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Price and party: The importance of partisanship and cost in American climate public opinion

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Abstract

Existing research on American climate opinion demonstrates that a wide variety of variables impact whether voters support a given policy. However, little research has empirically tested which variables matter the *most* in creating durable majority support for climate policies, and how varying outcomes of those variables can impact such support. I use a conjoint experiment to test the extent to which American voters value the six most important variables around climate mitigation policy, as illustrated in the current literature, and which potential options among those values attract the greatest support. I improve in external validity over previous conjoints by introducing partisanship and policy level, as well as more realistic ranges for policy cost. I find that voters generally-and across racial, gender, and partisan lines- value some variables ten times higher than others, and prefer Democratic or Bipartisan policies that are low cost and provide a variety of benefits.

Introduction

The urgency of climate change has spawned a bevy of recent literature into determinants of voter support for climate mitigation policies [1–6]. This literature has documented a wide variety of variables that impact voter support of individual policies, yet these papers tend to focus on specific variables, such as the form of the policy or its cost. Additionally, there is disagreement about the importance of different variables, such as partisan endorsements [7,8], and many are based on case studies rather than experimental data. In this paper, I merge this recent work and canonical literature on voter preferences to empirically test which variables are the *most important* determinants of voter support for climate mitigation policies, as well as which values of those variables are most likely to result in durable majority support.

I focus on 6 determinants of voter preferences: form of policy, cost of policy, distribution of benefits, scope of policy, whether the policy was enacted at the state or federal level and which political party has endorsed the policy. These 6 determinants were shortlisted using a "funnel approach", starting with a comprehensive review of over 80 peer-reviewed articles and narrowing down to six variables based on criteria discussed more in the "theory" section of this article.

I test the relative importance of these six factors in a conjoint experiment on a national sample of registered voters. While my variable selection is well grounded in the literature I make three improvements over previous climate experiments worth noting. This is the first experiment to test how the level of policy administration (state vs federal) affects voter support for that policy-a variable highly relevant to the contemporary U.S. debate over climate mitigation. It is also the first conjoint experiment to test how partisan endorsements affect voter support: a factor over which the existing literature disagrees, and which is highly relevant in today's hyper-partisan policy arena. Finally, I offer a wider range of cost levels than previous experiments, costs that are more reflective of both the range of policies currently on the table and of the policy alternatives that will be necessary to hit national climate targets in the coming years. By introducing federal-state conflict, partisanship, and realistic cost assessments I improve in external validity over previous experiments, making my results highly relevant to the current policy debates.

In my experiment, I find that voters value some variables ten times higher than others, preferring Democratic or Bipartisan policies that are low cost and provide a variety of benefits, preferences that persist across racial, gender, and partisan lines. Voters also prefer non-carbon pricing policies to carbon taxes or emissions trading systems, and prefer policies that apply across the economy and are administered at the national level. What do these results mean for policymakers, in and outside of government? If focused on coalition building, policymakers should aim for bipartisan elite support if possible, however they should not dismiss the appeal of Democratic-only policies. Keeping costs on ordinary voters low is vital, which can be accomplished either through non-taxation financing measures or by using highly progressive taxes. Policies that apply uniformly across the economy, are administered at the national level, and provide a variety of benefits help avoid voter impressions of favoritism and build support across party lines. Above all, my greatest finding is the uniformity of American preferences: across traditionally divisive partisan and racial lines, Americans largely prefer the same types of carbon mitigation policies, indicating that effective nationwide policies may require less political differentiation (the tailoring of climate policies and messaging to the preferences of different publics) than previously thought.

The rest of the paper proceeds as follows. "Theory" outlines the variables I've selected and the theoretical grounding for selecting them. "Methods" gives more detail on the experiment I use to test those variables and "Results" summarizes the outcome of that experiment. I conclude by discussing limitations and implications of my findings for climate activists and policymakers.

Theory

My understanding of voter decision making begins with [9], who established that rational voters vote in a way that maximizes their own utility (To avoid confusion with electric utilities, I use the word "value" instead of "utility" going forward). A problem arises, however, when voters lack sufficient information to accurately calculate what their value from a given policy is. Climate mitigation is a perfect example of an environment where calculating value is difficult, since the costs of a policy are sometimes difficult to quantify (Some costs are easy to quantify, such as increases in utility bills, while others, such as the life-cycle costs of electric cars, are more difficult), and benefits are diffuse and even more difficult to quantify [1]. As [10] establishes through the model of insurance referendums, in the absence of perfect information, voters rely on information shortcuts, such as partisan endorsements, to decide which policies to support. The six variables tested in my experiment are all such shortcuts.

To select these variables, I did an in depth review of the literature surrounding determinants of voters' support for climate mitigation, reviewing 83 peer reviewed articles based on a mixture of electoral and experimental data. From there, I identified 16 variables that had come up in at least 3 of those articles as being influential to voter decision making. From that list of 16, I selected 6 to focus on based on salience—the degree to which previous studies have found the variable to be important -, frequency of mention—how often they were included in previous studies, degree to which previous literature disagreed about the variables, and relevance to contemporary debate in the U.S. over climate policy.

One of the first variables this study takes into consideration is **policy form**. Policy form is one of the most salient variables across the studies I reviewed. Some have found that voters tend to favor less-efficient environmental policies overall [11] because the costs from such policies are less directly evident. This points to a larger theoretical disagreement between economists and political scientists on the optimal form of climate mitigation policy. Economists tend to be in favor of emissions trading systems and carbon taxes, i.e. carbon pricing policies, arguing that these policies are more efficient than policies like clean energy standards (non-carbon pricing policies). The 2018 Nobel Prize in Economics, awarded to Nordhaus and Romer for their work on carbon taxes, is an indication of the high regard with which carbon pricing is held. However, political scientists like [12] argue that carbon pricing policies will not have popular voter support because they can be perceived as entailing high costs. In experimental climate studies, which tend to condition on the form of policy by, for example, testing different types of climate taxes [13], this is an under-tested debate (with the exception of [11]). This paper attempts to address this gap by comparing different types of policies, not just different forms of the same policy.

