skeptical of climate change)
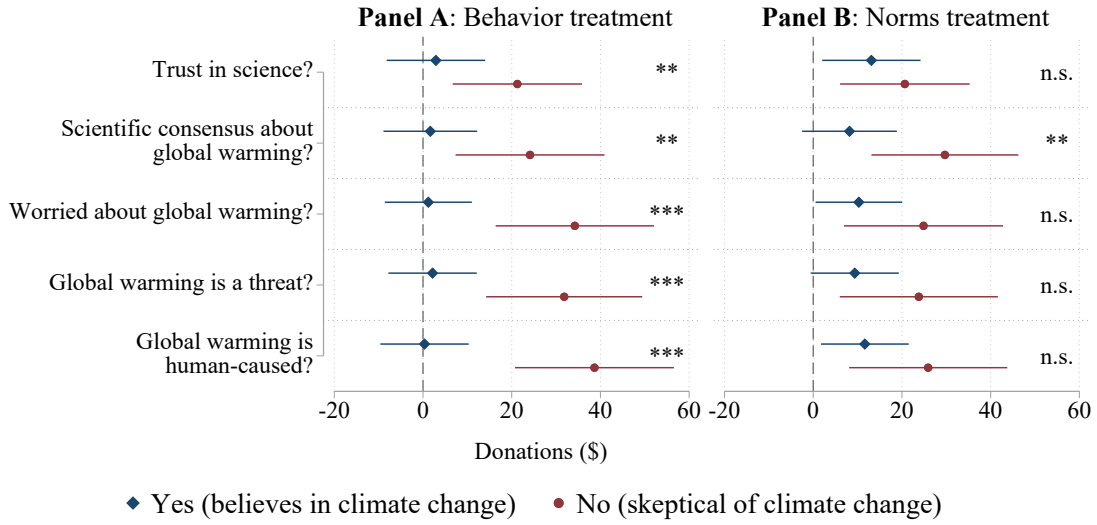
Notes: This figure shows OLS estimates of the treatment effects of the behavior (Panel A) and the norms treatment (Panel B) on donations (in $) in different subsamples. We use respondents from wave 2 and include the set of controls described in Table 2. 95% confidence intervals are shown. Each panel shows treatment effects among respondents who are skeptical of climate change ("No") and those who believe in climate change ("Yes"), where we use disagreement with different statements as a proxy for skepticism: "Trust in science" means that the respondent trusts climate scientists "a lot" or "a great deal" (on a five-point Likert scale). "Scientific consensus about global warming" means that the respondent thinks that most scientists think that global warming is happening. "Worried about global warming" means that the respondent is "somewhat worried' or "very worried" about global warming (on a four-point Likert scale). "Global warming is a threat" means that the respondent thinks that global warming will do "a moderate amount" or "a great deal" of harm (on a four-point Likert scale). "Global warming is human-caused" means that the respondent thinks that global warming is caused by human activities. For each sample split, we indicate the level of significance of a test of equality of coefficients.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$, n.s. $p \geq 0.10$.

even conditional on the same prior belief.

These results suggest that providing information about relevant peers – in particular, their behavior – is an effective tool to target, reach, and persuade skeptics, even where other means of persuasion, such as moral suasion or fact-based education, have failed.

One possible explanation for why the behavior treatment is so effective is that the behavior of fellow US Americans provides particularly important guidance to climate change deniers. Climate change deniers do not only have more scope to adjust their behavior.[17] They might also be surprised to learn that their views are in fact minority views and that the majority of their fellow citizens does take climate change seriously. Moreover, we find that climate change deniers exhibit much lower moral universalism (see Appendix Table A.17). This means that their moral compass places more weight on

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[17]It is unlikely that the much weaker treatment effect among respondents who believe in and are concerned about climate change can be attributed to a "ceiling effect". In the control treatment, the large majority of these climate change "believers" (about 73% to 75% depending on the question) can still increase their donation by at least $25.

Table 4: Treatment effects on support for policies and actions to fight global warming

	(1) Policies	(2) Actions	(3) All
Behavior treatment	0.088***	0.039	0.061**
	(0.026)	(0.027)	(0.026)
Norms treatment	0.066**	0.012	0.034
	(0.026)	(0.027)	(0.026)
N	5,999	5,994	5,993
z-scored	Yes	Yes	Yes
Controls	Yes	Yes	Yes

Notes: This table shows OLS regression estimates using respondents from wave 2. Dependent variables: "Policies" is an index measuring individual support for policies to fight climate change (7 items). "Actions" is an index measuring political engagement in different types of political activities (11 items). "All" is a joint index comprising all 18 items. All indices are constructed by taking the sum of all positively coded items and standardizing the sum to have a mean of zero and a standard deviation of one in the control group. The indices are regressed on binary indicators that take the value of 1 for respondents in the behavior treatment and norms treatment, respectively. All regressions include the set of controls described in Table 2.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors in parentheses.

communal values, which could render them more sensitive to information about the behavior of fellow citizens. Consistent with this conjecture, Appendix Table A.18 confirms that individuals who score low on the moral universalism index, i.e., endorse communal values, respond more strongly to information about other Americans' behavior.[18]

3.5 Treatment effects on policy support and political engagement

Do the positive treatment effects of the information treatments also carry over to the political domain? To study this question, we collect post-treatment information on policy support and political engagement (see Section 2.5). Columns 1 and 2 of Table 4 present the estimated treatment effects on the standardized indices of support for climate policies and willingness to engage in political actions. Column 3 presents the results for the standardized, joint index. We find that both treatments significantly increase support for climate policies. The behavior treatment significantly increases policy support by 0.09 standard deviations, while the norms treatment significantly increases policy support by 0.07 standard deviations. The estimated coefficients are positive albeit insignificant when we consider willingness to engage in political actions as the outcome. When we use the joint index as the outcome, we find that the behavior treatment signif-

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[18]The linear interaction coefficient indicates that the behavior treatment increases climate donations by $9 for each additional standard deviation decrease in the universalism index. This interaction is robust to heterogeneous treatment effects by priors (Column 2, Table A.18) and is statistically accounted for by the treatment heterogeneity in climate change denial (Column 3).

icantly increases the index by 0.06 standard deviations, while the norms treatment has an insignificant positive effect of 0.03.

Consistent with the results reported above, we also find that the estimated impacts of the treatments on policy support and political engagement tend to be stronger for the subgroup of climate change deniers. Appendix Figure A.7 shows that both the behavior and the norms treatment significantly increase individual support for policies to flight global warming by 10 to 20 percent of a standard deviation among climate change deniers. By contrast, our information treatments have hardly any impact on policy support among respondents who believe in climate change.

Taken together, we conclude that providing people with accurate information not only has the potential to increase individual willingness to fight climate change – especially among climate change deniers – but that it can also increase individual support for climate policies.

4 Concluding Discussion

In this paper, we study the behavioral determinants of individual willingness to fight climate change in a large-scale, representative survey with 8,000 US adults.

We document that fundamental human traits – namely patience, altruism, positive reciprocity, and moral universalism – are strongly correlated with individual willingness to fight climate change, as measured in a donation decision. This finding could prove fruitful in understanding the frequently observed cultural and political dissent on climate change (Dunlap et al., 2016; Hornsey et al., 2018). Indeed, in our data, economic preferences and universalism together explain about 40% of the large $74 baseline donation gap between Republicans and Democrats (wave 1 data, see Appendix Table A.11). Likewise, they explain 25% of the gap in policy preferences. Both results suggest that the political divide on climate change can be partially attributed to deeply entrenched human traits. The important role of prosociality further illustrates that many individuals care about the well-being of others and therefore seem to partially internalize the positive externalities of climate action. The traditional economic model of purely self-interested agents facing an insurmountable collective action problem thus underestimates the scope for climate action. Indeed, our survey documents that many Americans are actually willing to act against global warming. 62% of Americans try to fight global warming, and 79% think that this should be done. Moreover, many respondents are willing to give up money to support the work of a climate charity.

Our finding that Americans vastly underestimate the prevalence of climate norms in the US holds particular political relevance. We show both correlationally and causally

that perceived social norms are a key driver of individual willingness to fight climate change. The fact that climate norms are commonly underestimated in the US can thus form a dangerous obstacle to climate action. It could trap Americans in an equilibrium with low climate engagement: Individuals are discouraged by the (mis)perceived lack of support, and they abstain from taking actions themselves, which sustains the pessimistic beliefs held by others – a phenomenon that has been dubbed pluralistic ignorance (Allport, 1924; Miller and McFarland, 1987; Bursztyn et al., 2020).

However, this diagnosis also implies a unique opportunity to promote and accelerate climate-friendly norms and behavior. We show that a relatively simple, scalable, and cost-effective intervention – namely informing respondents about the actual prevalence of climate norms in the US – corrects these misperceptions and encourages climate-friendly behavior. Importantly, we find that this intervention is depolarizing and particularly effective for climate change deniers, namely the group of people who are commonly difficult to reach, but crucial for building up a broad alliance against climate change. These results thus suggest that informing people about the behavior of relevant peers constitutes a particularly effective tool to target, reach, and convince skeptics. Convincing those who remain skeptical of human-caused climate change is likely to have particularly high returns if these individuals still have ample scope to make their behavior more climate-friendly.

