Intertemporal Fairness in Global Climate Cooperation*

Executive Summary

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Abstract

Why do countries find it difficult to realize an effective global climate deal? Limiting global warming requires countries to cooperate over many decades and involves making contentious decisions about the intertemporal and intergenerational distribution of climate costs. We explore whether inequality aversion and time preferences can explain support for climate cooperation. We demonstrate the feasibility of a theoretically superior approach to measuring time preferences in large surveys and develop a novel measure of individual-level inequality aversion. We find that inequality aversion predicts support for climate cooperation. These results advance the academic debate about the role of fairness and time preferences in dynamic climate cooperation and promise to generate scientific knowledge that will enable policymakers to design climate policies that are more likely to be politically feasible in major emitter countries.

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1 Introduction

Why do countries find it difficult to realize effective global climate deals? Limiting global warming requires countries to cooperate over many decades and involves making contentious decisions about the distribution of climate costs (Adger and Nicholson-Cole 2011; Arnold 2011; Victor, Kennel and Ramanathan 2012; UNEP 2012).[1] As has been forcefully demonstrated by the Yellow Vests movement, costs imposed on citizens that are meant to address climate change can have dramatic political consequences. An important scientific task therefore lies in generating knowledge that enables societies to design institutions and policies that have the capability of realizing sustainable climate cooperation. This executive report provides an overview of the research for this project that we have completed to date and that has in part already been published in Proceedings of the National Academy of Sciences Bechtel, Liesch and Scheve (2018). We have made considerable progress on several fronts and are pleased to report significant results and outline subsequent scientific research that builds on the work carried out as part of this project.

2 Measuring Inequality Aversion and Time Preferences

A central objective of this project is to explore whether and how inequality aversion and time preferences shape public support for dynamic climate cooperation. A key component of this research is to develop better measures of individual-level inequality aversion and time preferences. In this section, we describe the new methodologies that we developed for measuring these characteristics in mass surveys. In our view, each of these innovations forms a central part of the scientific contributions of our research under this grant.

2.1 Measuring Inequality Aversion

An important factor promising to shed light on support for climate policy is individuals' aversion to inequality. We develop this idea within an inequality aversion framework inspired by (Fehr and Schmidt 1999). Individuals are assumed to receive utility from their own personal income, but they also care about their relative position in the income distribution. Here, we distinguish between disadvantageous and advantageous inequality. Disadvantageous inequality aversion (envy) means that individuals receive some utility from reducing the difference between their own wealth and that of those that are richer. Advantageous inequality aversion (altruism) means that individuals receive some utility from reducing the difference between their own wealth and that of those who are poorer. This reflects that some individuals exhibit a preference for more equitable outcomes while other do not.

We designed a randomized inequality experiment to study the drivers of redistribution and generate individual-level measures of inequality aversion. Our approach is based on behavioral responses to exogenous changes in inequality as revealed by human re-allocation choices in representative samples of the adult population. We combine a "give-or-take" game with an experiment that randomly varied the level of inequality between two individuals. We first raffled two Amazon gift cards among all survey participants. The two gift cards could take on three values, each corresponding to a different type of inequality. In the "own poorer" condition the values were \$/€25 (own) and \$/€75 (other). In the "own richer" condition the value of the gift cards was reversed (\$/€75, \$/€25). In the "equality" condition the gift cards were worth \$/€50 each. Respondents were randomly assigned to one of those conditions and then given the option to either give to or take from the other winner or to do nothing. Individuals who decided to give or take

[1] Kolstad, Urama, Broome, Bruvoll, Olvera, Fullerton, Gollier, Hanemann, Hassan, Jotzo, Khan, Meyer and Mundaca (2014) offer an overview of the fairness aspects involved in making climate policy decisions.

saw a slider they could drag to indicate how much they wanted to give or take. Respondents could give any amount up to all of the initial endowment to the other winner (if they chose give) or take any amount from the initial endowment of the other winner (if they chose take). A purely self-interested individual would maximize his or her monetary payoff by taking all of the other winner's endowment under all three treatment conditions. We embedded this experiment in surveys conducted of representative samples of the adult population in the United States (N=2,749) and Germany (N=2,217).[2] We embedded this experiment in surveys conducted of representative samples of the adult population in the United States (N=2,749) and Germany (N=2,217).