The next most salient factor across studies (and the most frequently mentioned) is the **cost of the policy**. Cost has historically been a dominant factor in voter preferences in climate conjoints, and nearly every study includes a direct, yearly, per-household measure of cost [13–16]. These studies have repeatedly demonstrated that households grasp the salience of the cost of climate policies and rely on them to form their opinions on climate policies. The cost estimates in previous experiments range from a few tens of dollars per year to a few hundred, reflecting estimates of the American voter's willingness-to-pay for climate policies, which ranges from $3 [1] to $177 [17] per year. The trouble with these ranges is they fail to reflect the true range of costs of both different proposals currently in the public discourse and the range of what might be necessary to fully mitigate and adapt to climate change. I address this shortcoming by including a wider range of levels ($11.2 a year to $3072 a year), which better represents the range of policy proposals currently and in the future on the table in the United States. Further explanation of how I calculated these levels is present in SI 1.2.

One might understandably question if pairing visible costs with policies, such as cap-and-trade, whose costs are normally indirect, is a threat to internal validity. This is a particularly relevant question given important recent work on public support for policies with direct and indirect costs (e.g. [18]). In my context, this would involve making cap and trade, which imposes costs indirectly on households, similar to a carbon tax. At least in the American context, however, I contend that this is less of an issue, because every debate over salient climate policies is accompanied by an effort to make the costs of those policies visible to voters. Two examples illustrate what this looks like in practice. In the 2018 referendum around carbon taxes in Washington State, many of the ads against the policy were focused around how much it would cost individual voters [19]. And when the Inflation Reduction Act was passed by Congress in 2021, analysis of media coverage by the author revealed that nearly every article included either a reference to the bill's overall cost or quantified the bill's benefits on a household level, providing voters with heuristics from which they might reasonably estimate their

own fiscal impact from the bill. So, while in the lab, the line between indirect and direct costs may be distinct, in the American electoral environment, the provision of information around climate policies makes that line much less well defined.

The third variable that is salient in most studies is the **scope of the policy** (in tax incidence terms). Previous experiments have found a strong relationship between the scope of a climate policy and its level of public support [1]. However, this understanding of scope does not factor for which industries bear the cost of the policy. Existing research shows that if policies were narrower, they are more likely to command broader levels of support. If a carbon tax was applied to fossil fuel companies, it is estimated that 68% of Americans would support such a tax, more than twice the percentage who opposed such a tax [20]; these projected estimates held for every state across the country even amid the widespread economic downturn caused by COVID-19, which is notable considering that negative economic conditions can erode support for environmental referenda [21].

Moreover, this reaction to narrow climate change policies seems to hold across different forms of policy. For example, the Regional Greenhouse Gas Initiative (RGGI), which is a narrow cap-and-trade system covering emissions from the power sector, has registered an approval rating of as high as 79% amongst registered voters across eleven states [22], suggesting that the popularity of narrow policies persists even when such policies are administered across state boundaries. Overall, these analyses suggest that existing evaluations of scope of policy have to consider what industries bear the policy incidence.

The fourth factor that was salient across studies was the manner in which **benefits were distributed** among different sections of society. However, these studies do not share the same understanding of what constitutes distribution of benefits and as a result, there continues to be a lack of clarity on how distribution of benefits shapes voter preferences. [23] found that the manner in which revenue was distributed had a significant impact on voter support for climate policies, with voters preferring revenue to be invested in "green projects" such as renewable energy rather than be used for reducing other taxes. Others have also demonstrated a preference for using revenue for renewable energy investments rather than revenue neutrality [24]. Still others have found that, when given the choice of distributing the revenue from a climate policy among four priorities—green investment, infrastructure, redistribution, and income transfers—how a voter chooses to distribute the revenue varies widely based on (1) the monthly cost of the policy, (2) differential in risk exposure due to climate change, and (3) the economic impact of climate policies [16]. [16] show that, regardless of the monthly cost (ranging from $16 to $256), or the sample group (general population, coastal fossil fuel, or coal country), voters always chose to allocate a greater percentage of funds to renewable energy than to reducing taxes, in line with [23,24]. The exact breakdown of each allocation varied widely, however, depending on both geographic and cost differentials. Another factor that seems to shape voter preferences on revenue distribution is political ideology, with conservatives favor tax reduction and liberals preferring investment in green energy [1]. There are two noticeable gaps in the literature on the allocation of revenue from climate projects: the testing of the relative importance of revenue usage when the "partisanship" of the policy is present and the further exploration of what priorities exactly voters would want to fund. This paper aims to explore the former (how cost and revenue usage matter when confounded by partisanship), the latter is a worthwhile endeavor for future research.

Many studies in recent years have investigated the impact of **partisanship** on voter policy preferences across a variety of domains, but when it comes to climate policy, the evidence is mixed. Some studies have found partisanship to have little impact on public opinion on energy issues [7], and others finding a greater impact [8]. Despite this, no major climate conjoint has yet included partisan endorsements among the factors they test, a gap I aim to fill here.

The final variable in my experiment, **whether the policy is enacted at the state or the federal level**, was selected for its relevance to the contemporary debate in the United States and elsewhere about the proper level of government at which to administer climate mitigation. Previous studies have found that voters are less likely to support state climate policies than federal ones, because voters see less incentive for policies at the state level than at the federal one, in line with the theory that that subnational action on climate change can be perceived as costly because it incentivizes free-riding by other sub-national units [25]. Such concern about subnational climate policies has helped drive the IPCC's recommendation that governmental action on climate change take place at the highest possible level [26]. However, there is evidence that subnational climate policy can provide benefits not present in policies at higher levels, including efficiency gains [27], policy innovation [28], and a greater flexibility to modify existing policies in the face of challenges [29]. The potential benefits of state climate action make testing this factor vital. If the differential does not exist, or runs in favor of state action (with state policies being more popular than federal ones) it would confirm previous findings from [25]. It also may support the theory from [3] that extant patterns of climate policies can be better explained by alternative frameworks such as distributive conflict, rather than a traditional collective action framework.