Arguably, the effect of a single, minimalist message as embodied in our information treatments may dissipate with time. However, large-scale information campaigns that repeatedly announce and effectively communicate the actual prevalence of climate norms could correct existing misperceptions and permanently foster climate norms (Bicchieri, 2017; DellaVigna and Gentzkow, 2010; La Ferrara, 2016; Constantino et al., 2020; Chopra, 2021).[19] Such campaigns could also highlight that misperceptions are prevalent for many different types of climate-friendly behaviors, and they could draw on diverse channels and strategies, such as information via the news or edutainment via television. In sum, they could trigger a positive feedback loop where learning about the existing support of climate norms encourages Americans to take visible action against climate change, which encourages others to follow suit.

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[19]An important caveat is that social-norm-based campaigns could in principle also backfire if they highlight that too many people do not follow a norm (Schultz et al., 2007). Our results suggest that this is unlikely to happen in the US, where climate norms are widely underestimated. Moreover, in our experimental context, even initial overestimators do not reduce their climate donations.

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Appendices

Summary of the Online Appendices

Appendix A provides additional figures and tables. Appendix B contains the main survey instructions. Appendix C explains how the measures of economic preferences and moral universalism are derived.

Appendix A   Supplementary Analyses

Table A.1: Comparison of the sample to the US population

Variable	Wave 1	Wave 2	US population (2019)
Female	51%	51%	51%
Age: 18-34	30%	30%	30%
Age: 35-54	32%	32%	32%
Age: 55+	38%	38%	38%
Education: Bachelor's degree or above	32%	31%	31%
Region: Northeast	17%	17%	17%
Region: Midwest	21%	21%	21%
Region: South	38%	38%	38%
Region: West	24%	24%	24%
Democrat*	54%	53%	52%
Republican*	46%	47%	47%
Income: Below 50k*	41%	45%	37%
Income: 50k to 100k*	39%	38%	31%
Income: Above 100k*	19%	20%	31%

Notes: Columns 1 and 2 display the summary statistics for the survey samples of waves 1 and 2, respectively. Column 3 displays summary statistics based on the American Community Survey 2019, with the following exceptions: The share of voters who lean towards the Democratic (Republican) Party is obtained from the annual totals of the Pew Research Center survey data in 2019. Variables marked with a (*) were not targeted by the quota-based sampling approach.

Figure A.1: Structure of experiment

Perceived social norms

Treatment *(randomized)*

Control	Behavior	Norms
	Information on others' behavior	Information on others' norms

Donation decision

Policy support and political engagment
Posterior perceived norms
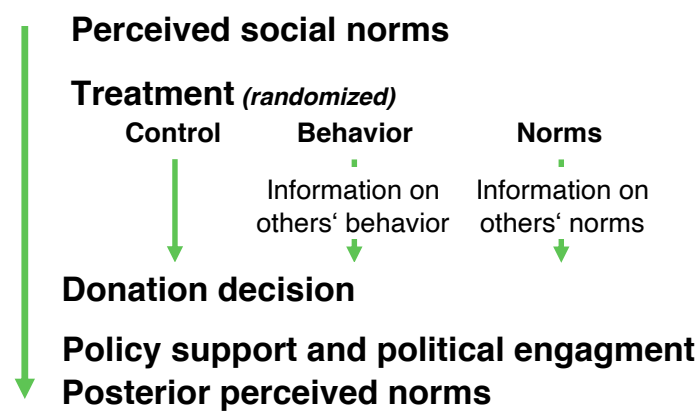
Notes: This figure provides an overview of the structure of the experiment.

Table A.2: Education and individual willingness to fight global warming

	Outcome: Donation ($)	
	(1)	(2)
Democrat x college degree	-6.838	-6.480
	(8.096)	(8.062)
Republican x college degree	-28.214***	-27.201***
	(10.320)	(10.429)
N	1,975	1,975
Control group mean	225.21	225.21
Demographic controls	Yes	Yes
Preferences and moral universalism	Yes	Yes
Normative belief	Behavior belief	Norms belief

Notes: This table shows OLS regression estimates where the dependent variable is the donation decision (in $) using respondents from wave 1. All regressions specifications are identical to those in Table 1, including demographic controls, economic preferences, moral universalism as well as normative beliefs as covariates. However, we replaced the "College degree" indicator with a "Democrat x college degree" and a "Republican x college degree" indicator.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors in parentheses.

Table A.3: Test of balance

|	Means (std. dev.)			Differences (p-values)		
	Control group (C)	Behavior treatment (T$_1$)	Norms treatment (T$_2$)	T$_1$ - C	T$_2$ - C	T$_2$ - T$_1$
Behavior belief	52.096	51.627	51.644	-0.470	-0.452	-0.017
	(21.339)	(21.213)	(21.391)	(0.486)	(0.503)	(0.980)
Norms belief	62.172	61.667	61.328	-0.505	-0.845	0.339
	(21.357)	(21.535)	(21.948)	(0.458)	(0.217)	(0.621)
Altruism	-0.008	-0.024	0.032	-0.016	0.040	-0.057*
	(0.982)	(0.984)	(1.032)	(0.600)	(0.206)	(0.076)
Patience	-0.020	0.005	0.015	0.025	0.035	-0.010
	(0.993)	(0.989)	(1.019)	(0.424)	(0.265)	(0.744)
Risk	-0.001	-0.005	0.006	-0.005	0.007	-0.011
	(0.989)	(1.011)	(1.000)	(0.887)	(0.827)	(0.719)
Pos. reciprocity	-0.018	0.021	-0.002	0.039	0.016	0.023
	(1.024)	(0.983)	(0.993)	(0.223)	(0.619)	(0.463)
Neg. reciprocity	-0.011	0.012	-0.001	0.023	0.011	0.013
	(0.999)	(0.978)	(1.023)	(0.455)	(0.733)	(0.692)
Trust	-0.028	0.017	0.010	0.045	0.038	0.007
	(1.001)	(1.000)	(0.999)	(0.156)	(0.229)	(0.825)
Rel. universalism	-0.027	0.021	0.006	0.047	0.032	0.015
	(0.987)	(1.020)	(0.993)	(0.138)	(0.303)	(0.639)
Age	48.114	47.350	47.847	-0.763	-0.266	-0.497
	(17.727)	(17.055)	(17.438)	(0.166)	(0.632)	(0.361)
Female	0.494	0.522	0.514	0.029*	0.020	0.008
	(0.500)	(0.500)	(0.500)	(0.071)	(0.202)	(0.593)
Log income	10.782	10.795	10.815	0.013	0.033	-0.020
	(0.882)	(0.879)	(0.858)	(0.645)	(0.236)	(0.471)
College degree	0.473	0.479	0.457	0.007	-0.015	0.022
	(0.499)	(0.500)	(0.498)	(0.676)	(0.335)	(0.166)
Employed	0.499	0.488	0.506	-0.012	0.007	-0.018
	(0.500)	(0.500)	(0.500)	(0.467)	(0.672)	(0.248)
Democrat	0.528	0.535	0.539	0.007	0.011	-0.003
	(0.499)	(0.499)	(0.499)	(0.640)	(0.497)	(0.833)
Northeast	0.170	0.165	0.174	-0.005	0.004	-0.009
	(0.376)	(0.372)	(0.380)	(0.692)	(0.717)	(0.447)
Midwest	0.204	0.211	0.216	0.007	0.012	-0.005
	(0.403)	(0.408)	(0.411)	(0.602)	(0.362)	(0.697)
South	0.390	0.385	0.365	-0.005	-0.025	0.020
	(0.488)	(0.487)	(0.482)	(0.743)	(0.105)	(0.196)
Parent	0.562	0.557	0.550	-0.005	-0.012	0.007
	(0.496)	(0.497)	(0.498)	(0.762)	(0.441)	(0.640)
p-value of joint F-test				0.426	0.684	0.425
Observations	1,987	1,995	2,018	3,982	4,005	4,013

Notes: Columns 1–3 show the means and standard deviations of respondent covariates in the different treatments of wave 2. Columns 4–6 show differences in means between the groups indicated in the column header together with p-values in parentheses. The p-values of the joint F-test are determined by regressing the treatment indicator on the vector of demographic controls. The F-test tests the joint hypothesis that none of the covariates predicts treatment assignment.

