What drives support for inefficient corrective policies? Evidence from a Nevada ballot initiative

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I use an information provision experiment conducted around a vote on Nevada's renewable portfolio standard (RPS) to understand voter preferences for externality-correcting policies: First, I leverage exogenous variation in respondent beliefs induced by the experiment to model policy support as a function of voter perceptions of policy attributes (cost, effectiveness, and regressivity). I find that voting behavior is relatively unresponsive to perceived cost and perceived regressivity, but relatively responsive to perceived policy effectiveness. Using this model, I decompose differences in support for a performance-based policy (Nevada's RPS) and a hypothetical price-based policy (a carbon tax). Oaxaca-Blinder decompositions imply that differences in perceptions of policy attributes explain just 23% of the gap in support between RPS policies and carbon taxes, suggesting a significant role for "tax aversion." To the extent that misperceptions of policy attributes do explain differences in support for these two policies, the explained gap results from overly optimistic beliefs about RPS attributes. To conclude, I predict voting behavior several under counterfactual scenarios. I find that targeting revenue toward "swing" voters is unlikely to significantly improve support for carbon taxes. Instead, the results of this experiment highlight the necessity of communicating to voters the efficacy of price-based policies.

JEL Codes: Q480, Q580, H220, H230, D72, D90
Keywords: Voting, tax incidence, misperception, corrective taxation, equity

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1 Introduction

Negative externalities are often regulated with performance standards or quantity thresholds where economic theory suggests that price-based mechanisms offer a more cost-effective alternative. Examples include the US Corporate Average Fuel Economy standards, low-carbon fuel standards, and the US Clean Air Act. While certain inefficient policies can be tied to regulatory capture or legislative lobbying, the ubiquity of performance regulation also reflects the preferences of US voters. Standard-based policies for reducing state-level electricity emissions, for example, enjoy bipartisan voter support, where state-level carbon tax ballot initiatives have repeatedly failed in the US. Among the many idiosyncratic attempts to explain voter's aversion to price-based regulation, a 2018 meta-analysis highlighted cost salience, perceived (in)effectiveness, and fairness concerns as common themes. (Carattini, Carvalho, and Fankhauser, 2018). A robust voting literature demonstrates that these three considerations also matter in other settings: In general, voters tend to prefer policies that they perceive as cheaper, fairer, and more effective (Healy, Persson, and Snowberg (2017), Huber, Wicki, and Bernauer (2020), Kuziemko, Norton, Saez, and Stantcheva (2015)).

Under these preferences, it is puzzling why voters routinely support performance standards over price-based policies. Given the cost-effectiveness of Pigouvian taxation and the ability of governments to pair these policies with redistribution, it should be possible to construct a price-based regulation that is superior to a performance-based regulation on at least one of the three dimensions of efficacy, fairness, or cost, holding fixed the others. One explanation for the tension between voter's stated preferences and policy attributes is that voters are misinformed. A growing literature has documented voter misperception of policy features (Sapienza and Zingales, 2013), lending credibility to early models of voter inattention proposed by Downs et al. (1957), Sims (2003), and others. Positively attributing qualities of voter behavior to misperceptions, however, is a difficult empirical question. While demonstrating misperception is relatively straightforward, drawing causal conclusions drawn from stated preference data may be confounded by omitted variables, or suffer from incentive-incompatible survey formats.

In this paper, I solve these identification problems using an information provision experiment conducted around a vote on Nevada's Renewable Portfolio Standard (RPS). The variation induced by this experiment allows me to study how voters *perceive* and *respond to* policy attributes. The information provision experiment had three stages: First, I surveyed a pool of Nevadans on their support for both a 50% RPS (which was on the ballot in Nevada in 2020) and for a hypothetical alternative price-based policy (a $25 dollar carbon tax). I also recorded their initial perceptions of the cost, effectiveness, and regressivity of these policies. Second, I provided respondents with source-randomized information about these policies. And third, in a follow-up survey I recorded voting behavior and posterior beliefs about both of these policies.

Leveraging the variation in beliefs about policy attributes induced by this information provision experiment, I estimate logit and linear models of voter support for corrective policies. These models allow me to answer three research questions: First, how do voter perceptions of policy attributes (cost, effectiveness, and regressivity) influence voter behavior? Second, do misperceptions of policy attributes explain voter preferences for nontax corrective policies? And third, given the answers to the aforementioned questions, can policy design or information provision bolster support for price-based corrective policies?

Results from the initial survey confirm that respondents prefer the performance-based policy (RPS) to the price-based policy (carbon tax), and suggest significant inaccuracy and bias in beliefs about the attributes of these policies. For example, on average, respondents believed that Nevada's 50% RPS would generate emissions reductions roughly five times larger than estimates from academic research. Using variation in beliefs induced by the information provision experiment, I recover elasticities of policy support with respect to perceived policy attributes. I find that respondents are relatively unresponsive to perceived policy cost and perceived regressivity: The largest elasticities admitted by the 95% confidence interval on the *cost* coefficient suggest that decreasing

the average voter's perception of a given policy's cost by $1000 annually (roughly 4 times the mean cost) would increase the probability that the voter supports said policy by just 1.3 percent. Conversely, I estimate that policy support is relatively elastic with respect to perceived policy effectiveness.

Armed with models of voter behavior, I then investigate the extent to which (mis)perceptions of policy attributes explain the gap in policy support. While misperceptions of policy attributes are significant, Oaxaca-Blinder decompositions suggest that they do not explain a large portion of the gap in support between the two policy types. According to my estimated models of voter behavior, holding fixed perceptions of all policy attributes, Nevadan voters are still 13.8% more likely to support Nevada's RPS than they are the carbon tax alternative. To the extent that differences in perceptions of policy attributes do explain the premium that respondents placed on RPS policies, my estimates suggest that this is largely a result of their overly optimistic views of the effectiveness of these policies. Finally, I use these estimated models of voter behavior to investigate several counterfactual scenarios, which generally demonstrate the difficulty in achieving majority support for carbon taxation either through policy design, or information provision.

2 Related Literature

My research is connected to the existing economic literature in three ways.

First, studying how and whether voters respond to policy attributes is related to the existing literature on the rationality of voters. A substantial portion of this literature is devoted to empirically testing for behavioral 'types.' For example, it has been demonstrated that voters are sociotropic (Hansford and Gomez, 2015), retrospective Bischoff and Siemers (2013), and time-inconsistent (Banzhaf and Oates, 2012; Dell'Anno and Mourao, 2012).

It has also been previously noted that voter irrationality or misperception may lead to inefficient policy. Downs et al. (1957), for example, argues that rational ignorance (resulting from the low probability of any individual vote changing an electoral outcome together with the costs of acquiring information) could lead to inefficient policy. Alternatively, Caplan (2001) presents a model of rational inattention where voters actively resist updating their priors because they have preferences over *beliefs*. That is, religious and social identities lead people to prefer holding certain beliefs over others. He argues that inefficiencies arise from the externalities borne of this inattention: The private cost of inattentive activity is near zero, but in aggregate these actions lead to sub-optimal policy.

My research will tangentially touch on two specific voter types: *inattentive* and *altruistic*. The choice to directly test for voter altruism reflects voter model advances by Jankowski (2007) and Edlin, Gelman, and Kaplan (2007), who added 'social preferences' to the egoist model of voter decisions as a way of solving the paradox of voting. Models that allow for altruism have also been substantiated in laboratory experiments (Fowler (2006); Dawes, Loewen, and Fowler (2011)). Recent work has also demonstrated significant misperceptions of the costs and benefits of public policies (Blaufus, Chirvi, Huber, Maiterth, and Sureth-Sloane, 2020; Stantcheva, 2020; Sausgruber and Tyran, 2011), which impairs the ability of voters to choose optimally between options regardless of altruism. Taken together, this body of work provides a strong case for why voters may not follow the 'pocketbook' model implicitly assumed in many early models of voter behavior.