One prominent variable that I do not include is a direct measurement of the policy's effectiveness, in terms of their impact on greenhouse gas emissions. A more detailed explanation of this decision is outlined in SI 1.2.

Much of the evidence on voter support for climate change has been based on evidence generated in an experimental context, but there is also a wealth of evidence on voter support for climate policy in the electoral context. This evidence can, at times, be contradictory, signaling that whether climate policy is a net electoral benefit or cost is highly contextual. For example: [30] found that climate policy appeared broadly popular in the 2020 elections, with Democrats who endorsed the Green New Deal receiving more votes, on average, than those who did not. In Canada, on the other hand, research has documented voter backlash in legislative elections over wind energy development [31] and carbon taxes [32], although the latter became more popular after it passed [33]. In the United States, carbon taxes have also historically been unpopular: with Washington State referendums on carbon pricing running well behind Democratic candidates in the 2016 and 2018 elections [19] in a way that could not be explained by campaign factors such as advertising alone [34].

I use my experiment to test the following:

1. Empirically, which variables most influence voter support for climate mitigation policies?
2. What is the relative value voters place upon different possible levels of different variables?

Methods

Ethics statement

This work was approved by the Columbia University IRB, protocol # AAAT4166. Written consent and written confirmation that participants were over 18 was obtained from all participants before their participation in this study.

To recap my variables, I include Table 1, which lists all 6 variables I test and the range of values that they take.

A detailed model of my theory of how voters calculate the value they assign to a given policy can be viewed in SI 1.1. In using a conjoint, I recognize that the six variables tested in my model do not on their own represent all of the variables that affect voter decision-making.

Table 1. Conjoint attributes and levels.

Variable:	Level 1	Level 2	Level 3	Level 4
Policy Form	Tax	Trading System	Standard	
Policy cost per household per year	$11.20	$192	$768	$3072
Revenue Usage	Reduce Taxes	Invest in clean energy	Reduce taxes and invest in clean energy	
Party Endorsement	Republican	Democratic	Republican and Democratic	None
Policy Scope	Fossil Fuel Companies	The Electric Industry	All Industries	None
Policy Level	State	Federal		

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Such a cap balances the masking-satisficing trade-off described by [35]. Such a cap also helps prevent the overweighting of both early and salient attributes by subjects. To further help prevent overweighting, I randomize the order in which the attributes are presented to participants, following the suggestions of [36,37]. In two cases, party endorsement and policy scope, I include an option leaving the factor blank, as a type of control. These controls were left blank in the test but are noted as "none" in the tables and figures in this study. This work was approved by the author's University IRB. Written consent and written confirmation that participants were over 18 was obtained from all participants before their participation in this study.

Estimand

My estimand selection is designed to allow the measurement of the relative importance of each attribute to voter decision making (R) and the value that voters assign to each level of each variable (V) for each of our 6 variables, averaged out over our population. To do so I use partworth utilities, also referred to as attribute importance scores and level values, or as conjoint analysis utilities. Partworth utilities are numerical values that measure the relative importance of different attributes to a voter's decision making (attribute partworths), and the relative value of different levels of a given attribute have on voter support of a policy (level partworths). I estimate partworth utilities using ordinary least squares regression, as described by [38,39]. My selection of partworths is designed to (1) accurately represent the important figures in my model and (2) avoid the multiple concerns recently voiced about AMCEs (inter alia [40,41]), the normal estimand in conjoint experiments.

While less widely used in political science than the AMCE, partworth utilities have a rich history as an externally valid target estimand for conjoint experiments. They have been used in conjoint-based studies in political science [42,43], renewable energy policy [44–47], economics [48,49], health policy [50] and electric grid policy [51]. Despite their widespread use across a variety of disciplines over several decades, partworth utilities have yet to face the type of validity concerns that have dogged AMCEs in recent years. Therefore, I am more than comfortable using them as my target estimand in this experiment. I calculated my partworth utilities using OLS regression using the Conjoint software package from Conjointly. All models included control variables for gender, age, partisanship and race. I explain further how to calculate partworth utilities in SI 1.4, which also contains a link to my data archive and further resources on the subject.

I recognize one shortcoming to my approach is that I cannot make any claim about the percentage of overall voter decision making due to each given attribute, since both attribute and level partworths are arbitrarily scaled to a constant, and because there are other variables present outside of the conjoint that affect voter evaluation of V_n. To test for the strength of my

Table 2. Example policy choice.

	Policy A	Policy B
Policy Form	Tax	Trading System
Household Cost Per Year	$11.2	$192
Revenue Usage	Reduce Taxes	Invest in clean energy
Party Endorsement	Democratic	Republican and Democratic
Industries Subject	Fossil Fuel Companies	All Industries
Policy Level	Federal	State

If you were choosing between the above policies to fight climate change, which would you choose?

- Policy A
- Policy B

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model, I run a goodness-of-fit test measuring how well the model predicts respondent policy choices using McFadden's pseudo-R^2 from [52], with results available in SI 1.5.

I derive my partworth utilities through a choice based conjoint (CBC) experiment on a convenience sample of 627 registered voters drawn from Amazon Mechanical Turk (MTurk). The initial sample size was 723, but 96 participants were dropped for inattentiveness: I followed programming suggestions from [53,54], including attention and automation checks and appropriate screening questions. Specifically, participants were subject to four attention checks modeled after [55] and an automation checker that used mouse movement as a proxy for human attention. If participants failed either the automation or attention checks, they were excluded from my analysis, although including them in analysis does not substantially change outcome variables. Given the rigorous combination of attention and automation checks, I am highly confident that I have screened out any bots or inattentive respondents present in my initial sample. Participants were recruited over the course of a 2 week period in Spring of 2021, at no time before, during, or after the study did authors have access to identifiable participant information.