To generate an individual-level measure of behavioral differences in how voters respond to inequality we asked respondents how much they would give or take conditional on different values of the other winner's initial gift card value ($/€5, $/€15, $/€25, $/€50, $/€75, $/€85, $/€95) while keeping the initial value of the respondent's gift card, which was randomly assigned to be either ($/€25, $/€50, or $/€75), constant. This provides us with 4,966 individual redistribution schedules that say how much and in which direction each individual would redistribute given a specific distribution of wealth, which here is understood as differences in the value of the two Amazon gift cards.

To obtain individual-level estimates of how respondents' redistribution behavior depends on the type and level of inequality we regress the redistributed amount on the difference in the Amazon gift cards separately for scenarios in which an individual was richer than the other (advantageous or a-inequality aversion) and scenarios in which an individual was poorer than the other (disadvantageous or d-inequality aversion).

2.2 Inequality Aversion: Empirical Findings

When breaking down the distributions of the raw inequality aversion parameters by country we find that 22% tend to perfectly equalize in Germany when confronted with unfavorable inequality while only about 15% of Americans remove this type of inequality. Instead, the modal value in the United States is 0 with 20% of respondents leaving the given level of unfavorable inequality unchanged. In contrast, only 12% of Germans are unresponsive to disadvantageous inequality. The stronger tendency of Germans to redistribute proportionally more in response to higher inequality also applies to conditions of advantageous inequality. 22% completely remove favorable inequality in Germany, while only 17% eliminate the wealth differences in the give-or-take game in the United States. Among American respondents the most frequent response to the other individual being poorer (20%) is to leave the distribution of wealth as measured by the gift card values unchanged. In Germany, only 12% refrain from redistribution when confronted with this type of inequality.

The empirical clustering at and around the theoretically meaningful values of 0 (unresponsive) and .5 (perfectly equalize) suggests a coding scheme that distinguishes between three redistribution types: *Equalizers* tend to re-allocate an amount that roughly leads to an equal distribution of wealth as measured by the final values of the two Amazon gift cards, i.e., on average, respondents classified as equalizers have an elasticity of .5. *Non-Equalizers* do not or only very mildly redistribute wealth. On average, their sensitivity to inequality is estimated at 0. In Germany and the United States these two groups comprise the vast majority of individuals (over 70%). Finally, we form a residual category of *Other* that also tend to redistribute, but their behavior does not seem to be driven by the motivation to equalize payoffs. Instead, this group comprises individuals who either take too much or give too much to equalize payoffs. Therefore,

[2]The experiments were approved by the Internal Review Boards at Washington University in St. Louis (IRB ID #201607129) and Stanford University (eProtocol #38517). All respondents first saw an informed consent text before indicating whether they would like to participate in the survey. The Supporting Information for (Bechtel et al. 2018) provides the exact informed consent text as well as detailed information about the survey and sample.

this group consists of strongly altruistic and strongly egoistic individuals whose behavior results in higher levels of post-redistribution inequality in the give-or-take game.

We find that 47% of the voting-eligible population can be classified as tending to remove inequality in response to disadvantageous inequality and the same proportion equalizes when confronted with advantageous inequality. This suggests that the public is divided over how to respond to inequality in ways that make it difficult to build a majority coalition that would be willing to back large-scale redistribution needed to counter rising inequality. In addition, this observation may actually overestimate the coalition for redistribution since only about 30% of all citizens are averse to both disadvantageous and advantageous inequality.

To what extent can our individual-level measures of inequality aversion explain citizens' attitudes toward government redistribution? We focus on two important types of policy instruments: imposing heavy taxes on the rich and the provision of welfare benefits, each of which constitutes a response to unfavorable and favorable inequality, respectively. As one would expect, *d-Equalizers* are significantly more likely to support heavy taxes on the rich than *Non-Equalizers*. In contrast, there exists no statistically discernible difference between those two groups when investigating support for upholding current levels of welfare spending. This correlational pattern adds to our confidence in the validity of the proposed classification that distinguishes between d-inequality and a-inequality: Since the behavior we observe under conditions of disadvantageous inequality captures aversion to others being richer, *d-Equalizers* should support policies that aim to reduce the wealth concentration among the rich, but not necessarily advocate the provision of benefits meant to make the poorest better off.

Consistent with this reasoning we also find that individuals who reduce advantageous inequality (*a-Equalizers*) are significantly more supportive of avoiding welfare spending cuts. At the same time, as one would expect, *a-Equalizers* and *a-Non-Equalizers* do not differ significantly on their support for high taxes on the rich. Overall, these patterns suggest that distinguishing between behavioral responses to a-inequality and d-inequality improves our ability to explain differences in support for government redistribution. These and more detailed results are reported in Bechtel et al. (2018). Our current research is exploring the ability of inequality aversion to predict preferences over dynamic climate cooperation.