Second, this paper relates to a significant body of work investigating the prevalence of inefficient policies. Although none of my research questions explicitly require the policy in question to be efficient, the answer to these questions will allow me to contribute to a more general conversation on the political economy of efficient policies.

The political Coase theorem (PCT) is a central idea in the study of the (in)efficiency of institutions and policies. It stipulates that political actors should agree on policies that maximize efficiency, regardless of the original distribution of political power (Vira, 1997). This principle fails in many settings (Acemoglu, 2003).

Prominent examples include unpriced road congestion, limits on free trade, and reliance on inefficient standards to regulate air pollution and vehicle emissions.

Broadly speaking, commitment and rent-seeking have been proposed as explanations for the failure of states to enact policies that could make everyone better off: North and Weingast (1989) first outlined why commitment issues may undermine the political Coase theorem: The ability to enforce contracts is crucial to a functioning Coase theorem. Because one of the parties entering into a political contract (the state, or a politician) is granted enforcement power, they cannot commit to not using this power to later alter the contract. With no guarantee that gains from an efficient policy will be distributed to citizens, voters are reluctant to pledge their support to policies or platforms that promise to improve efficiency. This idea was formalized in a game-theoretical model by Acemoglu (2003), and has been demonstrated empirically to suppress support for efficient policies Galiani, Torrens, and Yanguas (2014).

Special interest groups also contribute to the failure of the political Coase theorem. Rent-seeking was first introduced by Tullock (1967) and Krueger (1974), who both describe how this behavior leads to inefficient *outcomes*. Several models describe how rent-seeking could similarly lead to inefficient *policies*: Acemoglu and Robinson (2000), for example, models a monopolist who has the political capital to oppose the introduction of a new efficient technology in order to preserve rents, Becker (1983) models policymaking as competition for political pressure between taxpayers and special interests, and Grossman and Helpman (1994) model political contributions as bids that determine subsequent policy. Empirical studies have demonstrated lobbying's influence on efficient policies in several settings, including climate policy (Meng and Rode, 2019) and free trade Goldberg and Maggi (1999).

This paper will contribute to understanding the completeness of the current criticisms of the political Coase Theorem. In a setting with an independent judicial system, ballot initiatives effectively solve the commitment problem that plagues the political Coase theorem in other settings. The results from this paper will speak to whether misperception of policy attributes erodes the probability that political actors to correctly identify and support efficient policies.

Lastly, the methods I use to investigate voter responsiveness are synthesized from a suite of papers that leverage misperception and information provision to understand how beliefs map to actions. Broadly, these papers identify the causal effect of changing beliefs on actions by first eliciting priors (in an incentive-compatible way) about the cost or benefit associated with some outcome (e.g., a tax, good, or insurance policy), and then randomizing information treatments. By matching actions (e.g., support, purchase, or uptake) with posterior beliefs, the econometrician can produce causal estimates for how beliefs change the variable of interest. These methods have been used to understand behavior in a wide range of settings, including preferences for income redistribution, (Kuziemko et al. (2015)), preferences over relative income (Bottan and Perez-Truglia, 2017), participation in political protests, (Cantoni, Yang, Yuchtman, and Zhang, 2019), perceived incidence (Rees-Jones and Taubinsky, 2016), female labor force participation (Bursztyn, González, and Yanagizawa-Drott, 2018), and support for carbon taxation (Douenne and Fabre, 2020).

3 Background: State-level emissions policies in the US

In this section, I provide a brief overview of two varieties of state-level carbon emissions policies in the united states, and touch on the political and efficiency considerations of each type of regulation.

The US does not currently regulate emissions of carbon dioxide at the federal level.[1][2] Instead, to the extent that US carbon emissions are regulated, this is accomplished through a patchwork of state-level policies. In this study, I contrast two large-scale policies emissions policies: *Renewable portfolio standards* and *carbon pricing schemes*.[3]

Renewable portfolio standards are policies designed to reduce emissions from state-level electricity grids by mandating a shift toward renewable generation. While the details of RPSs vary across states, these policies generally require that a specified fraction of all electricity sold by utilities be generated from renewable sources.[4] Additionally, RPSs allow utilities to come into compliance by purchasing renewable electricity credits (RECs) from other utilities that exceed the RPS requirement. These policies are the most prevalent state-level carbon emissions policies: as of 2020, 30 states have instituted RPSs, and seven states have adopted similar non-binding renewable energy goals.

RPSs have been criticized for failing to incentivize decarbonization in the electricity sector along all possible margins (Reguant, 2018). RPSs do not, for example, provide incentives for utilities to supply electricity from relatively clean fossil sources (natural gas) over relatively dirty fossil sources (coal). Similarly, as with all output-based performance standards, RPSs introduce a second inefficiency via an implicit subsidy to overall production (Goulder, Long, Lu, and Morgenstern, 2019). Consistent with these inefficiencies, estimates of the price of CO_2 emissions avoided by RPSs tend to exceed most estimates of the social cost of carbon (Greenstone and Nath, 2019).

A smaller number of states (see Figure 1) have instituted price-based schemes as a means for reducing state-level emissions. These are the Regional Greenhouse Gas Initiative (RGGI), covering 10 Northeastern States, and California's Cap-and-Trade system, established in 2010 under AB32, and Washington state's Clean Air Rule, established in 2016. These policies allocate permits for carbon emissions and allow emitters to trade these permits. The overall number of permits available decreases over time in accordance with the idiosyncratic climate goals of the state or region. By tying compliance to total emissions rather than renewable generation, a price-based policy will equate the cost of emissions abatement across all possible margins, thereby achieving any given emissions reduction at the lowest cost (Boyce, 2018; Wilson and Staffell, 2018).

Despite the efficiency advantages of price-based emissions policies, they remain rare in the US. The paucity of carbon pricing or trading schemes reflects failures to pass policies both legislatively and electorally. Carbon tax ballot initiatives failed in Washington State in 2016 and 2018, and propositions failed to meet the signature requirements necessary to make the ballot in 2020 in both Oregon and Utah. Since 2018, bills instituting carbon pricing have failed in the state legislatures of Connecticut, Hawaii, Maryland, Massachusetts, Minnesota, Montana, New Hampshire, New Mexico, New York, Rhode Island, Texas, Utah, and Vermont.[5] As an anecdote illustrative of the political advantage enjoyed by renewable portfolio standards over carbon pricing schemes, 4

[1] Exceptions include Corporate Average Fuel Economy Standards (CAFE) and federal tax incentives for renewable production

[2] Several bills have failed in Congress, including the Climate Stewardship Act (in 2003 and 2005), the Global Warming Pollution Reduction Act (2007), and the American Clean Energy and Security Act (2009). The Clean Power Plan, first proposed by the EPA in 2014, was repealed by President Trump in 2017.

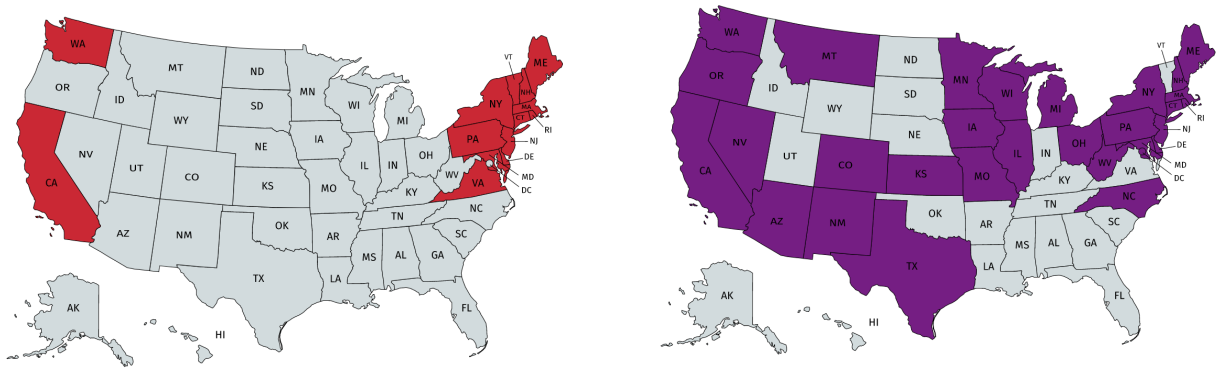
[3] Two other large-scale electricity policies are worth mentioning: feed-in tariffs and production subsidies. For a comprehensive analysis of the efficiency qualities of each of these policies, see Reguant (2018).