My use of a conjoint experiment grows out of the recognition that one major shortcoming of conventional survey experiments is that they prevent the authors from identifying which components of a multidimensional treatment are influential [36]. In the world of climate policy, such information is crucial. In my experiment ten such binary choices are employed, each varying according to the six different attributes listed above. An example of these choices is in Table 2.

I take measures to ensure that voters comprehend these complicated policies enough to incorporate them into their decision making. To address concerns about voters not comprehending the difference between these policies, I included definitions for each, followed by comprehension questions to test voter understanding of the differences. Participants spent an average of 54 seconds reading the definitions, more than enough to fully digest them, and passage rates on the comprehension questions were between 81% and 88%.

Validity and ethics concerns

Previous scholars have expressed concerns relating to external validity with respect to survey experiments conducted on MTurk. While understandable, previous studies find that MTurk respondents are demographically similar to the population more generally [56,57] with similar political psychology [58]. These studies have also found that results produced using an MTurk sample are generalizable to the broader population [57], with a high degree of correspondence

between results generated on MTurk and results generated using traditional national probability samples [59].

To address further concerns about external validity, and since I only surveyed registered voters, I reweight my sample according to the Census statistics on registered voter demographics from the 2020 Presidential election (conducted 2 months before my experiment was in the field) and the Gallup Survey statistics on partisan identification for the period that the survey was in the field (Q1, 2021). SI 1.3 contains the distribution of socioeconomic characteristics in the target population, the raw sample, and the weighted sample. Unweighted results were very similar to the weighted ones. Some readers may be concerned with the lack of a "neither" option inherent in conjoint design, and the threat it may pose to external validity. I mitigate this concern by only investigating the opinions of voters, rather than that of the public as a whole-in the supermajority of cases and in addition, an American general election is a forced choice between two policies, exactly the type of choice I simulate here.

In terms of ethical concerns, I have created my design to adhere to the AAPOR Code of Professional Ethics and Practices (2015 edition) and the APSA Principles and Guidance for Human Subjects Research (2020 edition). To avoid ethical concerns around low pay for "Turkers" [60], I paid $1.31 per respondent, which averaged out to between $12 to $18 an hour depending on completion time.

Power

In order to neutralize concerns about power, I performed a version of the power simulation technique described by [61]. Assuming a sample size of 620, 9 tasks (I ultimately employed 10) with a maximum of four levels per attribute and an effect size of 0.05, my predicted power is 96%, with a Type S error rate of $<1\%$ and a Type M error rate of 1.11-giving me strong confidence in the power of my overall results. I recognize that this power fades with the smaller size of some of my subgroups, and point out that my main benefit from subgroup analysis is showing the consistency in direction of my effects across subgroups rather than their size, making power less of a concern than the probability of a Type S error, which remains quite small even at my smallest subgroup size, Hispanic respondents. This is particularly true because a priori I do not hypothesize effect size. Thus, with very well powered full-group effect sizes and an interpretation strategy that prioritizes direction over effect size, I consider my sample size to be more than sufficient for my purposes.

Results

I center the discussion of my results around describing the relative value of different variables and variable outcomes. I also discuss the relative strength of my model and then conclude with whether the recent legislative successes on climate change policies are reflective of voter preferences.

Which variable is most important?

The relative importance *R* of each variable to voter decision-making can be measured using our attribute partworths. It is important to remember when interpreting that attribute partworths artificially sum to 100 and level partworths artificially sum to 0.95% confidence intervals are displayed:

If there was no statistically significant difference in the degree to which each attribute affects voter views on climate policies, we would expect each attribute score to be roughly equal, around 16.67, with overlap between the confidence intervals. As shown in Fig 1, however, that

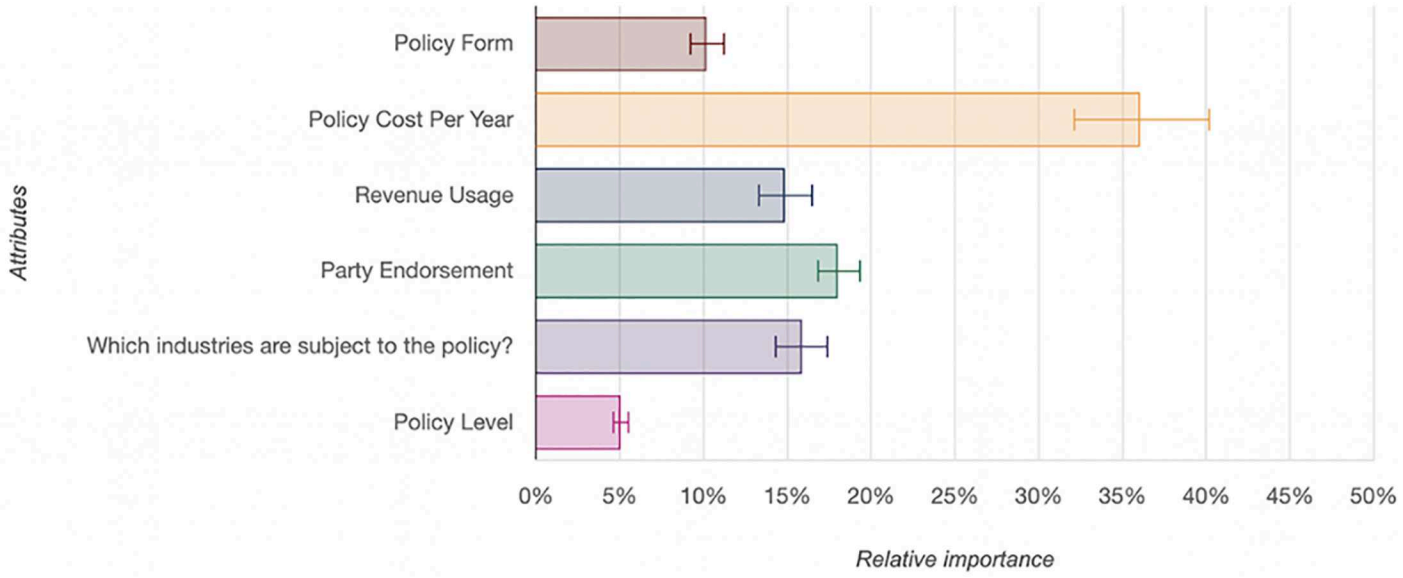

Fig 1. Attribute partworths for all responses.