Covariates "Behavior belief" and "Norms belief" are the perceived social norm measures, ranging from 0 to 100. Economic preferences (altruism, patience, risk, pos. reciprocity, neg. reciprocity, trust) and moral universalism (rel. universalism) are standardized. "Female", "Employed", "Democrat", "Parent", and the three census region dummies are binary indicators.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Figure A.2: The distribution of individual willingness to fight global warming
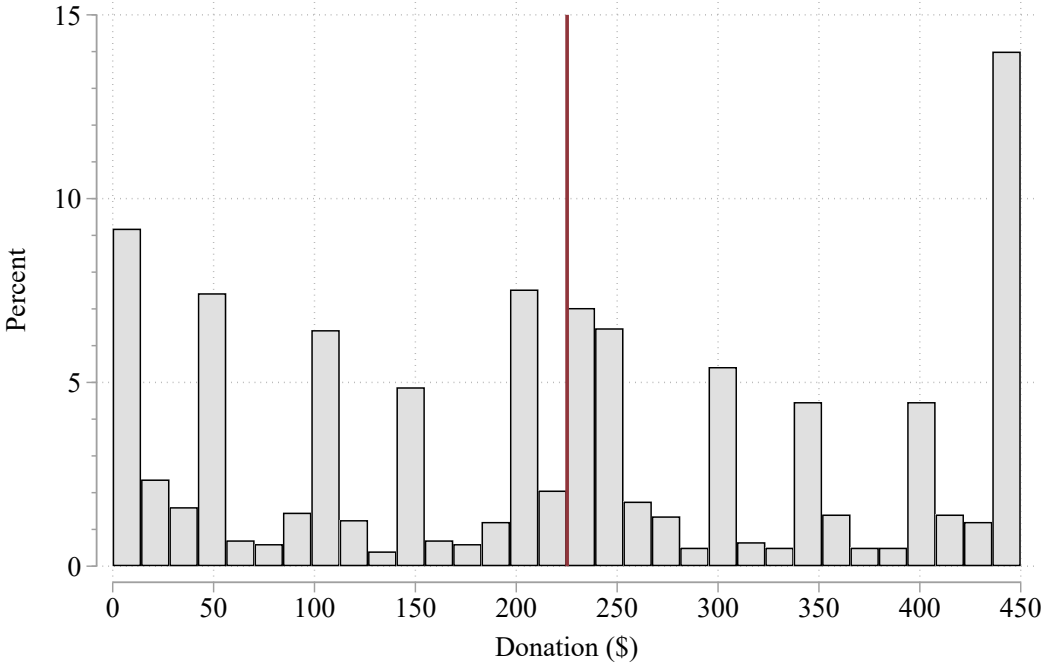
Notes: This figure shows the distribution of the monetary amounts donated to the climate charity in wave 1. The average donation is indicated by the vertical red line.

Figure A.3: Wedge in beliefs about social norms

Panel A: Behavior belief

Panel B: Norms belief
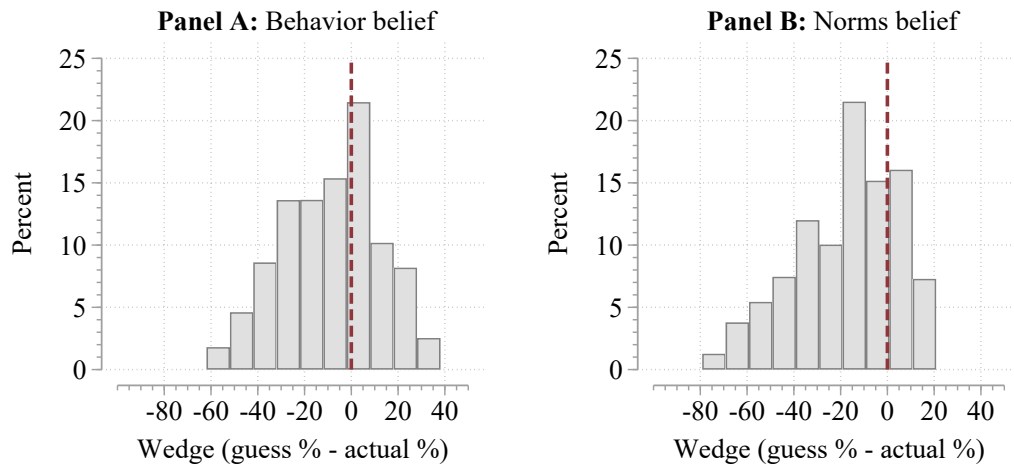
Notes: Using respondents from wave 2, this figure shows the distribution of the wedge between the respondent's perceived social norms and the actual shares in wave 1. Panel A shows people's belief about the share of Americans who say that they try to fight global warming. Panel B shows people's belief about the share of Americans who say that one should fight global warming. The red vertical line indicates the actual shares from wave 1.

Table A.4: Determinants of norm misperceptions

	Dependent variable: Absolute prediction error (in percentage points)			
	Behavior belief		Norms belief	
	(1) Full sample	(2) Underestimators only	(3) Full sample	(4) Underestimators only
Democrat	-1.869***	-1.997**	-3.130***	-3.343***
	(0.663)	(0.868)	(0.814)	(0.945)
Age	0.063***	0.077***	0.133***	0.138***
	(0.021)	(0.027)	(0.026)	(0.030)
Female	0.919	0.823	1.378*	1.277
	(0.665)	(0.866)	(0.805)	(0.930)
Log household income	-0.508	-0.556	-1.104**	-1.617***
	(0.423)	(0.531)	(0.540)	(0.624)
College degree or more	-0.956	-0.264	-2.299***	-2.947***
	(0.727)	(0.969)	(0.892)	(1.050)
Currently employed	1.024	0.781	0.601	1.014
	(0.727)	(0.947)	(0.903)	(1.054)
Parent	-0.046	-1.238	-0.828	-0.745
	(0.703)	(0.915)	(0.863)	(0.998)
Constant	23.107***	26.513***	30.344***	39.914***
	(4.581)	(5.684)	(5.786)	(6.683)
N	1,996	1,334	1,996	1,519
R^2	0.013	0.013	0.033	0.040

Notes: This table shows OLS regression estimates using respondents from wave 1. The dependent variable in each column is the absolute difference between the respondent's stated belief (behavior/norms) and the actual share. "Behavior belief" is the respondent's belief about the share of Americans who fight global warming. "Norms belief" is the respondent's belief about the share of Americans who think one should fight global warming. Columns 1 and 3 use the full sample, while columns 2 and 4 focus on the subset of respondents who underestimate the actual shares.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors in parentheses.

Figure A.4: Perceived prevalence of concrete climate-friendly behaviors
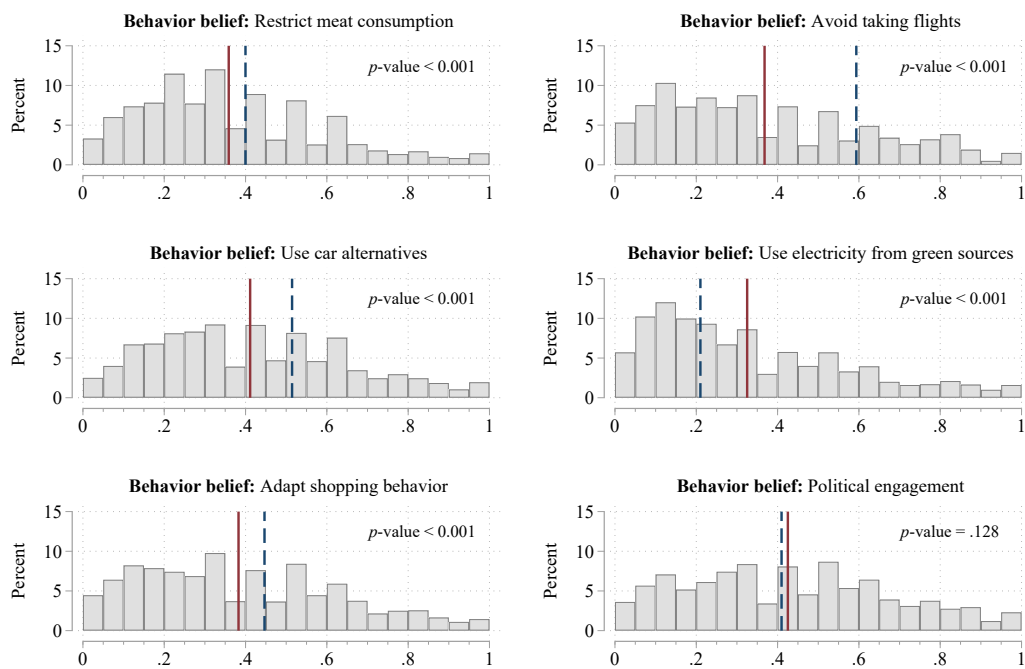
Notes: This figure shows the distribution of behavior beliefs in wave 1 for concrete climate-friendly behaviors. Each panel shows the distribution of people's beliefs about the share of Americans who say that they engage in the specific climate-friendly behavior indicated in the title of the panel. The solid red line indicates the average belief. The dashed blue line indicates the actual share of Americans engaging the behavior.

Figure A.5: Perceived prevalence of norms for concrete climate-friendly behavior
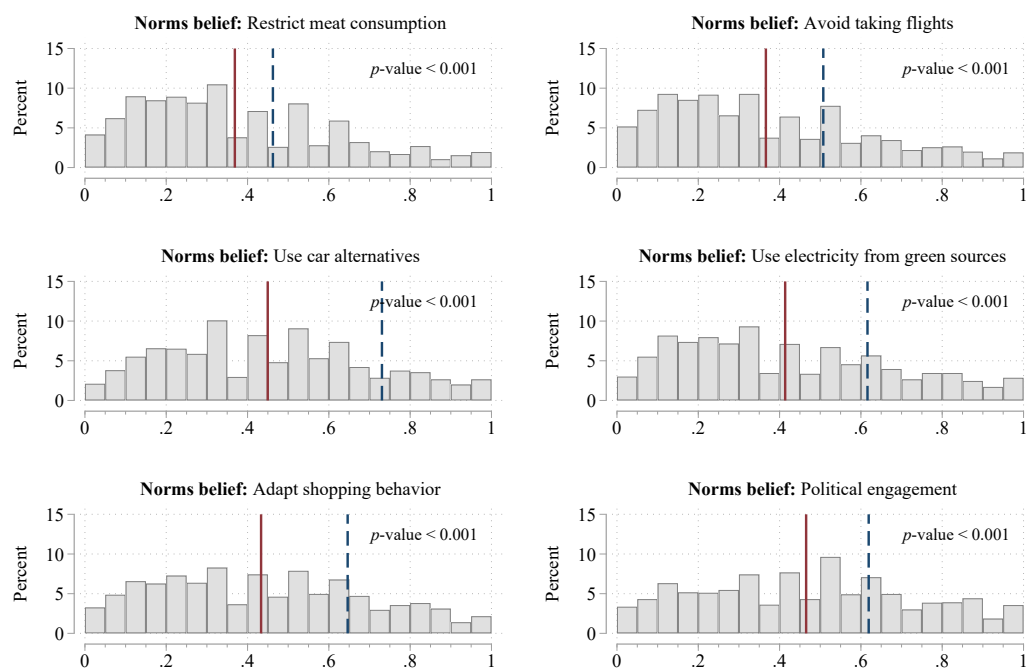
Notes: This figure shows the distribution of norms beliefs in wave 1 for concrete climate-friendly behaviors. Each panel shows the distribution of people's beliefs about the share of Americans who say that one *should* engage in the specific climate-friendly behavior. The solid red line indicates the average belief. The dashed blue line indicates the actual share of Americans saying that one should engage in the behavior indicated in the title of the panel.