[4] "Renewable" sources generally include wind, solar, geothermal, and biomass. In some cases, hydroelectric and/or nuclear power are also included as "renewable" or "clean."

[5] See the legislative tracker maintained by *Price on Carbon*.

of these states (Connecticut, Massachusetts, New Mexico, Maryland) increased their RPS standards within two years of rejecting a carbon tax senate bill (EIA (2018, 2019)).

In the remainder of this paper, I leverage an RPS level increase in Nevada to understand how perceptions of the attributes of these policies informs support for both price- and performance-based emissions policies.



(a) Carbon Pricing Schemes

(b) Renewable Portfolio Standards

Figure 1: State-level emissions policies in the US

4 Setting: Nevada Question 6

Nevada's Question 6 was an instituted constitutional amendment that was approved by Nevada voters during the 2020 election. This amendment increased Nevada's Renewable Portfolio Standard from requiring that 25% of the State's electricity come from renewable sources by 2030 to requiring 50% by 2030. The ballot language for Question 6 is as follows:

> ***Question 6***
>
> *Shall Article 4 of the Nevada Constitution be amended to require, beginning in calendar year 2022, that all providers of electric utility services who sell electricity to retail customers for consumption in Nevada generate or acquire incrementally larger percentages of electricity from renewable energy resources so that by calendar year 2030 not less than 50 percent of the total amount of electricity sold by each provider to its retail customers in Nevada comes from renewable energy resources?*

This initiative passed with 57.94% support. There are two peculiarities of this initiative worth noting: First, this initiative was also on the ballot in 2018, as initiated constitutional amendments in Nevada require passage in two consecutive even-year elections. The 2018 initiative passed with 59.28% support. Second, the Nevada State Legislature had already adopted a 50% RPS target via SB 358. Because subsequent state legislatures could easily change this target, this 2020 initiative was advertised as bill to prevent backsliding of the RPS target. Nevada does not have a carbon pricing system, nor has it voted on a carbon pricing system through either a ballot initiative of a senate bill.

5 Survey Design

5.1 Participants

I recruited participants through three online platforms: Prolific, Amazon's CloudResearch, and UC Berkeley's Xlab. The survey was made available only to users on each platform who had registered as residents of Nevada, and who were 18 years old or older. To verify that respondents did not take the survey on multiple platforms, the survey presented to users on the *XLab* and *Prolific* platforms screened participants based on whether they had accounts with the other platforms.

Obtaining a sufficiently large sample was a significant challenge due to the relatively low number of Nevadans on these online platforms. I received 359 responses to the initial survey and 316 responses to the follow-up survey. Of the 316 participants who returned for the follow-up, I was able to verify (by zip code or IP address) that 275 of them resided in Nevada.

Table 1 displays the characteristics of the participant pool relative to the demographics of the Nevada Electorate. Respondents tend to be younger, are more likely to identify as Democrats, and more likely to support Nevada Ballot Question 6 than the average Nevadan voter.

To account for this demographic and ideological bias engendered by selection into these platforms, I re-weight my sample using R's `anesrake` package, following (Battaglia, Izrael, Hoaglin, and Frankel, 2009). This package implements iterative proportional fitting (or "raking"), which aims to generate a set of sample weights that best match population proportions subject to user-specified objective functions and constraints on the magnitude of weights.

Descriptive Statistics

Respondents from Prolific, mTurk, and Xlab

Variable	Sample	Sd	Electorate
Female	0.524	0.500	0.510
White	0.652	0.477	0.730
Democrat	0.502	0.501	0.500
Under 44	0.791	0.407	0.480
Over 64	0.044	0.205	0.180
Support RPS (prior)	0.751	0.433	0.570

Table 1: Descriptive statistics for the 275 Nevadans who participated in both the prior and the posterior Surveys. The first column ("Sample") displays the fraction of participants with each row's trait. The third column ("Electorate") displays the same figures for the Nevada electorate, as per the US Census.

Figure 2 – Respondent Locations by Zip Code

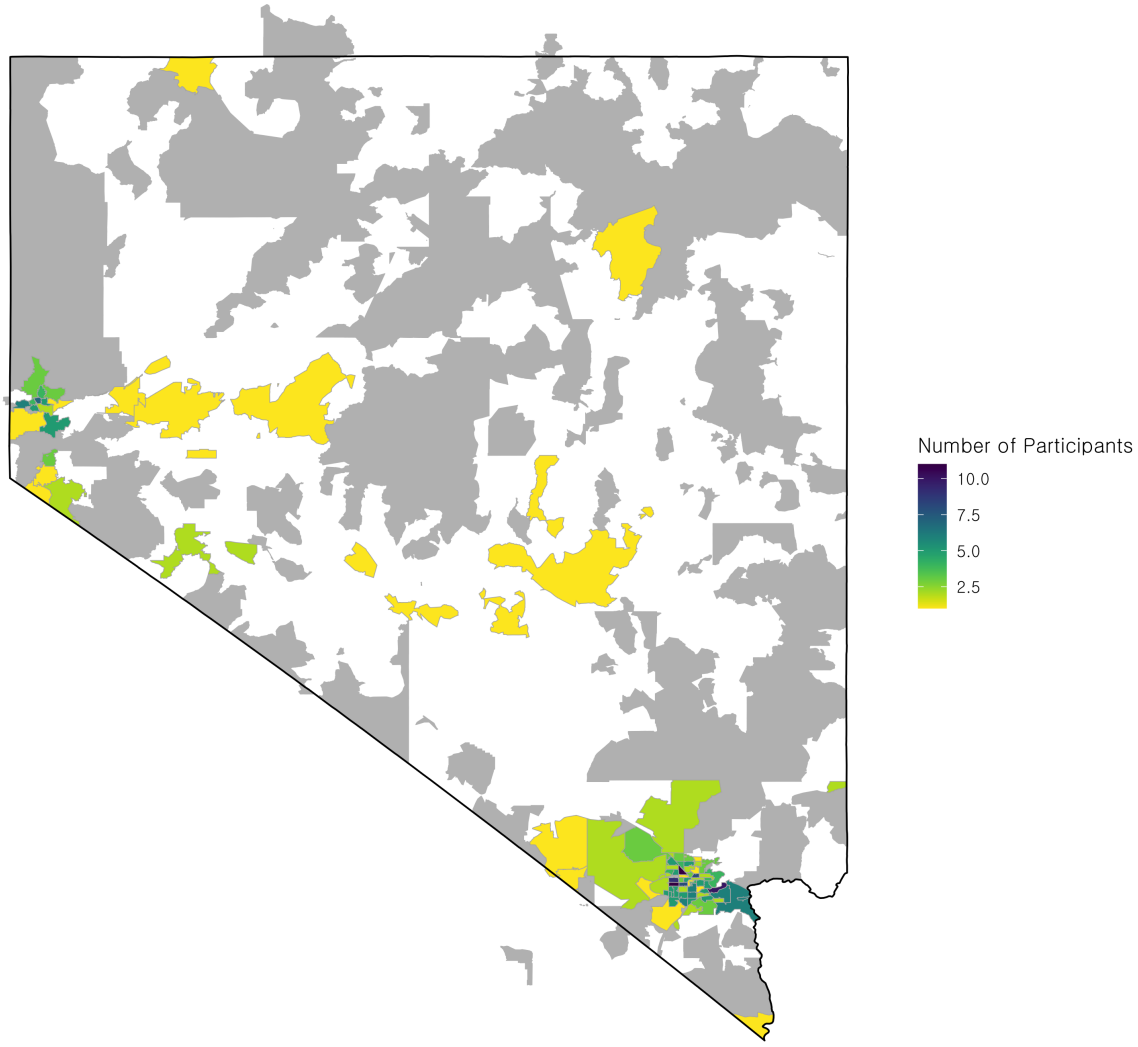


Figure 2: Locations of 275 individuals who participated in both prior and posterior surveys by zip code. The Black outline of the Nevada State border. Zip codes colored Gray did not have any respondents. White areas are uninhabited.