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is definitively not the case, with some attributes having a statistically significant greater or smaller value than others. First and foremost is policy cost, with a relative value of 36.1. This is in line with previous evidence (inter alia [8,11]) that cost is a significant determinant of voter views on climate policies. The next most important variables in voter decision-making are which industries are subject to the policy (15.9) and which parties have endorsed the policy (18.0). The relatively high value of policy scope in voter decision-making has been undercovered in previous literature, but my research suggests voters rely heavily on it as an information shortcut. The importance of partisan endorsements is in line with previous literature which has found partisan endorsements to have a large impact on voter views towards climate policies [inter alia 62–64].

While there is a statistically significant difference between the first and second most important variables (cost and endorsement) and between the second and fourth most important variables (scope and revenue usage), there was not a significant difference between the second and third variables (scope and endorsements) placing them in effectively a statistical tie. The three most important attributes (cost, scope, and endorsements), represent half of the attributes I tested, but they collectively have a relative value (70) more than twice that that of the other three attributes (30).

My remaining three attributes (revenue usage, policy form, and policy level) account for the remaining 30 relative value of voter decision-making, but they are not equal in their influence. Revenue usage has a relative value of 14.9, statistically less than scope and endorsements but statistically more than policy form or level. This still-significant role for revenue usage is in line with previous findings [inter alia 23, 1]that the allocation of revenue from climate policies can significantly impact voter support for or opposition to that policy.

In a statistical tie for least influential of my six attributes are policy form and policy level, valued at 10.2 and 5.0 by voters, respectively. The low influence of policy form is surprising in the light of significant previous evidence from [1,11,65,66] that the form of a given climate policy can significantly impact voter support for that policy. While there is still a statistically significant difference between voter views on different policies (see my discussion of whole-

sample level partworths below), the overall importance of policy form to voter views on climate policy is far less than that of more salient attributes such as the cost of the policy.

The relative importance of policy level to voter decision-making about climate policies is not well covered by existing research making my contribution here especially relevant. My results indicate that the question of which level of government is enacting climate policies is far less important to voters than other policy design variables. These results also indicate that voters care deeply about not only the politics of the policy but also about the details of the policy itself; policy design variables collectively have a relative value of over 80. For climate policies, in other words, it is not enough for a given policy to simply be endorsed by one's political party, rather, the devil is indeed in the details.

There also appears to be a correlation between how accessible a variable is and how heavily voters rely on it when picking climate policies. Easily understood shortcuts such as cost and endorsement are valued far more than complex shortcuts such as policy form or level.

How do voters value attribute levels?

Attribute weight does not tell the whole story, however. It is also important for policymakers to consider the relative value, positive or negative, that voters place on different levels of each attribute. A voter may value the distribution of benefits approximately 4 times more than the policy level, but if voters feel strongly about switching from one policy level to another, a change in Level may have a larger net impact on the overall relative value than a change in benefit distribution.

Estimating level values

For each level, I calculate the relative value that it has for voters. A positive value indicates that the inclusion of that level is valued positively relative to the alternatives, a negative value indicates that the inclusion of that level is valued negatively relative to the alternatives. For each level a 95% confidence interval is calculated, so it is possible to state both the relative impact of a given level and whether that level is statistically significant. These results are shown in Fig 2.

Voters are most sensitive to changes in variables which measure the distribution of costs and benefits: cost, revenue usage, and policy scope. In my experiment, policies that cost similar to contemporary estimates of Americans' willingness to pay for climate mitigation [1,17] $11.2 or $192 per year, received positive relative values of 19.5 and 9.3 over baseline. Policies that cost dramatically more than Americans are typically estimated as willing to pay for climate policy, ($768 or $3072 per year), on the other hand, received an average negative relative value of -3.9 and -24.9. It is possible that the treatment of cost is exaggerated slightly by the values chosen (compared to other studies, such as [14], who found cost to be a primary factor but not as dominant as my results). As stated in my theory section, however, I consider the range of levels in my experiment to better represent the wide range of proposals currently on the table in the United States, and thus better represent a decision making environment voters are likely to find themselves in. For example, in the 2020 general election voters found themselves choosing between a candidate whose climate proposal would have cost $200 billion a year or $1639 per household (right in the middle of our range), while his opponent's climate platform would have cost almost nothing. Additionally, my results are in line with recent findings from [67], who find cost to be a dominant factor in citizen preferences around carbon taxation particularly among low-income respondents. The cost level attributes had the greatest difference of any level attributes, underscoring how price-sensitive consumers are to climate policies and the salience of cost in the minds of voters.