Table A.5: Relationship of abstract and specific perceived norm measures

	(1) Restrict meat consumption	(2) Avoid taking flights	(3) Use car alternatives	(4) Use green electricity	(5) Adapt shopping behavior	(6) Political engagement
Panel A: Behavior						
Behavior belief	0.477***	0.362***	0.471***	0.421***	0.480***	0.468***
	(0.021)	(0.022)	(0.021)	(0.021)	(0.020)	(0.020)
N	1,994	1,993	1,993	1,994	1,992	1,993
R^2	0.228	0.131	0.222	0.178	0.231	0.219
Panel B: Norms						
Norms belief	0.410***	0.340***	0.454***	0.416***	0.471***	0.448***
	(0.021)	(0.021)	(0.021)	(0.020)	(0.020)	(0.020)
N	1,994	1,993	1,993	1,994	1,992	1,993
R^2	0.168	0.116	0.206	0.174	0.222	0.201

Notes: This table shows OLS regression estimates using respondents from wave 1. All coefficients can be interpreted as Pearson correlation coefficients. The dependent variables in Panel A are beliefs about the share of Americans who engage in the concrete climate-friendly behavior indicated in the column header. The dependent variables in Panel B are beliefs about the share of Americans who say that one should engage in the concrete climate-friendly behaviors. "Behavior belief" is the respondent's belief about the share of Americans who fight global warming. "Norms belief" is the respondent's belief about the share of Americans who think one should fight global warming. All beliefs are standardized to have a mean of zero and a standard deviation of one.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors in parentheses.

Table A.6: Relationship between donations and self-reported concrete climate behaviors

	Dependent variable: Donation ($)					
	(1)	(2)	(3)	(4)	(5)	(6)
Restrict meat consumption	63.603***					
	(6.465)					
Avoid taking flights		74.641***				
		(6.520)				
Use environmentally-friendly alternatives to car			66.675***			
			(6.440)			
Receive electricity from green sources				13.785*		
				(7.329)		
Adapt shopping behavior					78.708***	
					(6.334)	
Politically support fight against GW						76.922***
						(6.343)
Constant	199.819***	181.223***	191.127***	222.518***	190.184***	193.612***
	(4.296)	(5.060)	(4.861)	(3.821)	(4.428)	(4.349)
N	1,991	1,989	1,991	1,991	1,990	1,989

Notes: This table shows OLS regression estimates using respondents from wave 1 where the dependent variable is the donation decision (in $). Each column regresses donations on a binary indicator taking value one for respondents who said that they engage in the concrete climate-friendly behavior, and zero otherwise.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors in parentheses.

Table A.7: Validation of self-reported willingness to pay

	Dependent variable:						
	(1) Donation (in \$)	(2) Restrict meat consumption	(3) Avoid taking flights	(4) Use car alternatives	(5) Renewable energy use	(6) Adapt shopping behavior	(7) Politically support fight against GW
WTP 1%	81.340***	0.333***	0.207***	0.387***	0.283***	0.365***	0.442***
	(6.265)	(0.021)	(0.021)	(0.021)	(0.018)	(0.021)	(0.020)
Constant	188.849***	0.252***	0.501***	0.342***	0.084***	0.284***	0.213***
	(4.543)	(0.013)	(0.015)	(0.014)	(0.008)	(0.014)	(0.012)
N	1,993	1,998	1,996	1,998	1,998	1,997	1,996
R^2	0.076	0.114	0.044	0.148	0.120	0.133	0.200

Notes: This table shows OLS regression estimates using respondents from wave 1. "WTP 1%" is a binary indicator taking value one for respondents who are willing to give up 1% of their income for the fight against climate change. "Donation" is the amount donated that a respondent chose to donate to a pro-climate charity (incentivized). The dependent variables in columns 2–7 are binary indicators taking value one for respondents who reported to engage in the behavior indicated in the column header.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors in parentheses.

Table A.8: Treatment effects on climate donations and posterior beliefs: No controls

	(1) Donation ($)	(2) Behavior belief (post.)	(3) Norms belief (post.)
Behavior treatment	12.852***	0.285***	0.244***
	(4.824)	(0.031)	(0.031)
Norms treatment	17.485***	0.374***	0.355***
	(4.857)	(0.031)	(0.031)
N	5,991	5,988	5,976
Control group mean	249.31	0	0
z-scored	No	Yes	Yes

Notes: This table shows OLS regression estimates using respondents from wave 2. "Behavior treatment" is a binary indicator taking value one for respondents who received information about the share of Americans who try to fight global warming. "Norms treatment" is a binary indicator taking value one for respondents who received information about the share of Americans who say that one should try to fight global warming. "Behavior belief" is an index of six post-treatment beliefs about the share of Americans engaging in concrete climate-friendly behaviors to fight global warming. "Norms belief" is an index of six post-treatment beliefs about the share of Americans who say that one should engage in concrete climate-friendly behaviors to fight global warming. Both indices are standardized to have a mean of zero and a standard deviation of one in the control group.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors in parentheses.

Table A.9: Treatment effect heterogeneity: Climate change "deniers"

	Dependent variable: Donation ($)				
	Interactant:				
	(1) No trust in science	(2) No scientific consensus	(3) Not concerned	(4) Not a threat	(5) Caused by nature
Panel A: Behavior treatment					
Treatment (a)	2.733	1.335	1.004	1.895	0.122
	(5.661)	(5.392)	(5.007)	(5.085)	(5.082)
Treatment x Interactant (b)	18.268*	22.561**	33.200***	29.943***	38.333***
	(9.357)	(10.126)	(10.410)	(10.330)	(10.466)
Interactant	-91.364***	-82.718***	-140.489***	-128.326***	-127.592***
	(7.145)	(7.472)	(7.751)	(7.710)	(7.865)
Linear combination (a + b)	21.001***	23.896***	34.204***	31.837***	38.455***
	(7.444)	(8.568)	(9.121)	(8.981)	(9.144)
N	3,978	3,978	3,978	3,978	3,978
Controls	Yes	Yes	Yes	Yes	Yes
Panel B: Norms treatment					
Treatment (a)	13.000**	8.245	10.241**	9.397*	11.639**
	(5.667)	(5.460)	(4.987)	(5.069)	(5.053)
Treatment x Interactant (b)	7.751	21.274**	14.928	14.560	14.569
	(9.353)	(10.044)	(10.406)	(10.398)	(10.386)
Interactant	-89.976***	-80.385***	-139.925***	-127.516***	-128.427***
	(7.140)	(7.465)	(7.742)	(7.726)	(7.852)
Linear combination (a + b)	20.751***	29.519***	25.169***	23.957***	26.208***
	(7.442)	(8.431)	(9.136)	(9.084)	(9.082)
N	4,000	4,000	4,000	4,000	4,000
Controls	Yes	Yes	Yes	Yes	Yes

Notes: This table shows OLS regression from wave 2. The dependent variable is the donation to the climate charity ($). It is regressed on a treatment dummy for the behavior treatment (Panel A) and the norm treatment (Panel B), respectively, an interactant that varies across columns, and its interaction with the treatment dummy. Interactants are indicated by the column header. Each interactant is a binary variable taking value one. "No trust in science" means that the respondent trusts climate scientists "a moderate amount", "a little" or not at all (on a five-point Likert scale). "No scientific consensus" means that the respondent thinks that most scientists think that global warming is not happening or that there is no consensus among scientists. "Not concerned" means that the respondent is "not very worried' or "not at all worried" about global warming (on a four-point Likert scale). "Not a threat" means that the respondent thinks that global warming will do "only a little" or no harm at all (on a four-point Likert scale). "Caused by nature" means that the respondent thinks that global warming is caused by natural activities.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors in parentheses.