5.2 Information Provision Experiment

To understand how voter perceptions about policy attributes influence policy support, I solicited respondent's views on Nevada Ballot Question 6 as well as on a hypothetical price-based alternative policy, and tracked how their *beliefs* and *preferences* changed in response to information about these policies. Figure 3 shows this information with abbreviated survey questions. See Appendix A for more details.

Prior Survey (Starting October 8th)

Beginning on October 8th, 2020 I opened the prior survey to Nevada residents. The rationale for this start date was to ask voters about their preferences as close to the election date as possible, while minimizing the probability that respondents had already voted by mail (Nevada began mailing ballots on October 9th, 2020). This initial survey had three parts:

Part 1: Elicit priors. In this section, participants were shown the official text from Nevada Ballot Question 6. They were asked whether or not they planned on voting for the bill, and asked to share their beliefs on three attributes of the bill, *cost, effectiveness, and regressivity.*

To elicit beliefs about perceived (private) policy costs, participants were asked whether they believed the RPS would financially cost or financially benefit their household. Based on the response to this question, they were then asked to report how much they expected the policy to cost/benefit them per year, in dollars. To understand perceptions of policy *regressivity*, participants were asked whether they believed the RPS would financially cost or financially benefit the average low-income household (a household making $27,000 annually), and then (as in the cost belief solicitation) asked to report how much they expected the policy to cost/benefit a low-income household per annum, in dollars. Finally, participants were asked to report whether they believed that the policy would reduce CO_2 emissions in Nevada. Participants who believed that the policy would reduce emissions were asked to report how much they expected the policy to reduce total state-level emissions by 2030, in percent.

Following the information provision literature, these attribute questions were be performed in an incentive-compatible manner: before soliciting these beliefs, respondents were told that individuals that the 5% of respondents who answer these questions most accurately would be awarded a $10 bonus.

After responding to these questions about Question 6, respondents were shown a hypothetical alternative ballot initiative ("Question 7") that would impose a $25 carbon tax in Nevada and cut the state sales tax by 1.5%. The language of this initiative is modeled after Washington State's 2016 carbon tax ballot initiative (Initiative 732); the full text of this hypothetical initiative can be found in Appendix A. Respondents were asked how they would vote on this policy if it were on the ballot instead of Question 6, as well as analogous questions about cost, effectiveness, and regressivity of this hypothetical alternative initiative.

Part 2: Economic and Demographic Information In this section, respondents provided information about their age, income, energy expenditure, and employment. This information was used to tailor the information they receive about the private incidence of these policies.

Part 3: Information Provision. In this section, all participants[6] received information about the

[6] All respondents received information treatment because the goal of this experiment was to induce randomization in beliefs, not to identify the impact of information provision per se.

cost, effectiveness, and regressivity of both of the policies (the RPS and the carbon tax). Within each attribute-policy pair (e.g. the *cost* of the *carbon tax*), the respondents were randomly shown one of two possible academic information sources.

Follow-up Survey (Starting November 3th)

Beginning after polls closed on November 3rd (National Election Day in 2020), I opened the follow-up survey. The survey was only displayed to individuals who completed the prior survey, and had two parts:

Part 1: Record Posteriors and Voting Behavior. I recorded respondent's (self-reported) voting behavior on Nevada Question 6, and posterior support for the hypothetical carbon tax alternative ballot initiative,"Question 7." Additionally, I collected posterior beliefs on cost, effectiveness, and regressivity for both initiatives using the same questions outlined above.

Part 2: Record Additional Voter Information. The final stage of the survey involved collecting information that may have 'primed' voters toward certain responses had it been collected prior to eliciting beliefs. This information includes political affiliation, voting method, and exposure to advertising.

6 Results

In this section, I outline the results of the information provision experiment. Section 6.1 and 6.2 cover initial support and initial perceptions of policy attributes, respectively. Sections 6.3 and 6.4 cover posterior support and posterior beliefs. I present results from my regression models in section 6.5 and present counterfactual results in section 6.6.

6.1 Prior Support

Figures 4 presents prior support for Question 6 (a 50% RPS) and the hypothetical alternative price-based policy (a $25 carbon tax) after re-weighting the sample to match the demographic characteristics of Nevada's Electorate. For the unweighted fractions, see Appendix B.

Figure 4: Self-reported policy support for Nevada's Ballot Question 6 (a 50% RPS), and a price-based alternative policy (a $25 carbon tax with a 1.5% sales tax cut) among 275 Nevadans. The proportions in this figure reflect re-weighting to account for demographic and ideological differences between the sample and the Nevada Electorate.

6.2 Prior Beliefs

Figure 5 presents respondent beliefs for each attribute (*cost, effectiveness, and regressivity*) of each of the two policies. Reported perceptions about private costs (panel 1) are similar for the two policies, with respondents on average viewing the carbon tax alternative as slightly more costly. Similarly, respondents reported similar beliefs about incidence on low-income households (panel 3), with carbon taxes viewed as slightly more costly. Respondents did, however, report significant differences in initial views about policy effectiveness: On average, participants expected Question 6 to reduce emissions by 24.2% by 2030, as compared to an expected 13.2% reduction under the carbon tax alternative.

These results constitute significant misperceptions. Table 2 presents average beliefs alongside academic estimates. For example, measures of mean absolute error suggest that on average, respondents misperceive annual RPS and carbon tax costs by $250 and $1000, respectively. These initial beliefs also suggest *biased*

Figure 3 – Survey Design

Figure 3: Information provision flowchart. The questions displayed in the RHS of this figure have been abbreviated for ease of exposition. For the full survey, see Appendix A.

perceptions of certain attributes. The third column of Table 2 suggests that while the misperceptions in certain policy attributes (e.g., the effectiveness of carbon taxes) are relatively symmetric about the 'truth', the misperceptions of other attributes (e.g., the effectiveness of renewable portfolio standards) are asymmetric.