2.3 Measuring Time Preferences

A second feature that renders climate change a particularly difficult problem to address is that it requires investments now or for a period of time in order to realize some benefit that will be realized in the distant future. One reason could be that individuals do not support investments for long-term policy benefits because they heavily discount future benefits. Examples include investments in public infrastructure (Jacobs and Matthews 2015), military interventions (Kertzer 2017), as well as labor market choices (Falk, Becker, Dohmen, Enke, Huffman and Sunde 2018). At the same time, future benefits are also more uncertain which means that it is critical to separately identify the importance of time and risk preferences.

The most widespread methods to elicit individual-level measures of time and risk preferences tend to conflate these two forces. This is evident in the standard self-assessed measure of time preferences:

> We now ask for your willingness to act in a certain way. Please indicate your answer on a scale from 0 to 10, where 0 means you are "completely unwilling to do so" and a 10 means you are "very willing to do so". You can also use any numbers between 0 and 10 to indicate where you fall on the scale, like 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10.
>
> How willing are you to give up something that is beneficial for you today in order to benefit more from that in the future?

Since future benefits are also more uncertain, individuals may score low on the self-assessed time preference measure, i.e., may appear to be very impatient, because they strongly discount the future or because they are very risk averse. A similar problem characterizes measures that rely on titration or the staircase method.

A recently proposed solution relies on a costly lab-experimental method, convex time budgets (Andreoni and Sprenger 2012; Andreoni, Kuhn and Sprenger 2015). Convex time budgets (CTB) have so far only been used in lab experiments and are very costly due to the monetary incentives.

We develop, validate, and present a simplified and affordable version of the CTB method for implementation in large surveys. We show that changing the payoff mechanism of the CTB by either reducing by an order of magnitude the payoffs or employing hypothetical decisions yields measures of time preferences with nearly identical distributions. We also compare our CTB time measures with the two most widespread alternative approaches for mass surveys, the staircase method and self-assessment. We present evidence that neither the staircase nor the self-assessment methods is strongly correlated with the theoretically preferred CTB measures. Finally, we present evidence that the importance of time preferences for predicting support for future-oriented policies is weaker than is often claimed in studies that rely on stated time preferences.

CTB disentangles risk and time preferences. The framework considers an allocation of payments x_t and x_{t+k} that occur between two periods t and $t+k$. Individual preferences over these two payments are described by:

$$U(x_t, x_{t+k}) = \begin{cases} x_t^\alpha + \beta\delta^k x_{t+k}^\alpha, & \text{if } t = 0. \\ x_t^\alpha + \delta^k x_{t+k}^\alpha, & \text{if } t > 0, \end{cases} \tag{1}$$

where δ is the discount rate, α is risk aversion, and β is present bias. The CTB method asks respondents to choose repeatedly among payments received at t and $t+k$. Each choice includes both extreme cases in which the full payment is at t or $t+k$ as well as four convex combinations. δ, α, and β can be estimated by OLS at the aggregate and the individual level.

While this approach is theoretically elegant, it raises several feasibility questions. Lab implementations of CTB have an expected payoff of \$20 per respondent. Applying this elicitation question in mass survey of several thousand individuals therefore raises a serious financial feasibility problem. Also, CTB is quite time-consuming which increases respondents' completion times. This further increases survey costs. As a precondition for making progress with this project we therefore have to examine the sensitivity of the CTB method to whether the stakes were lower. We therefore explore whether we can replicate CTB estimates of time preference in mass surveys and whether this can be achieved using more affordable payoff mechanisms. We also study whether the results correlate with those based on other prominent approaches such as the staircase method or self-assessment. Finally, we examine whether time preferences, i.e., patience, predicts public opinion about dynamic policy problems.

2.4 Time Preferences: Empirical Findings

We fielded a survey to a quota sample of Americans (N=5,820). We included an exact replication of the lab implementation of CTB (Andreoni et al. 2015) for randomly selected quarter of our sample (Benchmark). The average payoff for each of these respondents was \$20. The remaining three randomly assigned treatment conditions were: *CTB Lottery* paid only a randomly chosen 20% of all respondents, *CTB Hypothetical Low* asked respondents to make decision as if they were being paid, and *CTB Hypothetical High*

Table 1: Comparing Time Preference Measures: Differences-in-Means and p-Values from t-Tests (p(t)) and Kolmogorov-Smirnov (p(KS)) tests.