Table A.10: Treatment effect heterogeneity: Climate change "deniers" – Robustness to controlling for the interaction between treatment and prior beliefs

	Dependent variable: Donation ($)				
	Interactant:				
	(1) No trust in science	(2) No scientific consensus	(3) Not concerned	(4) Not a threat	(5) Caused by nature
Panel A: Behavior treatment					
Treatment (a)	9.683 (13.391)	9.228 (13.147)	12.670 (12.671)	13.362 (12.741)	13.353 (12.617)
Treatment x Interactant (b)	17.090* (9.420)	21.511** (10.142)	32.559*** (10.464)	29.391*** (10.379)	38.440*** (10.424)
Interactant	-89.111*** (7.202)	-80.718*** (7.502)	-138.804*** (7.782)	-126.678*** (7.742)	-127.584*** (7.823)
Linear combination (a + b)	26.772** (13.242)	30.739** (13.961)	45.229*** (13.740)	42.753*** (13.726)	51.793*** (13.967)
N	3,978	3,978	3,978	3,978	3,978
Controls	Yes	Yes	Yes	Yes	Yes
Treatment x Prior	Yes	Yes	Yes	Yes	Yes
Panel B: Norms treatment					
Treatment (a)	27.580* (15.650)	18.851 (15.657)	22.250 (15.042)	25.774* (15.231)	26.725* (14.881)
Treatment x Interactant (b)	5.596 (9.481)	18.748* (10.173)	13.119 (10.688)	13.138 (10.649)	13.001 (10.508)
Interactant	-84.081*** (7.214)	-74.126*** (7.569)	-134.167*** (7.935)	-121.945*** (7.871)	-123.874*** (7.927)
Linear combination (a + b)	33.176** (14.660)	37.599** (15.099)	35.370** (14.536)	38.912*** (14.745)	39.726*** (14.640)
N	4,000	4,000	4,000	4,000	4,000
Controls	Yes	Yes	Yes	Yes	Yes
Treatment x Prior	Yes	Yes	Yes	Yes	Yes

Notes: This table shows OLS regression from wave 2. The dependent variable is the donation to the climate charity ($). It is regressed on a treatment dummy for the behavior treatment (Panel A) and the norm treatment (Panel B), respectively, an interactant that varies across columns, and its interaction with the treatment dummy. Interactants are indicated by the column header. Each interactant is a binary variable taking value one. "No trust in science" means that the respondent trusts climate scientists "a moderate amount", "a little" or not at all (on a five-point Likert scale). "No scientific consensus" means that the respondent thinks that most scientists think that global warming is not happening or that there is no consensus among scientists. "Not concerned" means that the respondent is "not very worried' or "not at all worried" about global warming (on a four-point Likert scale). "Not a threat" means that the respondent thinks that global warming will do "only a little" or no harm at all (on a four-point Likert scale). "Caused by nature" means that the respondent thinks that global warming is caused by natural activities. All regressions include the corresponding prior belief and the interaction between the treatment indicator and the prior belief.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors in parentheses.

Table A.11: Preferences and universal values explain the partisan gap

	Donation ($)		Policy support	
	(1)	(2)	(3)	(4)
Democrat	74.323***	46.084***	0.923***	0.709***
	(6.523)	(6.279)	(0.041)	(0.040)
N	1,993	1,976	1,993	1,979
R^2	0.086	0.275	0.221	0.337
Demographic controls	Yes	Yes	Yes	Yes
Preferences and moral universalism		Yes		Yes

Notes: This table shows OLS regression estimates using respondents from wave 1. "Democrat" is a binary indicator taking value one if respondents identify with the Democrat party. We include our standard set of demographic controls: gender (indicator), age (continuous), log income, college degree (indicator), employment (indicator), and census region (three indicators). The dependent variable in columns 1–2 are donations, whereas the dependent variable in columns 3–4 is our standardized index of support for policies to fight global warming.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors in parentheses.

Figure A.6: Treatment effect heterogeneity by perceived social norms: Non-parametric estimates
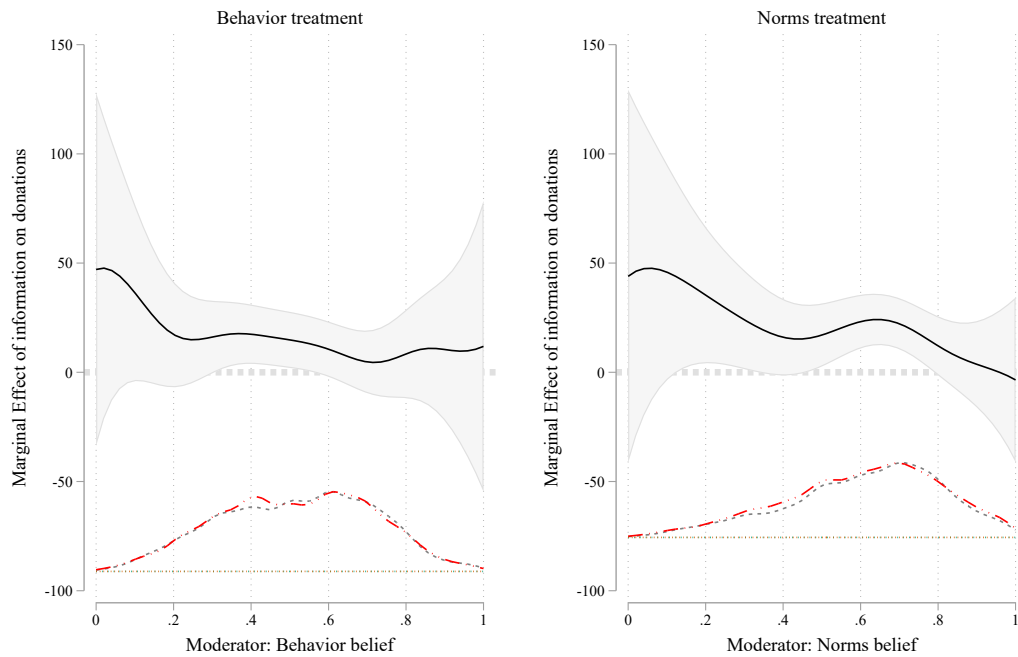
Notes: This figure shows the results from a non-linear interaction analysis using the *interflex* package (Xu et al., 2017; Hainmueller et al., 2019) and restricting the sample to respondents from wave 2. The left panel excludes respondents in the norms treatment, while the right panel excludes respondents in the behavior treatment. The dashed lines at the bottom of each panel plot the distribution of the pre-treatment belief. 95% confidence intervals using robust standard errors are shown. Both panels show results without including additional controls.

Figure A.7: Heterogeneity by "climate change deniers": Political outcomes
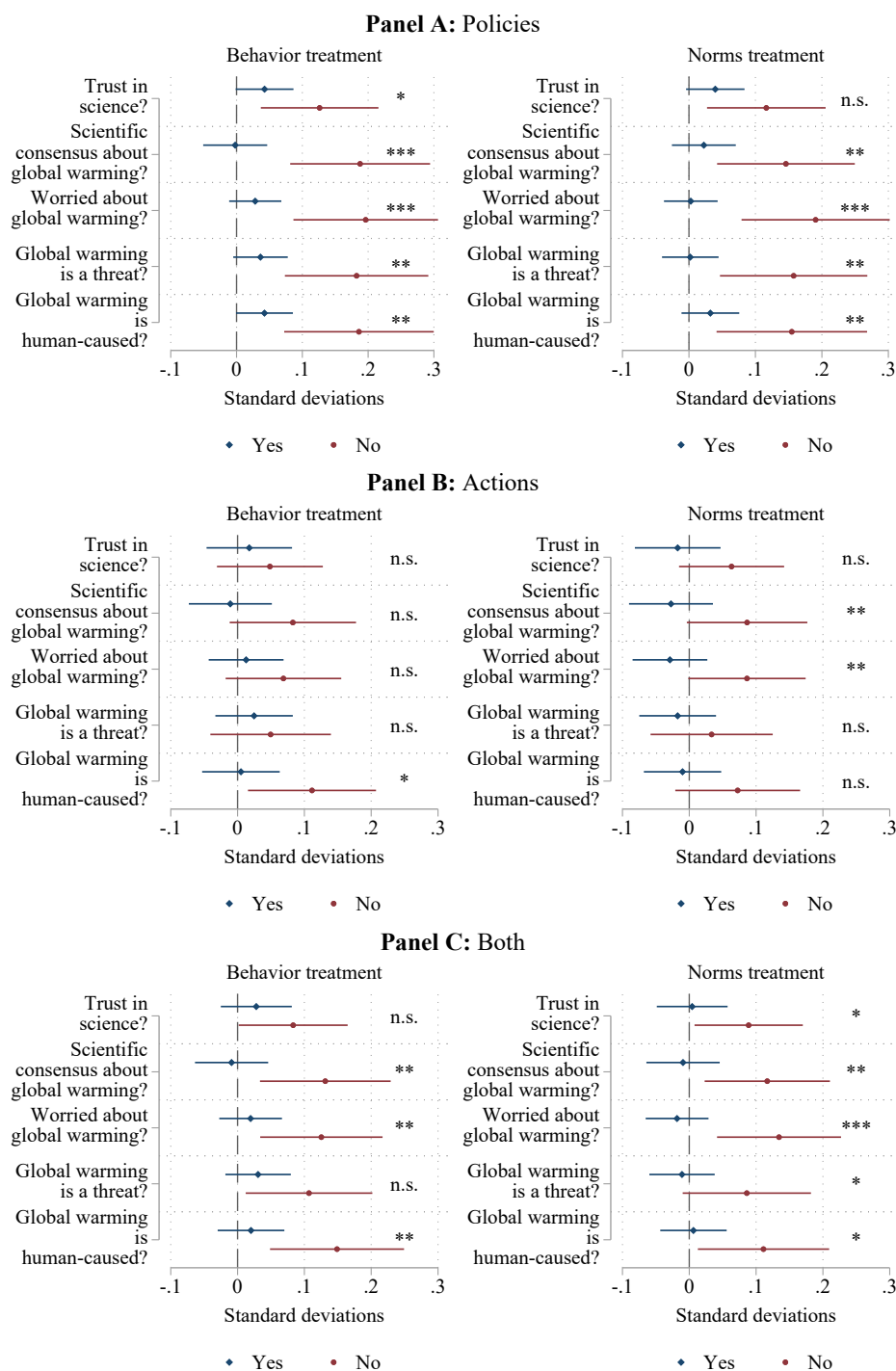
Notes: This figure shows treatment effects in different subsamples using respondents from wave 2. Panel A shows treatment effects on the policy support index, Panel B shows treatment effects of the action index, and Panel C shows treatment effects on the joint index. 95% confidence intervals are shown. Each panel shows estimates for the subsample of climate change deniers – e.g., those who have no trust in science or do not believe in human-caused global warming – and the subsample of respondents who are not skeptical of climate change. "Trust in science" means that the respondent trust climate scientists "a lot" or "a great deal" (on a five-point Likert scale). "Scientific consensus about global warming" means that the respondent thinks that most scientists think that global warming is happening. "Worried about global warming" means that the respondent is "somewhat worried' or "very worried" about global warming (on a four-point Likert scale). "Global warming is a threat" means that the respondent thinks that global warming will do "a moderate amount" or "a great deal" of harm (on a four-point Likert scale). "Global warming is human-caused" means that the respondent thinks that global warming is caused by human activities. 51