Figure 5 – Initial Beliefs about Policy Attributes

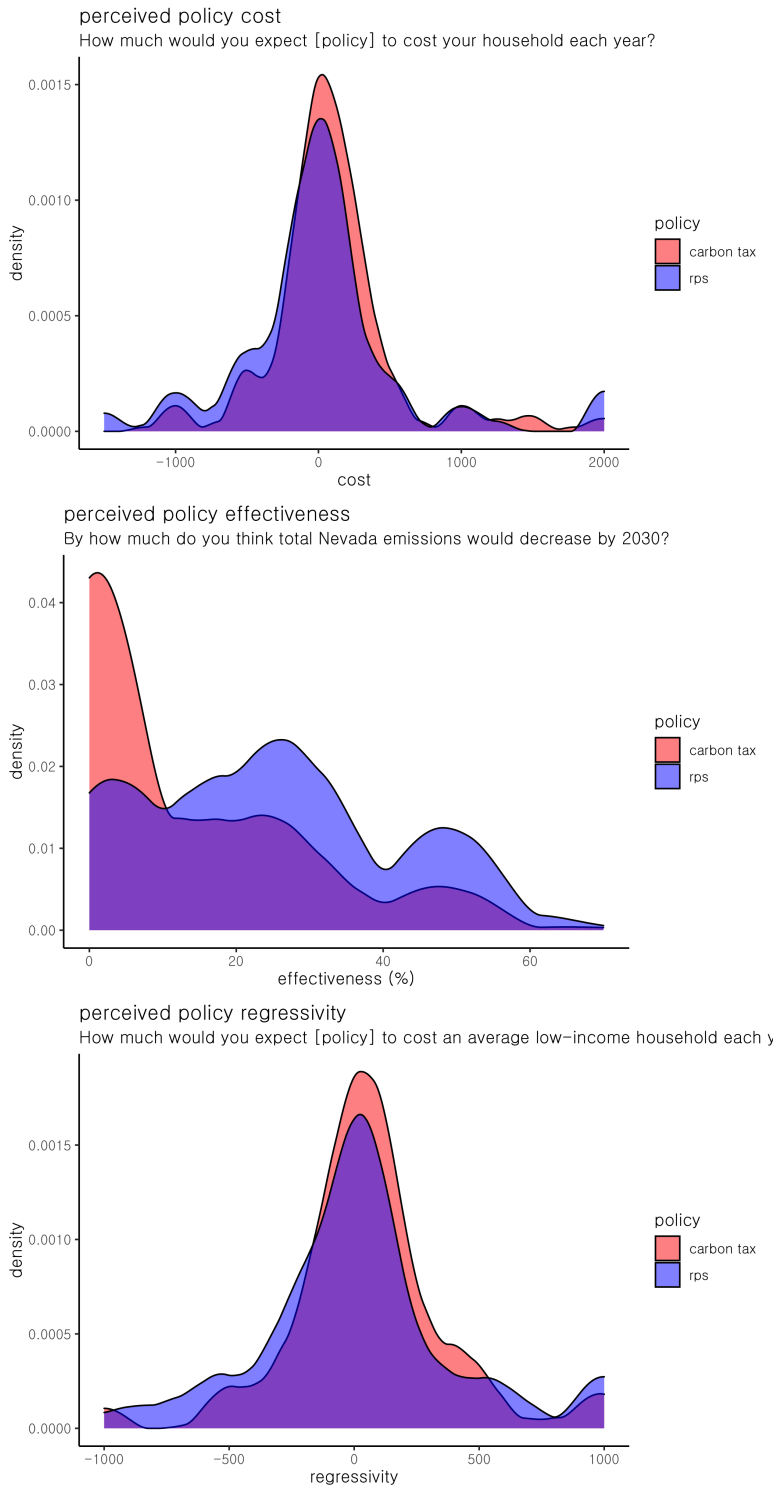


Figure 5: This figure displays (unweighted) the initial beliefs among surveyed Nevadans over three policy attributes (private cost, effectiveness at reducing emissions, and regressivity) for each policy option (RPS and carbon tax).

Initial Perception of Policy Attributes				
attribute	mean belief (prior)	academic research estimate	mean error (bias)	mean absolute error
cost, rps ($)	-117.6	126.2	-243.7	951.5
cost, carbon tax ($)	-6.9	999.5	-1006.4	1504.2
effectiveness, rps (%)	24.2	4.5	19.7	21.2
effectiveness, carbon tax (%)	13.2	14.5	-1.3	14.4
regressivity, rps ($)	21.9	334.5	-656.7	1256.7
regressivity, carbon tax ($)	350.3	1007.0	-312.6	806.3

Table 2: This table displays summary statistics for initial perceptions of carbon tax and RPS attributes for 275 voters in Nevada. The first column is the mean belief of a given attribute among survey participants. The second column displays the mean estimate of the policy attribute among the two academic sources used in the information provision experiment. Column three displays the mean error (i.e., the bias) among survey participants, and column 4 displays the mean *absolute* error (i.e., the level of misperception).

6.3 Posterior Support

Figure 6 presents posterior support for Question 6 (a 50% RPS) and the hypothetical alternative price-based policy (a $25 carbon tax), after re-weighting the sample to match the demographic characteristics of Nevada's Electorate. See appendix B for unweighted results.

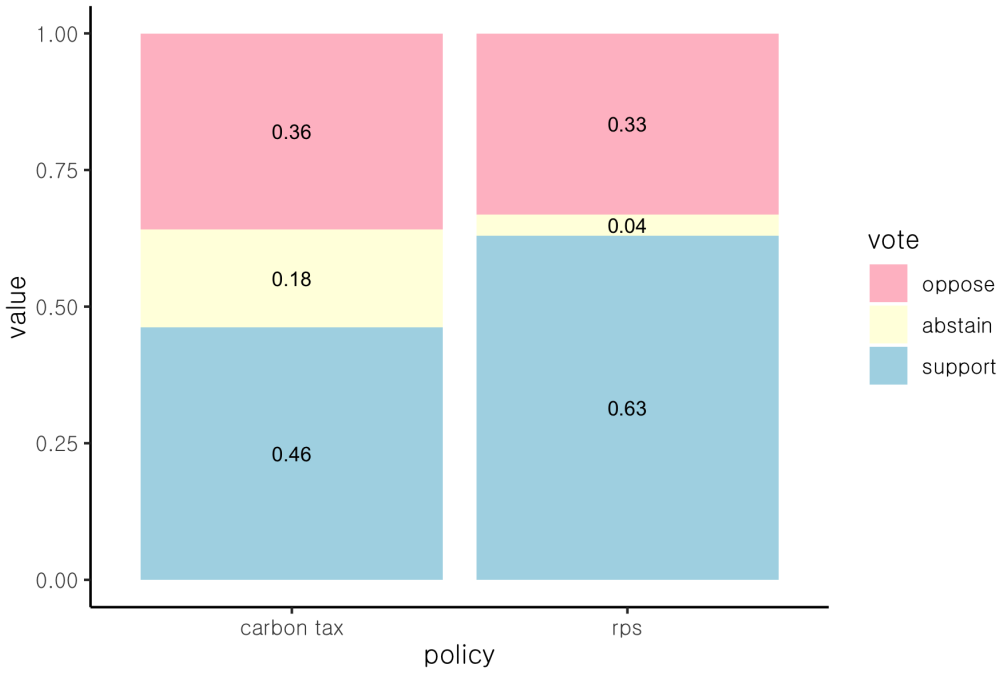


Figure 6: Self-reported policy support for Nevada's Ballot Question 6 (a 50% RPS), and a price-based alternative policy (a $25 carbon tax with a 1.5% sales tax cut) among 275 Nevadans, after receiving information treatment about policy attributes. The proportions in this figure reflect re-weighting to account for demographic and ideological differences between the sample and the Nevada Electorate.

6.4 Posterior Beliefs

Figure 7 presents respondent beliefs about each policy recorded during the follow-up survey. As in the prior survey, reported perceptions about both private costs (panel 1) and beliefs about incidence on low-income households (panel 3) are similar across the policies. In contrast to initial beliefs, however, respondents now believe, on average, that Question 6 is *more* expensive than the carbon tax alternative, and that Question 6 places a *higher* burden on low-income households than does the carbon tax alternative. Similarly, responses in the follow-up survey indicate that participants revised their initial beliefs about policy effectiveness to view carbon taxes as more effective, and RPSs as less effective.