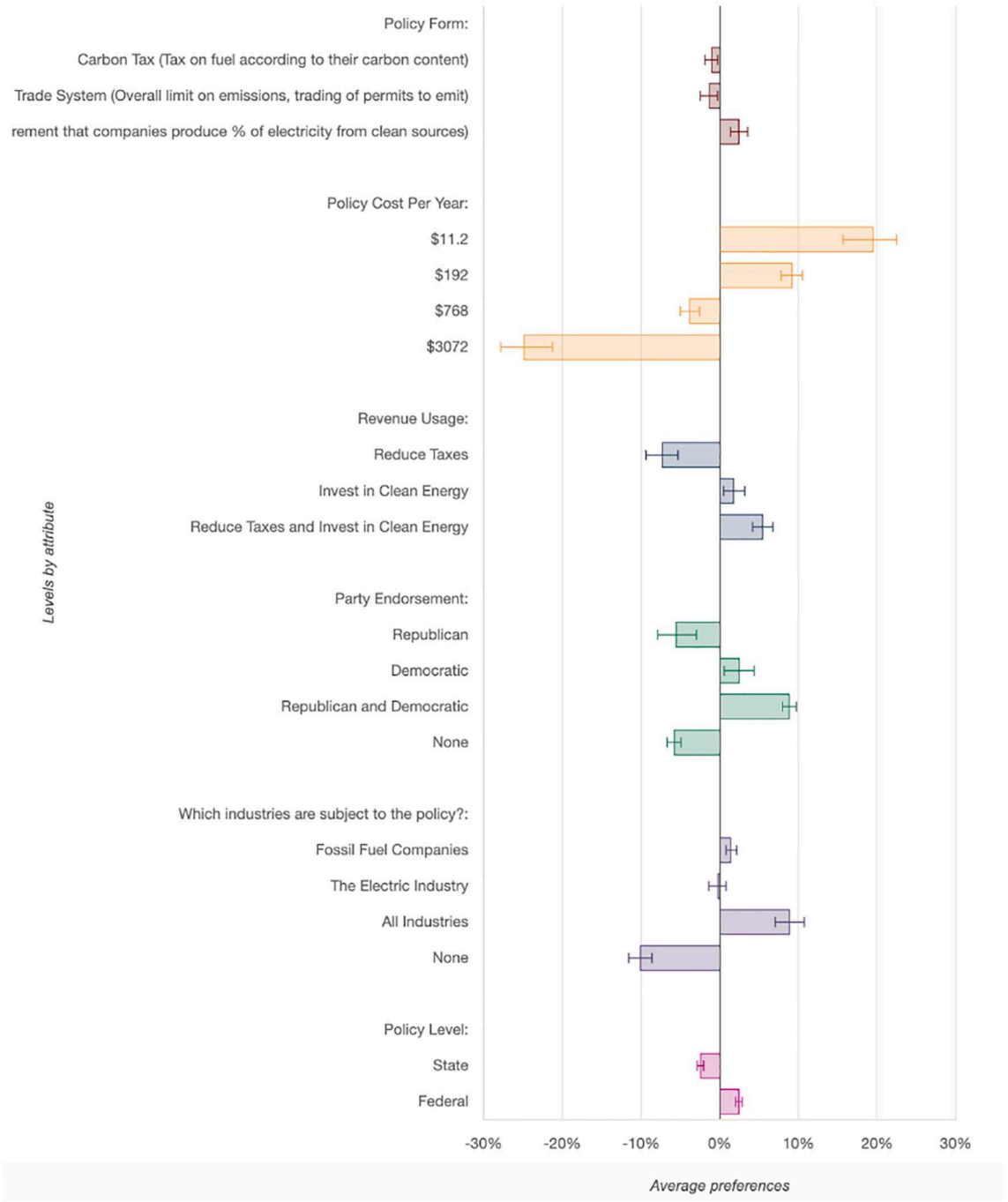

Fig 2. Voter preferences for attributes by level.

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In order to view how different demographic factors may vary patterns in climate policy preferences, I calculate partworths for partisan, gender, and demographic subgroups. While there were, predictably, some differences in preferences (particularly among partisan subgroups), the most remarkable outcome of my subgroup analysis is the extent to which climate policy preferences persist across partisan, racial, and gender lines-lines that are sharply divisive

when it comes to voting behavior. I focus on partisanship over other demographic subgroups below because across all subgroups divided by gender and race, there was not a single statistically significant difference between voter prioritization of a given attribute, with voters agreeing on which variables were the most important, least important, and the order in between.

As mentioned above, there were some key distinctions between partisan subgroups in the extent to which they valued different variables, although the overall *order* remained the same. Republicans were more sensitive to cost. While cost is still the most important attribute in the decision-making of voters from each category, there is a statistically significant difference between the importance placed upon cost by Democrats (31.5) and Republicans (42.8). The difference between the relative value of cost was far less pronounced between Democrats (31.5) and Independents (33.6), but the difference was not statistically significant due to the large size of the Independent confidence interval.

For the "policy form" level partworths calculated using all responses, there was a statistically significant difference in voter preferences between the clean energy standard and the two carbon pricing options, with a clean energy standard having a 2.5 positive value, compared to a -1.1 negative value with a carbon tax and a -1.4 negative value for a cap-and-trade system. There was not a statistically significant difference in level partworths between the two types of carbon pricing.

When it came to level partworths there were also some differences among demographic subgroups worth noting, but again, the story was one of remarkable consistency. Across partisan subgroups voters demonstrated cost sensitivity, preferring cheaper policies to more expensive ones, but Republicans were more cost-sensitive than Democrats, with Independents falling in the middle. Voters across subgroups consistently prioritized green investment over tax reduction in line with previous literature [inter alia 23,24], although given a choice to distribute revenue over multiple priorities, voters generally tend to "spread the wealth around" while still allocating a greater percentage of funds to renewable energy than to reducing taxes [16]. While this identical prioritization contradicts the topline assertion from [1] that conservatives tend to prioritize tax reduction and liberals tend to prioritize clean energy, I still provide evidence that revenue usage preferences differ among subgroups in a statistically significant manner. Specifically, there is a statistically significant difference between Republican and Democratic level partworths, with a policy that only reduces taxes valued at -5.5 by Republicans and -9.4 by Democrats. It is important to recognize that a negative value on reducing taxes does not mean that, ceteris paribus, voters dislike reducing taxes, rather it confirms earlier findings that voters prefer to use revenues for climate on a diverse set of priorities. I acknowledge that interpretation of my revenue usage variable may have varied based on if the policy was set at the Federal or State level, since the taxes available to reduce at the State level are different from those available for reduction at the Federal level. The randomized way that conjoint experiments operate prevented me from specifying what exact tax reductions would take place in either situation. Existing work on preferences for revenue allocation from carbon taxes [17] offers a reasonable proxy: among different types of taxes, voters support reducing income taxes the most and corporate taxes the least.