Table A.12: Treatment effect heterogeneity by political affiliation

	Dependent variable:		
	(1) Donation (\$)	(2) Policy support	(3) Support actions
Panel A: Behavior treatment			
Treatment	18.114**	0.155***	0.072
	(7.363)	(0.048)	(0.045)
Treatment x Democrat	-10.940	-0.119**	-0.051
	(9.495)	(0.054)	(0.056)
Democrat	75.232***	1.029***	0.911***
	(6.839)	(0.040)	(0.041)
N	3,978	3,981	3,977
Controls	No	No	No
Panel B: Norms treatment			
Treatment	16.904**	0.114**	0.045
	(7.507)	(0.049)	(0.044)
Treatment x Democrat	-0.604	-0.081	-0.058
	(9.557)	(0.055)	(0.057)
Democrat	75.232***	1.029***	0.911***
	(6.839)	(0.040)	(0.041)
N	4,000	4,005	4,002
Controls	No	No	No

Notes: This table shows OLS regression from wave 2. The dependent variables are indicated by the column header. It is regressed on a treatment dummy for the behavior treatment (Panel A) and the norm treatment (Panel B), respectively, a binary indicator for whether respondents identify as Democrats, and the interaction of this indicator with the respective treatment indicator.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors in parentheses.

Table A.13: Treatment effect heterogeneity by political affiliation: Robustness to prior x treatment interaction

	Dependent variable:		
	(1) Donation (\$)	(2) Policy support	(3) Support actions
Panel A: Behavior treatment			
Treatment	28.457**	0.159*	-0.056
	(13.787)	(0.082)	(0.076)
Treatment x Democrat	-9.206	-0.103*	-0.043
	(9.456)	(0.054)	(0.055)
Democrat	73.085***	0.996***	0.859***
	(6.845)	(0.040)	(0.040)
N	3,978	3,981	3,977
Controls	Yes	Yes	Yes
Treatment x Prior	Yes	Yes	Yes
Panel B: Norms treatment			
Treatment	34.966**	0.200**	0.075
	(15.344)	(0.094)	(0.084)
Treatment x Democrat	1.153	-0.074	-0.059
	(9.520)	(0.054)	(0.055)
Democrat	70.477***	0.985***	0.843***
	(6.820)	(0.039)	(0.040)
N	4,000	4,005	4,002
Controls	Yes	Yes	Yes
Treatment x Prior	Yes	Yes	Yes

Notes: This table shows OLS regression from wave 2. The dependent variables are indicated by the column header. It is regressed on a treatment dummy for the behavior treatment (Panel A) and the norm treatment (Panel B), respectively, a binary indicator for whether respondents identify as Democrats, and the interaction of this indicator with the respective treatment indicator. All regressions include sociodemographic controls and the interaction between the prior belief and the respective treatment.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors in parentheses.

Table A.14: Baseline differences in donations: "Climate change deniers"

	Dependent variable: Donation ($)				
	(1)	(2)	(3)	(4)	(5)
Panel A: No controls					
No trust in science	-107.464***				
	(6.736)				
No scientific consensus		-102.040***			
		(7.209)			
Not concerned			-150.412***		
			(7.239)		
Not a threat				-140.521***	
				(7.223)	
Caused by nature					-142.019***
					(7.365)
Constant	296.258***	284.234***	292.462***	290.968***	289.982***
	(4.064)	(3.944)	(3.603)	(3.681)	(3.637)
N	1,987	1,987	1,987	1,987	1,987
Panel B: Controls					
No trust in science	-56.692***				
	(7.491)				
No scientific consensus		-64.028***			
		(7.422)			
Not concerned			-105.933***		
			(8.319)		
Not a threat				-96.897***	
				(8.027)	
Caused by nature					-101.338***
					(8.174)
Constant	243.600***	236.416***	256.064***	219.876***	260.010***
	(47.752)	(47.364)	(46.300)	(46.711)	(46.361)
N	1,977	1,977	1,977	1,977	1,977

Notes: This table shows OLS regression estimates where the dependent variable is the donation decision (in $) using control group respondents from wave 2. Panel A presents estimates without the inclusion of controls for economic preferences, moral values, perceived social norms, and sociodemographic controls. Panel B includes these controls. "No trust in science" means that the respondent trusts climate scientists "a moderate amount", "a little" or not at all (on a five-point Likert scale). "No scientific consensus" means that the respondent thinks that most scientists think that global warming is not happening or that there is no consensus among scientists. "Not concerned" means that the respondent is "not very worried' or "not at all worried" about global warming (on a four-point Likert scale). "Not a threat" means that the respondent thinks that global warming will do "only a little" or no harm at all (on a four-point Likert scale). "Caused by nature" means that the respondent thinks that global warming is caused by natural activities.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors in parentheses.

Table A.15: Treatment effect heterogeneity for political outcomes: Prior above/below actual share

	Prior below actual share			Prior above actual share		
	(1) Policies	(2) Actions	(3) Both	(4) Policies	(5) Actions	(6) Both
Panel A: Behavior treatment						
Behavior treatment	0.097***	0.001	0.039	0.063	0.106**	0.096**
	(0.033)	(0.033)	(0.032)	(0.043)	(0.047)	(0.045)
N	2,582	2,577	2,577	1,399	1,400	1,399
Control group mean	-0.03	-0.06	-0.05	0.06	0.10	0.09
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Panel B: Norms treatment						
Norms treatment	0.078**	0.005	0.035	0.036	0.033	0.036
	(0.030)	(0.030)	(0.029)	(0.052)	(0.059)	(0.055)
N	3,058	3,056	3,056	947	946	946
Control group mean	-0.06	-0.05	-0.06	0.18	0.17	0.19
Controls	Yes	Yes	Yes	Yes	Yes	Yes

Notes: This table shows OLS regression estimates using respondents from wave 2. The dependent variables are support for climate policies (columns 1, 4), willingness to engage in political actions (column 2, 5), and the index using both measures (columns 3, 6). It is regressed on binary indicators that take the value of 1 for respondents in the behavior treatment and norms treatment, respectively. We run separate analyses for respondents with prior norm perceptions strictly below the actual share (columns 1-3) and equal to or above the actual share (columns 4-6). All regressions include the set of controls described in Table 2.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors in parentheses.

Table A.16: Treatment effect heterogeneity for post-treatment beliefs: Prior above/below actual share

	Prior below actual share		Prior above actual share	
	(1) Behavior belief (post.)	(2) Norms belief (post.)	(3) Behavior belief (post.)	(4) Norms belief (post.)
Panel A: Behavior treatment				
Behavior treatment	0.401***	0.366***	0.062	0.003
	(0.033)	(0.033)	(0.056)	(0.054)
N	2,577	2,573	1,397	1,398
Control group mean	-0.23	-0.22	0.42	0.41
Controls	Yes	Yes	Yes	Yes
Panel B: Norms treatment				
Norms treatment	0.422***	0.433***	0.195***	0.078
	(0.032)	(0.032)	(0.072)	(0.068)
N	3,054	3,043	945	946
Control group mean	-0.13	-0.15	0.42	0.49
Controls	Yes	Yes	Yes	Yes

Notes: This table shows OLS regression estimates using respondents from wave 2. The dependent variables are post-treatment beliefs. It is regressed on binary indicators that take the value of 1 for respondents in the behavior treatment and norms treatment, respectively. We run separate analyses for respondents with prior norm perceptions strictly below the actual share (columns 1-2) and equal to or above the actual share (columns 3-4). All regressions include the set of controls described in Table 2.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors in parentheses.