Figure 7 – Posterior Beliefs about Policy Attributes

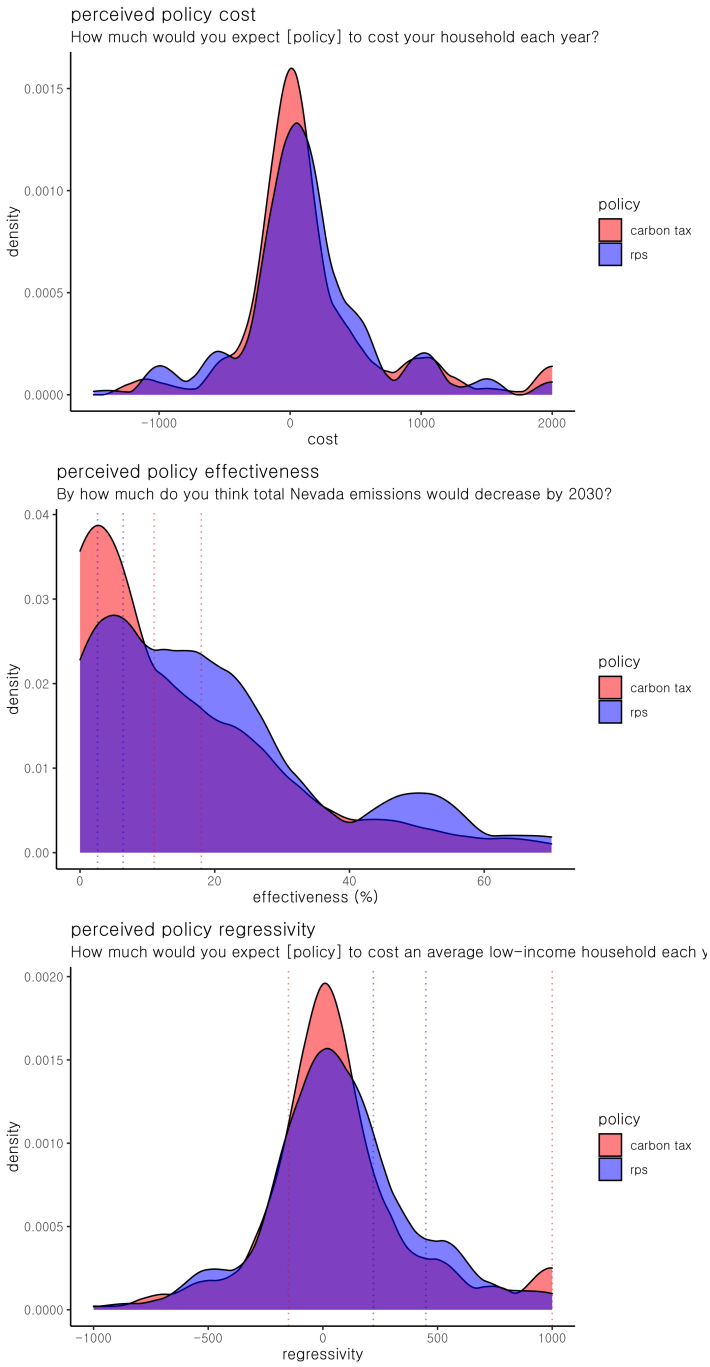


Figure 7: This figure displays (unweighted) the beliefs of 275 surveyed Nevadans over three policy attributes (private cost, effectiveness at reducing emissions, and regressivity) for each policy option (RPS and carbon tax), *after* they received information about each of these policy attributes. The red and blue dotted lines represent information provision provided to respondents about carbon taxes and RPSs, respectively. Panel 1 does not display information provision because it was tailored by income level.

6.5 Regressions

I now use the variation in beliefs induced by the information provision experiment to estimate models of voter support for corrective policies. Table 3 presents results from an ordered logit regression and Table 4 presents results from a linear probability model. In Table 5, I present an Oaxaca-Blinder Decomposition of the difference in support between carbon tax and RPS policies.

Ordered Logit Model

First, I model voter i's support for policy p at time t, $Vote_{i,p,t}$, as a function of the latent utility that would be realized under the passage of a given policy. This latent utility, $u_{i,p,t}$, is a function of voter i's beliefs about the private costs of the policy $c_{i,p,t}$, beliefs about the regressivity of the policy, $r_{i,p,t}$, and beliefs about the effectiveness of the policy $e_{i,p,t}$. Γ_p, θ_t, and η_i are fixed effects for policy, period, and individual, respectively. By employing an ordered rather than binary logit, I capture the information encoded in abstaining votes. This regression therefore relies on the structural assumption that increasing the latent utility associated with a given policy would lead voters to be more likely so support the policy over abstaining from voting, and more likely abstain from voting over opposing the policy.

$$u_{i,p,t} = \alpha + \beta_1 c_{i,p,t} + \beta_2 r_{i,p,t} + \beta_3 e_{i,p,t} + \Gamma_p + \theta_t + \eta_i + \epsilon_{i,p,t} \tag{1}$$

$$Vote_{i,p,t} = \begin{cases} oppose, & \text{if } u < \mu_1 \\ abstain, & \text{if } \mu_1 < u < \mu_2 \\ support, & \mu_2 < u \end{cases}$$

Ordered Logit Model

variable	coef	se	t	p
cost	−0.022	0.024	−0.918	0.358
effectiveness	0.032	0.006	4.981	0.000
regressivity	−0.011	0.052	−0.211	0.833
periodpre	−0.237	0.150	−1.579	0.114
policyrps	0.591	0.158	3.738	0.000

Table 3: Results from a two-period ordered logit regression modeling voter behavior as a function of voter perceptions (model 1). The dependent variable in this regression is a ternary variable where *support*>*abstain*>*oppose*. *Cost* is the perceived private cost of a given policy, *effectiveness* is the perceived effectiveness of the policy (expected percent reduction in state-level emissions), and *regressivity* is the expected incidence on a low-income household. Fixed effects in this regression include policy (rps vs. carbon tax), period (pre vs. post), and individual. Both perceived *cost* and *regressivity* are measured in thousands of dollars.

Linear Probability Model

I now present results of a linear probability model, where I regress an indicator for voter i's support for a policy ($I(vote\ \ yes_{i,p,t})$) on beliefs about the costs of the policy $c_{i,p,t}$, beliefs about the regressivity of the policy, $r_{i,p,t}$, and beliefs about the effectiveness of the policy $e_{i,p,t}$. As above, Γ_p, θ_t, and η_i are fixed effects for policy, period, and individual, respectively.

$$I(vote\ \ yes_{i,p,t}) = \alpha + \beta_1 c_{i,p,t} + \beta_2 r_{i,p,t} + \beta_3 e_{i,p,t} + \Gamma_p + \theta_t + \eta_i + \epsilon_{i,p,t} \tag{2}$$

Linear Probability Model			
Variable	Beta	95% CI	P
cost	-0.0013	-0.0050, 0.0024	0.5
effectiveness	0.0047	0.0028, 0.0067	<0.001
regressivity	-0.0010	-0.0121, 0.0101	0.9
factor(period)			
post	—	—	
pre	-0.0461	-0.0956, 0.0033	0.067
factor(policy)			
carbon tax	—	—	
rps	0.1367	0.0856, 0.1878	<0.001

Table 4: Results from a two-period linear probability regression (model 2). The dependent variable is coded 1 if a voter reports that they support a given policy during a given period, and 0 if they either abstain or oppose. *Cost* is the perceived private cost of a given policy, *effectiveness* is the perceived effectiveness of the policy (expected percent reduction in state-level emissions), and *regressivity* is the expected incidence on a low-income household. Fixed effects in this regression include policy (rps vs. carbon tax), period (pre vs. post), and individual. Both perceived *cost* and *regressivity* are measured in thousands of dollars.

Oaxaca-Blinder Decomposition

Oaxaca-Blinder Decmposition	
difference	value
Levels, explained	-0.068
Levels, unexplained	-0.228
Levels, Total	-0.297
Percent, explained	23.072
Percent, unexplained	76.928
Percent, Total	100.000

Table 5: Results from a twofold Oaxaca-Blinder decomposition of the gap in prior support for carbon taxes vs. renewable portfolio standards. The model used for this decomposition is a two-period linear probability model with individual and time fixed effects. *Explained* components represent the share of the gap in support between the two policy types that can be attributed to differences in "endowments" (differences in initial beliefs about policy attributes), conditional on the estimated model of voter behavior. *Unexplained* components represent the portion of the gap that cannot be attributed to differences in perceptions of attributes. The unexplained share results from differences in responses to perceived attributes between policy types (differences in "slope"), and the interaction between the endowment and slope effects.