Voters also matched in their preference of policies that treat all industries equally to those which only target certain industries or those which fail to specifically outline their target industries. This is a promising finding for advocates of climate change policies, given that sectoral policies are by definition, on their own, unlikely to achieve the economy-wide net-zero-emissions goal that is necessary to mitigate the worst effects of climate change [68]. Policies that apply equally to all industries also avoid attacks leveled against previous climate policies such as the 2018 Washington Carbon Tax, which was attacked for being "Filled With Unfair Exemptions That Make No Sense" [69].

The preference for federal over state policies was also consistent, with Republicans slightly less enthusiastic about federal policies than Democrats or Independents, the differential was not statistically significant.

There was one notable exception to consistency across subgroups. Hispanic voters bucked other subgroups on two occasions, preferring state policies to federal ones and being more friendly to tax cuts than other groups. Previous literature [inter alia 70,71] has pointed out that the climate policy views of Hispanic voters differ from those of the general population, my findings substantiate that proposition. When combined with Hispanic voters' status as the fastest growing voting bloc in America [72], this highlights the importance of future research on Hispanic climate policy views.

Endorsements: The "Republican penalty"

The consistency across subgroups continued to party endorsements: across all three partisan subgroups, voters preferred policies that were endorsed by both the Democratic and Republican parties to policies supported by just one party or none at all to a statistically significant degree. Both Republicans and Democrats preferred policies that were endorsed by both parties to ones that were only endorsed by their own party, while Independents also placed the greatest value on bipartisanship, they preferred policies endorsed by only the Democratic party to those only endorsed by the Republican party, with the difference being statistically significant. Even Republicans slightly favored policies only endorsed by the Democratic party to those only endorsed by the Republican party, although the divide between those two level partworths was not statistically significant.

Voters were also suspicious of policies that lacked a partisan endorsement of any type, rather than attract additional support; these "nonpartisan" policies received less support across all subgroups than policies endorsed by only the Democratic party or those endorsed by both parties. All other factors equal, in other words, voters tend to prefer liberal partisanship or bipartisanship to a lack of nonpartisanship. In addition to persisting across partisan lines, these findings were also consistent across gender and racial subgroups, with no statistically significant variance in voter preferences along either of those dimensions. The persistence of the divide across partisan subgroups helps eliminate the possibility that the "Republican penalty" was due to disproportionate Democratic dislike of Republican only policies: while there was a statistically significant difference in the size of the "Republican penalty" among different partisan subgroups, ranging from -10.6 with Democrats to -2.2 with Republicans, the persistence of the penalty across all subgroups renders this explanation an insufficient one. Rather, all data signs point to both a voter reward of bipartisanship across the partisan spectrum and an electorate-wide suspicion of the Republican Party on solutions to climate change, perhaps not surprising, given the Party's decades-long history of climate denialism [73].

Across racial, gender, and partisan dimensions, my most notable finding was not the difference between subgroups preferences but rather their consistency: across all subgroups, there was not a single statistically significant difference between voter prioritization of a given attribute, and the relative order of attributes was also identical (with any variation not being statistically significant). This means that across a swath of traditionally divided subcategories, voter climate policy preferences depend on roughly the same attributes, and voters prioritize those attributes in a statistically similar manner. In many ways, this may simplify the job of the climate policymaker: if you are weighing which attributes of a policy are the most important to your target audience, that answer will often be the same regardless of that audience's composition. My research clearly shows that sometimes policy choices matter a great deal to public

opinion, and other times policymakers should be free to optimize policies for emissions reduction rather than political appeal.

Discussion

I close with four sections. First, I address a concern readers may have about the realistic nature of low cost, high impact climate mitigation policies. Second, I discuss the role of political mobilization in turning these priorities into policy reality. Third, I examine the three major pieces of climate legislation passed at the federal level in 2021–22 and the extent to which their success reflects my findings. Finally, I close with findings for advocates of future climate mitigation policy.

Are low cost policies realistic?

My experimental results clearly show a significant difference between low cost and high cost policies when it comes to voter support. A natural question is if large scale climate mitigation policies are even possible at such low cost levels. I make two points to assuage this concern. First, as my analysis of the Inflation Reduction Act (below) shows, it is possible to construct policies that raise revenue progressively, imposing higher costs on affluent voters and large corporations and ensuring costs for ordinary voters are small. Second, since clean energy policies are a form of economic stimulus, many types of climate spending generate economic growth which in turn generates additional tax revenue. A 2013 analysis by McKinsey found 20 carbon mitigation policies with a net-zero or negative abatement cost, indicating a wide suite of options for low cost, high-scale carbon mitigation policy [74].

What role does mobilization play?

My experiment has demonstrated the preferences of voters when presented with sets of hypothetical climate mitigation policies, however I recognize that what policies voters will actually turn out to support can be confounded by which policies organizations such as environmental groups choose to get behind. If there is a large divergence between the types of policies groups mobilize support for and those that voters support in my experiment, the applicability of voter views to their actual voting behavior may be muddied. However, I argue that the impact of this confounding tends to be minimal, since groups tend to advocate for policies they think voters will support, rather than the policies they think are, all else equal, best. This can be seen in both electoral and legislative contexts.