Table A.17: Moral universalism and climate change denial

	Dependent variable: Relative moral universalism (z-scored)				
	(1)	(2)	(3)	(4)	(5)
Low trust in science	-0.718*** (0.040)				
No scientific consensus		-0.710*** (0.040)			
Not concerned			-0.747*** (0.042)		
No harm				-0.790*** (0.040)	
Nature-caused					-0.775*** (0.041)
N	1,980	1,980	1,980	1,980	1,980

Notes: This table shows OLS regression estimates using control group respondents from wave 2. It regresses the standardized moral universalism index on various binary indicators of climate change denial. "Low trust in science" means that the respondent trusts climate scientists "a moderate amount", "a little" or not at all (on a five-point Likert scale). "No scientific consensus" means that the respondent thinks that most scientists think that global warming is not happening or that there is no consensus among scientists. "Not concerned" means that the respondent is "not very worried' or "not at all worried" about global warming (on a four-point Likert scale). "Not a threat" means that the respondent thinks that global warming will do "only a little" or no harm at all (on a four-point Likert scale). "Caused by nature" means that the respondent thinks that global warming is caused by natural activities.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors in parentheses.

Table A.18: Treatment effect heterogeneity for moral universalism

	Dependent variable: Donations ($)		
	(1)	(2)	(3)
Behavior treatment	10.622**	20.974*	11.185
	(4.620)	(12.679)	(12.633)
Behavior treatment x Moral universalism	-9.181**	-8.964**	-1.739
	(4.576)	(4.562)	(4.726)
Behavior treatment x Behavior belief		-19.474	-21.660
		(22.439)	(21.556)
Behavior treatment x Denier			37.601***
			(11.151)
Moral universalism	33.497***	33.575***	21.540***
	(3.510)	(3.497)	(3.529)
Behavior belief		61.542***	61.788***
		(16.336)	(15.609)
Nature-caused			-118.835***
			(8.169)
N	3,963	3,963	3,963
Controls	Yes	Yes	Yes

Notes: This table shows OLS regression estimates using respondents from wave 2 assigned to the control group or the behavior treatment. The dependent variables are donations (in $). It is regressed on binary indicators that take the value of 1 for respondents in the behavior treatment. "Denier" is a binary indicator taking value 1 for respondents who do not believe in human-caused climate change. All regressions include the set of controls described in Table 2.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors in parentheses.

Appendix B   Questionnaire

This appendix presents the main survey blocks, following the order of exposition in the paper. The full questionnaire containing all questions administered as part of this study can be downloaded from https://osf.io/chvy6/.

B.1   Attention screener

The next question is about the following problem. In questionnaires like ours, sometimes there are participants who do not carefully read the questions and just quickly click through the survey. This compromises the results of research studies. **To show that you are reading the survey carefully, please choose both "Very strongly interested" and "Not at all interested" as your answer to the next question.**
Given the above, how interested are you in politics?

- a) Very strongly interested

- b) Very interested

- c) A little bit interested

- d) Not very interested

- e) Not at all interested

Only participants who select both (a) and (e) pass this attention screener.

B.2   Measuring individual willingness to fight climate change

A decision about money

Please pay special attention to the next question in which you will make a decision about money. We will randomly select 25 respondents. If you are among them, your decision will be a real decision. The decision will be implemented and you can receive up to $450.

Your decision

Here is the decision: You can divide $450 between yourself and a charitable organization that fights global warming. The amount that you keep for yourself will be added to your account. The amount that you donate will go to the award-winning charity *atmosfair*. *atmosfair* actively contributes to CO_2 mitigation by promoting, developing and financing renewable energies worldwide. In this way, a donation saves CO_2 that would otherwise

be created by fossil fuels. *atmosfair* spends around $12 million per year to fight global warming and uses less than 5% of donated funds to cover administrative costs. You can find more information on *atmosfair* <u>here</u>.

It costs about $450 to offset the yearly CO_2 emissions of a typical US citizen. This number is calculated as follows: It costs about $28 to prevent 1 ton of CO_2 emissions. The World Bank estimates that a typical US citizen causes about 16 tons of CO_2 emissions per year.

How much of the $450 would you like to donate to *atmosfair*?

B.3   Introducing bonus scheme

Bonus payment possible

There are several questions in this survey, in which we will ask you to guess how other respondents answered a question. These questions are flagged with the sign:

You can earn a bonus of $1. This works as follows: We will randomly select one of the flagged questions. Your response to this question is considered as correct if it differs at most by three from the correct number you are asked to guess. If your response to this question is correct, $1 will be added to your account.

B.4   Measuring perceived social norms

Do you try to fight global warming?
[Yes/No]
Do you think that people in the United States should try to fight global warming?
[Yes/No]

[PAGE BREAK]

The questions on this page are bonus questions. This means that you can earn additional money if you answer them correctly.
As part of this research project, we recently surveyed many people in the United States and asked them the same questions. Respondents come from all parts of the population and their responses represent the views and attitudes of people in the United States.
What do you think? Out of 100 people we asked, how many stated that...

a) ... they try to fight global warming?

b) ... they think that people in the United States should try to fight global warming?

B.5   Treatments: Shifting perceived social norms
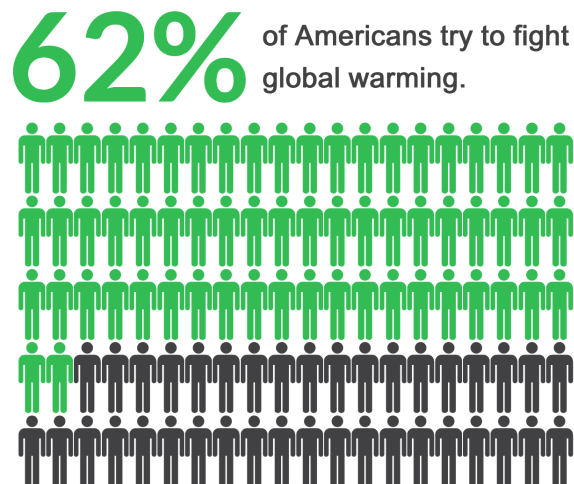
B.5.1   Behavior treatment

What do other people in the United States do?

We recently surveyed 2,000 people in the United States and asked them whether they try to fight global warming. Respondents come from all parts of the population and their responses represent the views and attitudes of people in the United States. On the next page, you will learn how they responded. Please read the information carefully.

[PAGE BREAK]

We asked 2,000 Americans: Do you try to fight global warming? Yes or no?
Here are the results:
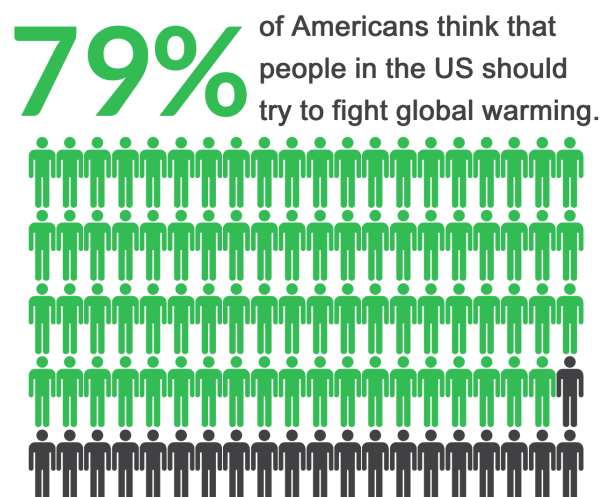

62% of Americans try to fight global warming.

What do other people in the United States think?

We recently surveyed 2,000 people in the United States and asked them whether they think people in the US should try to fight global warming. Respondents come from all parts of the population and their responses represent the views and attitudes of people in the United States. On the next page, you will learn how they responded. Please read the information carefully.

[PAGE BREAK]

We asked 2,000 Americans: Do you think that people in the United States should try to fight global warming? Yes or no?

Here are the results:

79% of Americans think that people in the US should try to fight global warming.

B.6 Measuring posterior beliefs

The questions on this page are bonus questions. This means that you can earn additional money if you answer them correctly.

BONUS

As part of this research project, we recently surveyed many people in the United States and asked them the same questions. Respondents come from all parts of the population and their responses represent the views and attitudes of people in the United States. **We asked respondents to state whether they have taken different actions to fight global warming over the last year.**
What do you think? Out of 100 people we asked, how many stated that...

  a) ... restrict their meat consumption?

  b) ... avoid taking flights?

  c) ... regularly use environmentally-friendly alternatives to their private car such as walking, cycling, taking public transport or car-sharing?

  d) ... receive electricity only from green/renewable sources (e.g., solar energy or wind power)?

  e) ... adapt their shopping behavior to the carbon footprint of products?

  f) ... politically support the fight against global warming, e.g. participate in a demonstration, sign a letter, or support a political organization?

[PAGE BREAK]

Do you think that people in the United states **should**...

  a) ... restrict their meat consumption?

  b) ... avoid taking flights?

  c) ... regularly use environmentally-friendly alternatives to their private car such as walking, cycling, taking public transport or car-sharing?

d) ... receive electricity only from green/renewable sources (e.g., solar energy or wind power)?

e) ... adapt their shopping behavior to the carbon footprint of products?

f) ... politically support the fight against global warming, e.g. participate in a demonstration, sign a letter, or support a political organization?

[PAGE BREAK]

The questions on this page are bonus questions. This means that you can earn additional money if you answer them correctly.