Trimmed Measures		Lottery	Hypothetical Low	Hypothetical High
Benchmark CTB	Difference	0.000	0.000	0.000
	p(t)	0.530	0.960	0.010
	p(KS)	0.990	0.350	0.000
Lottery	Difference		0.000	0.000
	p(t)		0.580	0.000
	p(KS)		0.170	0.000
Hypothetical Low	Difference			0.000
	p(t)			0.000
	p(KS)			0.000
Hypothetical High	Difference			
	p(t)			
	p(KS)			

asked respondents to select as if they were being paid but strongly increased the hypothetical stakes (the average payoffs in this condition was $2,000).

The results reported in Table 1 suggest that we can replicate CTB estimates of time preferences in mass surveys using more affordable payoff mechanisms as the estimated discount factors are very similar.

We also evaluate CTB and its alternatives regarding the degree of missingness they create. We find that CTB creates 16% missing data which is still preferable over the staircase method which generates 28% of missing values. Almost all respondents answer the self-assessed, stated time preference question

In additional analyses which we refrain from reporting here in detail we find that CTB time preference measures correlate only weakly with other time preference measures. We validate the measure by demonstrating that it predicts individual choices in an abstract, policy investment problem. Finally, we regress a standard measure of general support for climate cooperation on the various time preference measures. We expect that more patient individuals should be more supportive of investing in climate policy because they discount the benefits less strongly.

These preliminary results suggest that patience as measured using the CTB method does not predict climate policy support. However, the self-stated patience measure is a significant predictor of support climate policy. However, since the survey question conflates time and risk *and* is subject to social desirability bias, the correlation between the stated-preference measure of patience and climate policy opinions could also be due to *correlated measurement error* rather than evidence for patience helping to explain climate policy support.

Overall, this part of our research project has generated several valuable insights. First, we show that the CTB method can be implemented in mass surveys at an affordable price using a hypothetical version of the original instrument although survey time a severe constraint. Moreover, we find that neither the self-assessed/stated-preference measure nor the staircase methods seem to recover the same underlying trait.

3 Dynamic Climate Policy Preferences

To explore the determinants of preferences for dynamic climate policy, we designed a survey instrument that we fielded in Germany, France, the United Kingdom, and the United States. We fielded the survey

Table 2: Climate Policy Views and Patience

	Agree: Cut Emissions (Binary)					Agree: Invest New Technology (Binary)				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Patience CTB (Winsorized)	0.737	0.220				0.810	1.127*			
	(0.540)	(0.585)				(0.535)	(0.585)			
Risk Acceptance CTB (Winsorized)	-0.003	-0.002				-0.010	-0.012			
	(0.022)	(0.024)				(0.022)	(0.024)			
Patience (Staircase)			0.000					-0.000		
			(0.001)					(0.001)		
Risk Acceptance (Staircase)			0.000					0.001*		
			(0.000)					(0.000)		
Patience (Staircase Imputed)				0.000					-0.000	
				(0.000)					(0.000)	
Risk Acceptance (Staircase Imputed)				0.000**					0.000**	
				(0.000)					(0.000)	
Patience (Self)					0.015***					0.011***
					(0.003)					(0.003)
Risk Accpetance (Self)					0.002					0.005*
					(0.003)					(0.003)
Sociodemographics:		Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes
Constant	-0.146	0.410	0.629***	0.534***	0.533***	-0.191	-0.440	0.600***	0.655***	0.579***
	(0.539)	(0.581)	(0.092)	(0.049)	(0.039)	(0.534)	(0.583)	(0.092)	(0.049)	(0.039)
Observations	4,879	4,195	2,865	4,205	4,205	4,879	4,195	2,865	4,205	4,205
R-squared	0.000	0.079	0.070	0.081	0.085	0.000	0.072	0.061	0.072	0.075

Note: Coefficients from a linear probability model with robust standard errors clustered on individuals in parentheses. *** p<0.01, ** p<0.05, * p<0.1 Sociodemographic covariates: Age: 35-49, Age: 50-64, Age: 65+, Education: Some College, Education: High School, Education: BA or higher, Income: Lower Middle, Income: Upper Middle, Income: High, Female, White, Republican, Democrat.