6.6 Counterfactuals

Armed with the models of voter behavior estimated in section 6.5, I estimate voter support under three counterfactual scenarios: *perfectly informed voters*, *targeted redistribution of carbon tax revenues*, and *targeted information provision*. For each counterfactual, I predict vote shares using an ordered logit model. Broadly speaking, the goal of these counterfactual exercises is to speak to the degree of mutability in policy support.

Counterfactual 1: Perfectly Informed Voters. In this scenario, I replace voters prior beliefs of each of the policy attributes with the 'true' policy attributes,[7] and estimate the vote shares (*support, abstain, oppose*) for each of the two policies. The results from this exercise are displayed in Figure 9.

Figure 9 — Perfectly Informed Voters

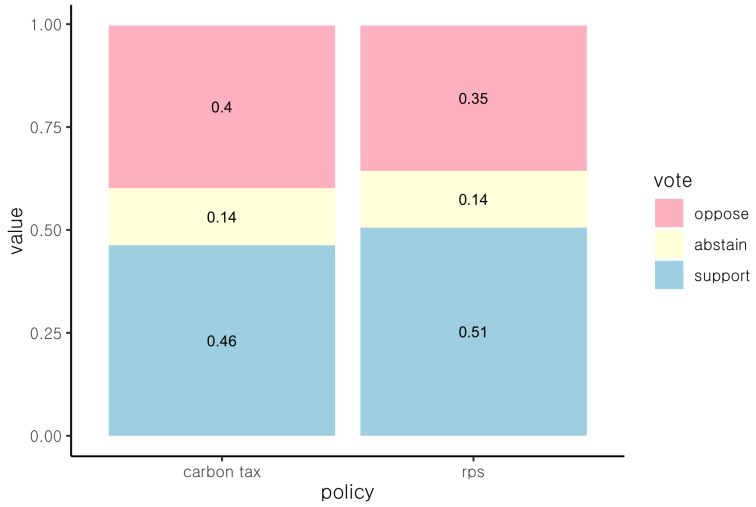


Figure 8: Counterfactual vote shares under perfectly informed voters. Shares reflect vote probabilities generated by applying an ordered logit model (model X) to data where initial voter beliefs have been replaced with beliefs that accord with (average) conclusions academic research about the cost, effectiveness, and regressivity of each policy.

Counterfactual 2: Targeted redistribution of carbon tax revenues. In this scenario, I model support for a carbon tax policy where rather than returning revenue to voters through a sales tax, revenue is used to minimize the incidence (maximize the transfers) to marginal ("swing") voters. Note that the transfers used in this section are likely infeasible: Sallee (2019) details the difficulty in targeting compensation to ameliorate tax burdens from corrective policies given the information set and policy levers available to regulators. As such, the results from exercise can be viewed as bounds on the extent to which compensation to marginal voters can be expected to impact support for carbon taxation.

[7] It is worth noting that participants may have private information about the expected costs of these policies, specifically carbon pricing. Given the average magnitude of cost misperceptions, however, the bias engendered by private information is likely second-order.

Figure 9 — Rebates Targeted at Swing Voters

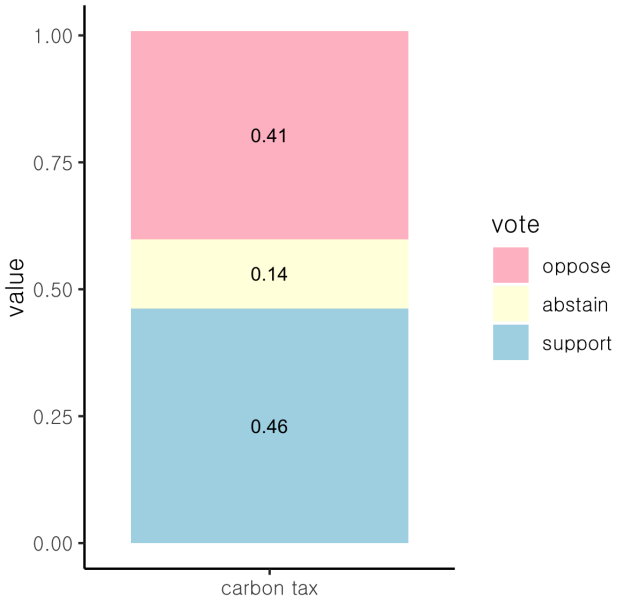


Figure 9: Counterfactual vote shares under perfectly informed voters.

Counterfactual 3: Targeted information provision. In this counterfactual, I imagine providing information on policy *effectiveness* alone to respondents who either abstained from voting or opposed carbon taxes in either period. This counterfactual takes advantage of the fact that respondents have biased perceptions about carbon tax cost and regressivity that bolster support.

Figure 10 — Targeted Information Provision

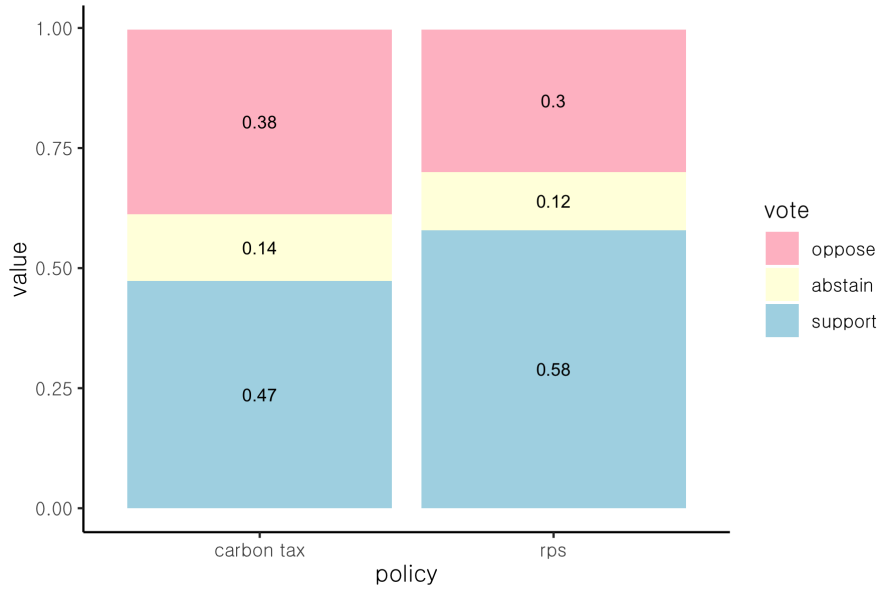


Figure 10: Counterfactual vote shares under perfectly informed voters.

7 Discussion

Results from the initial survey confirm that respondents prefer the performance-based policy (RPS) to the price-based policy (carbon tax), and suggest significant misperceptions about the attributes of these policies. On average, respondents misperceive the private costs by 211% in absolute terms, costs to low-income households by 286%, and the effectiveness of each policy by 183%. Unweighted survey results imply a 29 percentage point advantage for RPSs before information provision; weighted results imply an 18 percentage point advantage.

After providing source-randomized information provision, respondents updated their priors to view carbon taxes more favorably, and RPSs less favorably. That is, relative to reported beliefs in the initial survey, respondents in the follow-up survey reported believing RPS (carbon taxes) to be more (less) costly, more (less) regressive, and less (more) effective.