BONUS

What do you think? Out of 100 people we asked the same questions, how many stated that they think that people in the United States should...

a) ... restrict their meat consumption?

b) ... avoid taking flights?

c) ... regularly use environmentally-friendly alternatives to their private car such as walking, cycling, taking public transport or car-sharing?

d) ... receive electricity only from green/renewable sources (e.g., solar energy or wind power)?

e) ... adapt their shopping behavior to the carbon footprint of products?

f) ... politically support the fight against global warming, e.g. participate in a demonstration, sign a letter, or support a political organization?

B.7 Measuring climate change skepticism

In general, how much do you trust scientists who do research on global warming?

    a) A great deal

    b) A lot

    c) A moderate amount

    d) A little

    e) Not at all

Which comes closest to your own view?

    a) Most scientists think global warming is happening.

    b) There is a lot of disagreement among scientists about whether or not global warming is happening.

    c) Most scientists think global warming is not happening.

How worried are you about global warming?

    a) Very worried

    b) Somewhat worried

    c) Not very worried

    d) Not at all worried

How much do you think global warming will harm people in the United States?

    a) Not at all

    b) Only a little

    c) A moderate amount

    d) A great deal

Do you think that global warming is mainly...?

    a) a result of human activities

    b) a result of natural causes

B.8   Measuring policy support and political engagement

Taken from the detailed politics module developed as part of the Climate Change in the American Mind Project (Howe et al., 2015).

Policy support

How much do you support or oppose the following policies?
Strongly support / Somewhat support / Somewhat oppose / Strongly oppose

a) Fund more research into renewable energy sources, such as solar and wind power.

b) Regulate carbon dioxide (the primary greenhouse gas) as a pollutant.

c) Set strict carbon dioxide emission limits on existing coal-fired power plants to reduce global warming and improve public health. Power plants would have to reduce their emissions and/or invest in renewable energy and energy efficiency. The cost of electricity to consumers and companies would likely increase.

d) Require fossil fuel companies to pay a carbon tax and use the money to reduce other taxes (such as income tax) by an equal amount.

e) Require electric utilities to produce at least 20% of their electricity from wind, solar, or other renewable energy sources, even if it costs the average household an extra $100 a year.

f) Provide tax rebates for people who purchase energy-efficient vehicles or solar panels.

How much do you agree or disagree with the following statements?
Strongly agree / Somewhat agree / Somewhat disagree / Strongly disagree

a) Schools should teach our children about the causes, consequences, and potential solutions to global warming.

Political engagement

How likely would you be to do each of the following things?
Definitely would / Probably would / Probably would not / Definitely would not

a) Vote for a candidate for public office because of their position on global warming.

b) Publicly display t-shirt, bumper sticker, button, wrist band, or sign about global warming.

c) Donate money to an organization working on global warming.

d) Volunteer your time to an organization working on global warming.

e) Write letters, email, or phone government officials about global warming.

f) Meet with an elected official or their staff about global warming.

g) Support an organization engaging in non-violent civil disobedience against corporate or government activities that make global warming worse.

h) Personally engage in non-violent civil disobedience (e.g., sit-ins, blockades, or trespassing) against corporate or government activities that make global warming worse.

i) Attend a political rally, speech, or organized protest about global warming.

j) Write a letter to the editor of a newspaper or magazine or call a live radio or TV show to express an opinion about global warming.

k) Share information about global warming on social media.

Appendix C Construction of Variables

C.1 Measuring economic preferences

We administer the Global Preferences Survey (GPS) and follow the methodology described in Falk et al. (2018a) to obtain detailed individual-level measures of economic preferences. More information on the construction of the variables can be found below.

1. *Patience.* The measure of patience (or time preference) is derived from the combination of responses to two survey measures, one with a quantitative and one with a qualitative format. The quantitative survey measure consists of a series of five interdependent hypothetical binary choices between immediate and delayed financial rewards. In each of the five questions, participants have to decide between receiving a payment today or a larger payment in 12 months. The qualitative measure of patience is given by the respondents' self-assessment regarding their willingness to wait on an eleven-point Likert scale, asking "how willing are you to give up something that is beneficial for you today in order to benefit more from that in the future?".

2. *Risk Taking.* Risk preferences are also elicited through a series of related quantitative questions as well as one qualitative question. Just as with patience, the quantitative measure consists of a series of five binary choices. Choices are between a fixed lottery, in which the individual could win x or zero, and varying sure payments, y. The qualitative item asks for the respondents' self-assessment of their willingness to take risks on an eleven-point scale ("In general, how willing are you to take risks?").

3. *Positive Reciprocity.* Positive reciprocity is measured using one quantitative item and one qualitative question. First, respondents are presented a choice scenario in which they are asked to imagine that they got lost in an unfamiliar area and that a stranger – when asked for directions – offered to take them to their destination. Respondents are then asked which out of six presents (worth between 10 and 60 dollars) they would give to the stranger as a "thank you". Second, respondents are asked to provide a self-assessment about how willing they are to return a favor on an eleven-point Likert scale.

4. *Negative Reciprocity.* Negative reciprocity is elicited through three self-assessments. First, respondents are asked how willing they are to take revenge if they are treated very unjustly, even if doing so comes at a cost (Likert scale, 0-10). The second and third items probe respondents about their willingness to punish someone for unfair behavior, either towards themselves or a third person.

5. *Altruism.* Altruism is measured through a combination of one qualitative and one quantitative item, both of which are related to donations. The qualitative question asks respondents how willing they would be to give to good causes without expecting anything in return on an eleven-point scale. The quantitative scenario depicts a situation in which the respondent unexpectedly receives 1,600 dollars and is asked to state how much of this amount they would donate.

6. *Trust.* The trust measure is based on one item, which asks respondents whether they assume that other people only have the best intentions (Likert scale, 0-10).

For each economic preference, the survey items are combined into a single preference measure. More specifically, each preference is computed by (i) calculating the z-scores of each survey item at the individual level and (ii) weighting these z-scores using the weights provided in Table C.1. For ease of interpretation, each preference measure is standardized to have a mean of zero and a standard deviation of one.

Table C.1: GPS Survey Items and Weights

Preference	Item description	Weight
Patience	Intertemporal choice sequence using staircase method	0.712
	Self-assessment: willingness to wait	0.288
Risk taking	Lottery choice sequence using stair case method	0.473
	Self-assessment: willingness to take risks in general	0.527
Positive reciprocity	Gift in exchange for help	0.515
	Self-assessment: willingness to return a favor	0.485
Negative reciprocity	Self-assessment: willingness to take revenge	0.374
	Self-assessment: willingness to punish unfair behavior toward self	0.313
	Self-assessment: willingness to punish unfair behavior toward others	0.313
Altruism	Donation decision	0.635
	Self-assessment: willingness to give to good causes	0.365
Trust	Self-assessment: people have only the best intentions	1

C.2 Measuring universal moral values

Moral Foundation Theory posits that people's moral concerns can be split into five foundations:

1. *Care/Harm*. This foundation measures the extent to which people care about the weak and try to keep others away from harm.

2. *Fairness/Reciprocity*. This measure captures the importance of equality, justice, rights and autonomy.

3. *In-group/Loyalty*. This foundation captures the extent to which people emphasize loyalty to the "in-group" (family, country) and how morally relevant betrayal is.

4. *Authority/Respect*. This foundation measures how important respect for authority, tradition and order is.

5. *Purity/Sanctity*. This measure captures the importance of ideas related to purity, disgust and traditional religious attitudes.

To obtain measures of the five foundations, we administer the Moral Foundations Questionnaire. In this survey, each moral foundation is measured using six different survey items. Respondents are either asked to assess the moral relevance of certain behaviors, or they are asked if they agree with certain moral value statements. All the questions are answered on a Likert scale (0–5). Table C.2 provides an overview of the specific items that are included in each foundation. In order to construct the final scores, responses are summed.

To construct a measure of the relative importance of universal versus communal moral values, we follow the approach described in Enke (2020):

$$\text{Relative importance of universal values} \tag{1}$$
$$= \text{Universal values} - \text{Communal values} \tag{2}$$
$$= \text{Harm/Care} + \text{Fairness/Reciprocity} - \text{In-group/Loyalty} - \text{Authority/Respect} \tag{3}$$

To ease interpretation, the resulting measure is standardized to have a mean of zero and a standard deviation of one.

Table C.2: Survey items: Moral Foundations Questionnaire

	Moral Relevance	Agreement with Statement
Harm/care	Emotional suffering Care for weak and vulnerable Cruelty	Compassion with suffering crucial virtue Hurt defenseless animal is the worst thing Never right to kill human being
Fairness/reciprocity	Treat people differently Act unfairly Deny rights	Laws should treat everyone fairly Justice most important requirement for society Morally wrong that rich children inherit a lot
In-group/loyalty	Show love for country Betray group Lack of loyalty	Proud of country's history Be loyal to family even if done something wrong Be team player, rather than express oneself
Authority/respect	Lack of respect for authority Conform to societal traditions Cause disorder	Children need to learn respect for authority Men and women have different roles in society Soldiers must obey even if disagree with order
Purity/sancity	Violate standards of purity Do something disgusting Act in a way that God would approve	Not do things that are disgusting Call acts wrong if unnatural Chastity is an important virtue

Note: For the items in column 1, respondents are asked to state to what extent these considerations are morally relevant (Likert scale from 0 to 5). For the items in column 2, respondents are asked to state whether they agree or disagree with the statements (Likert scale from 0 to 5).