in the United States first and completed the field period in January 2019 (N=4,081). We worked together with YouGov and surveyed a representative sample of the adult population. We are in the process of collecting and analyzing the data for the remaining countries and report initial results for the United States here. The results for the remaining countries will be part of the paper resulting from these multi-country surveys. We focus on three key questions. First, which intertemporal distribution of the costs from global climate cooperation do voters prefer? Second, how important are these dynamic cost allocation preferences compared to other theoretically important factors such as the cost level, how the revenues are invested (adaptation or mitigation), and what other countries are doing with respect to costs, their temporal distribution, and investment decisions. Third, what role do inequality aversion and time preferences play in determining levels of support and conflict over climate policy? Due to space constraints, we focus on the first two of these questions in this executive summary.

Our survey asked respondents to indicate which distribution of costs over time they would prefer if their country implemented an international agreement that would be associated with a specific level of average household costs (these were randomly assigned across individuals and based on the quantities used in Bechtel and Scheve (2013), but that there are different ways of distributing these costs over time. The exact wording was: *"As you probably know, many experts say that countries should take action to address global warming. Generally speaking, how strongly do you support or oppose the United States joining an international agreement to reduce greenhouse gas emissions if implementing the agreement would mean that each household would have to pay $[insert one of the following: 53, 107, 213, 267] more per month through, for example, higher energy prices."* Respondents then indicated their level of support on a 1 to 10 scale. This was followed by the question: *"Regardless of your previous answer, suppose the United States is going to implement that international agreement and the household costs would still be $[insert same costs as above] per month on average. However, there are different ways of distributing these costs over time. The figures below indicate four alternatives. If you had to select one of the options in a referendum, which would you chose? Please carefully consider the available options. In addition, you can rate each option individually."*

We then showed respondents four different cost paths in randomized order that illustrated how the costs would develop over the 2020 to 2040 period: a constant plan in which the costs would remain unchanged, an increasing plan in which costs would increase linearly over time, a decreasing plan with high costs initially that decrease over time, and an inverse, U-shaped plan with costs increasing initially and decreasing after about 2030.

We find that a majority of citizen (56%) prefers a constant cost allocation. About 13% supports an increasing cost distribution, 18% prefer a decreasing allocation, and 13% select an inverse, U-shaped distribution.

3.1 Dynamic Climate Cost Preferences

To examine whether individual time preferences may explain which dynamic climate cost allocations voters support, we use a multinomial regression in which we model a respondent's cost path choice as a function of our CTB patience measures along with a comprehensive set of sociodemographics to account for systematic differences in respondents' personal time horizons across key characteristics such as age, education, or sex.

Table 3 reports the results. We first explore whether patience (using the trimmed and dichotomized variable to safeguard against measurement error and avoiding the assumptions underlying the winsorized measures) predicts cost path choice. The theoretical expectation is that less patient individuals are more likely to select the increasing cost path than more patient respondents because this plan has lower present costs for individuals who discount the future more. The coefficient reported in Model 1 for the increasing cost path suggests that this is the case. Another test of whether discounting helps predict dynamic climate cost preferences is to interact the randomly assigned cost levels with our binary patience measure. We would expect the sign on these multiplicative terms to be significantly negative since this would indicate that more patient individuals are significantly more sensitive to the cost level associated with a specific policy option. However, the results in Model 2 do not support this prediction. We replicate these models and replace the CTB measure of patience with the stated preference measure in Models 3 and 4. The results suggest that the stated preference measure fails to predict choosing the increasing cost path over the constant option. At the same time, this patience measure correlates systematically with selecting the decreasing and the inverse, U-shaped path, although these results do not remain robust against the inclusion of the cost indicators and their interaction. Overall, these initial results suggest that the timing of climate costs is not robustly related to individuals' patience.

3.2 The Causal Effects of Temporal Cost Allocations, Cost Levels, and Investment Decisions on Policy Support

The results we have presented so far are novel and informative, but their interpretation remains correlational. To explore whether the distribution of costs over time is a causal driver of support for international climate cooperation we devised an experimental conjoint (Hainmueller, Hopkins and Yamamoto 2014; Gampfer, Bernauer and Kachi 2014; Bechtel and Scheve 2013) that randomly varied in how costly a policy scenario is to households, how those costs will change over time, whether investments will be made in mitigation efforts to reduce greenhouse gas emissions thus making global warming less likely or in adaptation efforts to adjust to environmental change to lessen the negative effects of global warming. We varied these dimensions for the United States and in other major economies. Respondents were shown 8 binary comparisons.[3]

[3] We also implemented several other versions of the conjoint which is why the number of observations for this analysis is lower than it would be otherwise. We do not report the results from these other conjoints here due to space constraints.