In the electoral context, Washington voters decided on a pair of state carbon tax referendums in 2016 and 2018, one of which would have cut taxes and one of which would have invested in clean energy. Matching the preferences of voters in my experiment, groups such as the Sierra Club mobilized support for the tax that invested in clean energy but opposed the one that focused on reducing taxes [19], increasing support for the tax they supported relative to the one they opposed. The political element of the Washington referendums went beyond policy differences, however, and included divides on political strategy between referendum sponsors and environmental groups, which further hindered the former's efforts at political mobilization [1]. And in the legislative context, all three major climate bills that have passed Congress in the last decade have received enthusiastic backing from environmental groups and matched the preferences of voters in my sample (see the next section).

At the same time, for the last few congressional sessions, advocates have introduced carbon pricing legislation in the House of Representatives of the type that voters in my sample oppose (based on bills from the Citizen Climate Lobby and Resources for the Future Carbon Pricing Trackers). Those proposals have attracted at best lukewarm support from environmental

groups and have gone nowhere (in a review of the abovementioned bills by the author the strongest endorsement of a carbon pricing bill I could locate was "a step in the right direction" by the EDF for the Energy Innovation Act-hardly a ringing endorsement). Given political mobilization appears to work to amplify voter beliefs, this makes my findings more relevant to the electoral context, and especially to those groups seeking to mobilize support for further climate action.

Political mobilization is only one medium through which voter preferences are moderated in the policy process. The United States is not a direct democracy at the federal level, and there are a number of mechanisms which may confound the translation of climate policy preferences into law.

- Opposition, in elections or the policymaking process, from individuals or industries (e.g. the fossil fuel industry) with a vested interest in preventing the passage of such legislation.
- A media environment conducive to the spread of climate misinformation, which can provide a further counterweight against the passage of such legislation.
- Lack of knowledge on the part of representatives or their staff about their constituents or the public's preferences on climate policy.

The following section of my discussion outlines the conditions under which Congress has recently successfully translated voter climate preferences into law.

Legislative evidence for my results in practice

In the year after my survey was in the field, Congress broke its decade-long drought on climate mitigation policy with the passage of three bills with significant climate mitigation components: the CHIPS Act, the Bipartisan Infrastructure Bill (BIB), and the Inflation Reduction Act (IRA). Passage of all three involved the construction of durable coalitions for climate policy in a tightly divided Congress, something not achieved since 2009. Close analysis of these three bills show the success of my principles in practice. All three bills had either bipartisan (CHIPS and BIB) or Democratic-only (IRA) support, kept costs on ordinary voters low, applied across the economy, and provided a wide range of benefits. I offer evidence for each of these points below:

- Strong Bipartisan or Democratic support: Unlike failed previous legislation such as the Waxman-Markey Cap and Trade Bill (2010) and the BTU tax (1993), the three above pieces of legislation attracted strong Bipartisan or Democratic support. CHIPS and BIB both passed the Senate with supermajority, Bipartisan support, while the IRA passed both houses with unanimous Democratic support-notable, since Waxman-Markey and the BTU tax both failed due to opposition from within the Democratic party itself. Strong signals of elite support likely boost public support more than a bill that attracts opposition from within its own sponsoring party. Given the high historical polarization around climate change, one might reasonably question if bipartisan climate policy is realistic. CHIPS and BIB show that it is, with the caveat that it seems most likely to succeed when packaged in a broader bill with bipartisan support, rather than standing on its own. The opportunity for such bills are not unprecedented: mandatory yearly funding bills are a good example of bills that regularly pass Congress with bipartisan support, and to which climate riders could be attached.
- Keeping costs low: While the per-capita cost of the three bills was not low (they collectively contained $509 billion in climate funding), they kept the cost for ordinary voters low

through their financing. Unlike a carbon tax, which is regressive [75], the three bills drew their revenue largely from non-tax funding mechanisms (such as auctioning federal broadband or allowing Medicare to negotiate prescription drug prices) or highly progressive taxes (such as an excise tax on stock buybacks). Avoiding the type of broad-based tax or utility bill increases inherent in carbon pricing likely helped buoy the bills' support.

- Applying across the economy: All three bills spread their emissions reductions across the economy, rather than concentrating on a single industry.
- Providing a variety of benefits: Each of the three bills spread its climate funding across a variety of programs, from climate-friendly farming, to electric car credits, to nuclear energy R&D. Many of these programs (particularly in the IRA) involved lowering the cost of green alternatives to fossil fuel consumption rather than penalizing fossil fuel consumption-a carrot-over-stick approach that, coupled with the low cost of the bills to the average voter, helped ensure that the value of the bills to most voters was quite high.

Findings for climate advocates

I close with 4 recommendations for advocates of future climate mitigation policies:

- While differentiated messaging between subgroups is valid, a uniform approach may be nearly as effective. Given that voters across the political spectrum prioritize the same order of attributes when deciding their position on a given climate policy, and the same order of possibilities within those attributes, a uniform message may be more effective than previously thought.
- Ensure costs on regular voters are low. Given voters' high cost sensitivity between low cost and high cost climate mitigation policies, it is wise to focus on policies that raise revenue in a progressive manner and/or are highly stimulative to economic growth and tax revenue.
- Draw Bipartisan elite sponsorship if possible but do not dismiss Democratic-only policies as long as elite support is strong and other criteria are met. Under existing conditions, Republican-only policies are unlikely to be competitive, since they are discounted even among their own voters.
- Provide a wide suite of benefits, prioritizing investments in clean energy. This is another point in favor of prioritizing carrots and "green industrial policy" over any type of carbon pricing. Voters prioritize benefit distribution over wonky details such as the form of the policy.

Supporting information

S1 Text. SI 1.1: Model For Voter Decision-making on Climate Mitigation Policy. SI 1.2: Cost and Benefits Rationale. SI 1.3: Reweighting Procedure. SI 1.4: How to Calculate Partworth Utilities. SI 1.5: Strength of Model. SI 1.6: Consent and survey materials.
(DOCX)

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