Table 3: Dynamic Climate Policy Preferences and Patience

DV: Climate Cost Path	(1)			(2)			(3)			(4)		
Path Chosen	Increasing	Decreasing	Inverse U	Increasing	Decreasing	Inverse U	Increasing	Decreasing	Inverse U	Increasing	Decreasing	Inverse U
Patience CTB Trim: High	-0.212**	-0.096	-0.052	-0.083	0.071	0.090						
	(0.084)	(0.082)	(0.087)	(0.168)	(0.169)	(0.183)						
Patience Stated: High							0.096	0.250***	0.119*	0.062	0.136	0.019
							(0.070)	(0.066)	(0.070)	(0.135)	(0.131)	(0.143)
Costs: $107				-0.103	0.017	0.150	-0.018	-0.115	0.042			
				(0.166)	(0.166)	(0.180)	(0.134)	(0.131)	(0.138)			
Costs: $213				-0.046	0.120	0.140	-0.220	0.002	0.081			
				(0.167)	(0.166)	(0.182)	(0.139)	(0.130)	(0.138)			
Costs: $267				-0.105	0.061	0.204	-0.008	-0.050	0.003			
				(0.168)	(0.167)	(0.180)	(0.134)	(0.130)	(0.139)			
Costs: $107XPatience CTB Trim: High				-0.103	-0.203	-0.271						
				(0.239)	(0.238)	(0.253)						
Costs: $213XPatience CTB Trim: High				-0.275	-0.189	-0.104						
				(0.244)	(0.237)	(0.254)						
Costs: $267XPatience CTB Trim: High				-0.165	-0.325	-0.380						
				(0.243)	(0.240)	(0.258)						
Risk Acceptance CTB Trim: High				-0.123	-0.132	-0.058						
				(0.089)	(0.086)	(0.092)						
Costs: $107XPatience Stated: High										-0.156	0.226	0.153
										(0.191)	(0.183)	(0.195)
Costs: $213XPatience Stated: High										0.126	0.052	-0.031
										(0.194)	(0.182)	(0.198)
Costs: $267XPatience Stated: High										-0.019	0.054	0.074
										(0.190)	(0.183)	(0.198)
Risk Acceptance Stated: High										0.198***	0.130*	0.204***
										(0.071)	(0.069)	(0.072)
Sociodemographics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-0.385***	-0.250**	-0.314**	-0.234	-0.223	-0.396**	-0.541***	-0.452***	-0.540***	-0.550***	-0.449***	-0.633***
	(0.125)	(0.122)	(0.124)	(0.163)	(0.159)	(0.167)	(0.100)	(0.097)	(0.100)	(0.133)	(0.126)	(0.134)
Observations	2,546	2,546	2,546	2,374	2,374	2,374	4,081	4,081	4,081	4,081	4,081	4,081

Note: Multinomial regression coefficients reported with robust standard errors clustered on individuals in parentheses. *** p<0.01, ** p<0.05, * p<0.1
Sociodemographic covariates: Age: 35-49, Age: 50-64, Age: 65+, Education: Lowest Tier, Education: Middle Tier, Education: Highest, Income: Low, Income: Middle, Income: High.

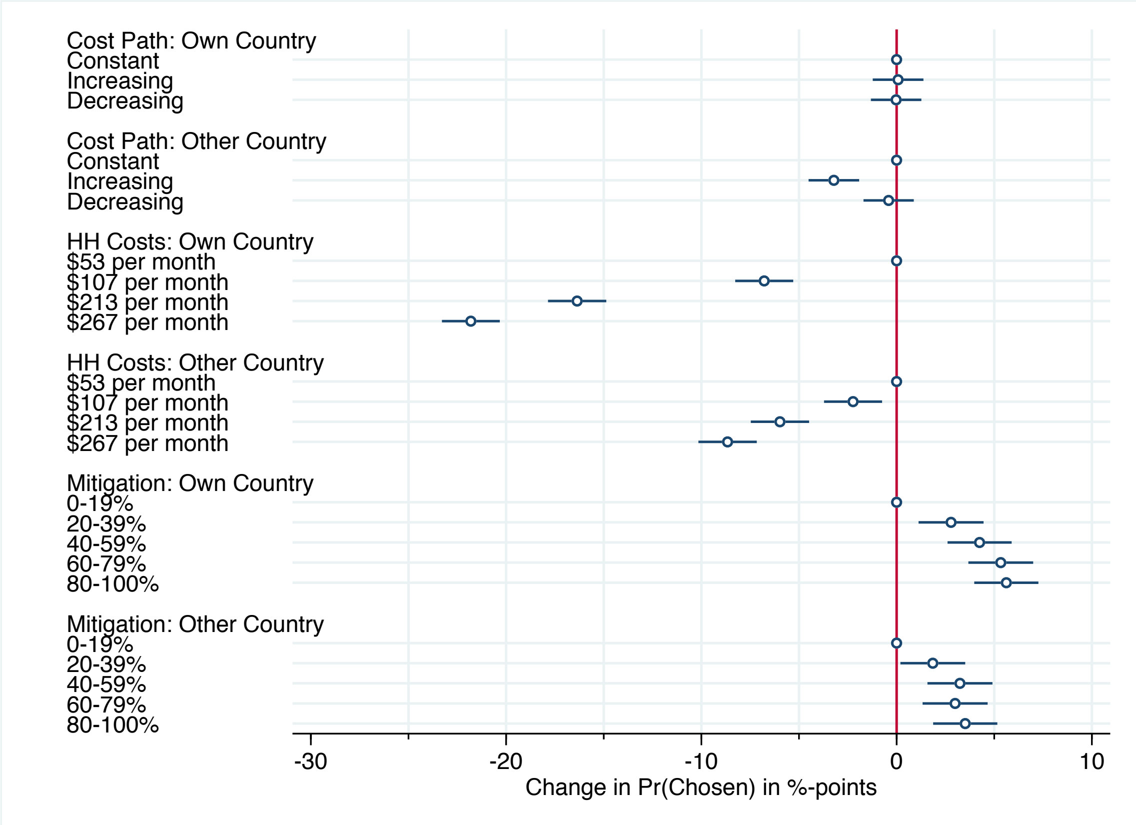
Figure 1 reports the results from a linear probability model in which we regressed whether a policy scenario was chosen on treatment indicators for the various attributes and attribute levels. First, the results suggest that the distribution of climate costs (constant, increasing, decreasing) do not seem to be a strong or systematic driver of policy support. On average, respondents are not sensitive to which cost path their own country pursues and tend to exhibit more opposition to policies in which other major economies follow an increasing cost schedule. The strongest driver of policy support seems to be the costs imposed on households in their own country with higher costs reducing support. We find a similar pattern when exploring the effect of household costs in other countries, although the sensitivities are about half the size of the own country effects. This sensitivity to how much other countries are contributing to dealing with global warming is consistent with a reciprocity argument which we intend to explores in more detail as outlined in the pre-analysis plan for this study.[4] Finally, we note that mass support for climate policy also reacts systematically to the investment profile associated with a given policy: the results suggest that devoting more financial resources to mitigation investments causes significantly higher levels of policy support. This result holds for both, investment decisions in one's own country and those in other major economies.

To test whether the null findings for the cost path attribute may hide individual-level differences in patience, we re-computed the causal effects separately by patience estimated via the CTB measure and the stated preference measure. As the results in Figure 2 suggest, the sensitivity to a country's own cost path does not seem to vary systematically across more and less patient respondents. This result holds irrespective of the technique that was used to generate those individual-level measures (CTB or stated).

We envision the research presented in this report and the work in progress to result in one methodological paper (intended for submission to a journal such as *Political Analysis*) and one substantive contribution that focuses on the role of time preferences for understanding dynamic climate cooperation and long/term policy problems, more generally, which we intend to submit to a general-interest journal in political science or international relations.

[4]The pre-analysis plan is available at `https://dataverse.harvard.edu/dataset.xhtml?persistentId=doi:10.7910/DVN/FV5WKI`.

Figure 1: Dynamic Climate Policy Preferences: Conjoint Results



Note: This plot reports the causal effects of randomly assigned dynamic climate policy features on the probability of supporting a policy being chosen together with 95% robust confidence intervals. N=33,280.

4 Policy Relevance

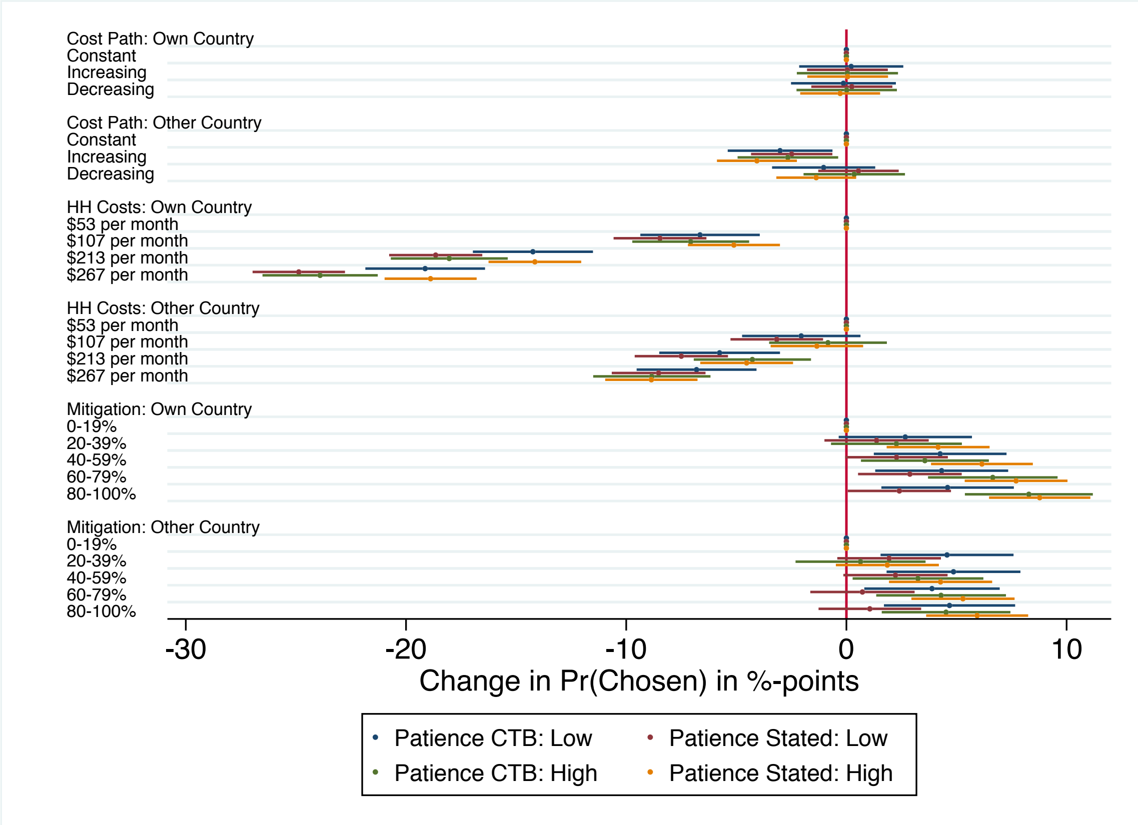
Our project can provide useful knowledge about which types of climate cooperation are likely to be politically feasible in democracies. In addition to reporting our findings in scientific articles, we also intend to discuss them with our project partners.

5 Other Activities: Workshop, Academic Presentations, Media Coverage

As part of our project we organized workshop funded by Stanford University on *The Mass Politics of Environmental Policymaking* which provided a high-quality forum for presenting ongoing research on climate and environmental policy with contributions from Breanne Chryst, Patrick Egan, Federica Genovese, Nikhar Gaikwad, Geoffrey Henderson, Matto Mildenberger, Megan Mullin, Leah Stokes, Dustin Tingley, and Michael Tomz. The workshop was very productive and well received. We also met with our partners to present our work and receive feedback.

The work resulting from this projects has been presented at various international academic conferences and academic institutions: Yale University, McGill University and CSDC, University of Mannheim, the International Political Economy Society Annual Meeting, and elsewhere.

Figure 2: Dynamic Climate Policy Preferences: Conjoint Results by Patience



Note: This plot reports the causal effects of randomly assigned dynamic climate policy features on the probability of supporting a policy being chosen together with 95% robust confidence intervals. N=33,280.

The research we have conducted as part of this project has been featured in 20 news outlets such as *The Independent*[5] and so far has resulted in 15 tweets with an upper bound of 20,312 followers.[6]

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[5]See "Most Americans would rather keep wealth to themselves than help others financially, study suggests", `https://www.independent.co.uk/news/world/americas/americans-wealth-keep-help-others-robin-hood-reflexes-economic-inequality-study-a8263771.html`.

[6]`https://pnas.altmetric.com/details/34536346/twitter`.

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