Panel fixed-effects regression models using the variation in beliefs induced by the information provision suggests that individuals who updated their priors to view a given policy as more effective, less costly, or less regressive were more likely to support said policy. Notably, the estimated coefficients on *cost* and *regressivity* are small, with 95% confidence intervals include zero. The largest elasticities admitted by these confidence intervals are quite modest. For example, estimates from Model 2 imply that decreasing the average voter's perceived cost of a corrective policy by $1000 annually (4 times the mean cost across policies) would increase the probability that the average voter supports said policy by just 1.3 percent. Conversely, I recover large elasticities of policy support with respect to perceived policy effectiveness. The coefficient in Table 4, for example, suggest that a voter who updates her prior from believing that a given policy would reduce emissions by 15% in a decade to believing that a given policy would reduce emissions by 25% in a decade would be 5% more likely support said policy. Importantly, this magnitude of change in perception is not uncommon in my sample. Pooling across the two polices, the average change in perceived effectiveness was roughly 9 percentage points.

The decomposition analysis presented in Table 5 suggests that a meaningful portion (23%) of the unweighted difference in support between the carbon tax and RPS policies can be attributed to differences in perceptions of policy attributes. On its face, this result would suggest that it may be possible to generate majority support for carbon taxes by correcting misperceptions, especially if respondents tended to hold initial beliefs about carbon taxes that were biased toward pessimism. Counterfactual exercises, however, suggest the opposite type of bias: to the extent that misperceptions of policy attributes explain the gap in support for these two policies, the misperceptions are *asymmetric* and *optimistic* toward Nevada's RPS. For example, counterfactual estimates in Figure 9 imply that replacing voter perceptions with 'true' policy attributes would reduce support RPSs by roughly 10%, while leaving support for carbon taxes unchanged.

The relatively low elasticities of support with respect to perceived policy cost and perceived regressivity, also imply that targeted transfers will have limited effectiveness in bolstering carbon tax support. Figure 10 illustrates that even a policy implausibly-well designed to minimize the incidence to swing voters may fail to achieve majority support.

Approaching the Oaxaca-Blinder decomposition results from a glass-half-empty is also informative for the understanding of voter beliefs about corrective policies. Conditional on observable characteristics, voters are 13.8% (22.8% in raw terms) more likely to vote for RPSs than they are taxes — I call this unexplained residual 'tax aversion,' as it captures the dispreference for a tax-based policy relative to a nontax alternative, all else equal.[8]

[8]It should be noted that 'all else equal' assumes that the attributes that I focus in the paper cover the relevant attributes to Nevadan voters.

8 Conclusion

I use an information provision experiment conducted around a vote on Nevada's renewable portfolio standard (RPS) to study voter preferences for public policies.

Broadly, I reach four conclusions: First, using incentive-compatible elicitation of beliefs I demonstrate significant inaccuracy and bias in the perceptions of the cost, effectiveness, and regressivity of carbon taxes and renewable portfolio standards. For example, on average, respondents overestimated the emissions reductions resulting from RPS policies by a factor of 5. Second, I recover small elasticities of policy support with respect to perceived costs and perceived regressivity, and relatively large elasticities of policy support with respect to perceived policy effectiveness. Third, I find that differences in perceptions of policy attributes explain roughly a quarter of the gap in support for carbon taxes and RPS policies, implying tax aversion — the dispreference for taxes holding other policy attributes fixed — may play a significant role in the political barriers facing price-based policies. Returning to the research questions outlined in the introduction, this decomposition trivially suggests that misperceptions alone cannot explain the entire policy support gap. To the extent that misperceptions of policy attributes can explain differences in support for these two policies, the explained gap results mainly from optimistic views of RPS policies rather than pessimistic views about carbon tax attributes. Fourth, and finally, I predict counterfactual estimates of vote shares to shed light on the practical mutability of the observed shared of policy support. These exercises suggest that even implausibly well-targeted transfer schemes using carbon tax revenue are unlikely to significantly increase support for these policies.

Regarding the design of policies, the results from this experiment suggest that sophisticated policy design is unlikely to engender significant political gains for carbon taxation. Instead, my results highlight the relative importance of increasing public confidence in market-based policies. While the efficacy of price instruments as methods to address externalities is consensus among economists and energy policy sphere, this notion is not reflected in public perceptions. The results in this paper suggest that this lack of communication may significantly hinder the political success of these policy instruments.

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A Survey Details

In this appendix I provide information on the language used in the survey to describe each of the policy alternatives, and provide references for the information provision section of the survey. PDF versions of prior and posterior surveys are available here and here, respectively.

The following is how Nevada Question 6 was presented to respondents:

The following initiative will be on the 2020 ballot in Nevada:

Question 6

Shall Article 4 of the Nevada Constitution be amended to require, beginning in calendar year 2022, that all providers of electric utility services who sell electricity to retail customers for consumption in Nevada generate or acquire incrementally larger percentages of electricity from renewable energy resources so that by calendar year 2030 not less than 50 percent of the total amount of electricity sold by each provider to its retail customers in Nevada comes from renewable energy resources?

How do you plan on voting for this initiative?

The following is how the carbon tax alternative was is presented to respondents:

Question 6 is a policy that addresses state-level carbon emissions. As an alternative to requiring that a certain percent of energy be produced by renewable sources, some states and countries put a price on carbon emissions. Consider the following hypothetical alternative to Question 6:

Question 7

Shall Article 4 of the Nevada Constitution be amended to levy, beginning in calendar year 2022, a carbon emissions fee of $25 per metric ton of carbon on the sale or use of certain fossil fuels and fossil-fuel-generated electricity, and reduce the sales tax by 1.5 percentage points, while freezing Nevada's renewable energy standard at its current level?

If this initiative were on the ballot instead of Question 6, how would you vote on this initiative?

Information Provision sources

The following are the sources for 12 possible information treatments that are randomized to survey participants."Question 6" is Nevada's RPS; "Question 7" is the hypothetical carbon tax ballot initiative.

Question 6 cost high

Greenstone and Nath (2019)

Question 6 cost low

Galen (2018)

Question 6 regressivity high

Rausch and Karplus (2014)

Question 6 regressivity low

Rausch and Mowers (2014)

Question 6 effectiveness high

Greenstone and Nath (2019)

Question 6 effectiveness low

Sekar and Sohngen (2014)

Question 7 cost high

Cronin, Fullerton, and Sexton (2019)

Question 7 cost low

Marron, Toder, and Austin (2015)

Question 7 regressivity high

Grainger and Kolstad (2010)

Question 7 regressivity low

Marron, Toder, and Austin (2015)

Question 7 effectiveness high

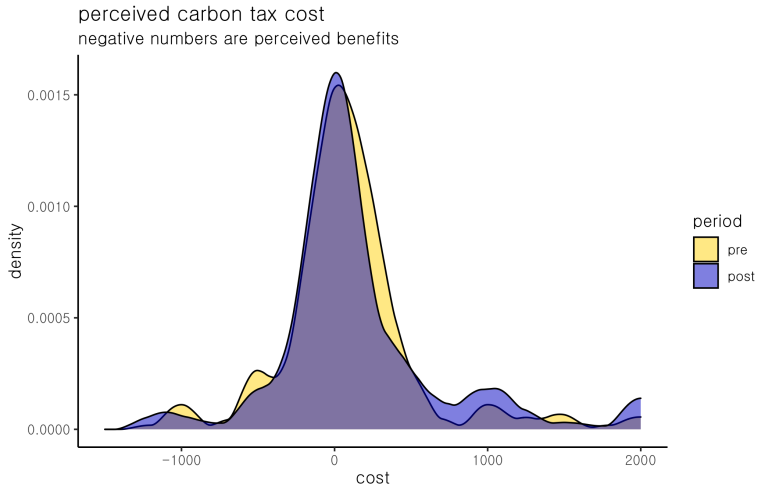
Barron, Fawcett, Hafstead, McFarland, and Morris (2018)

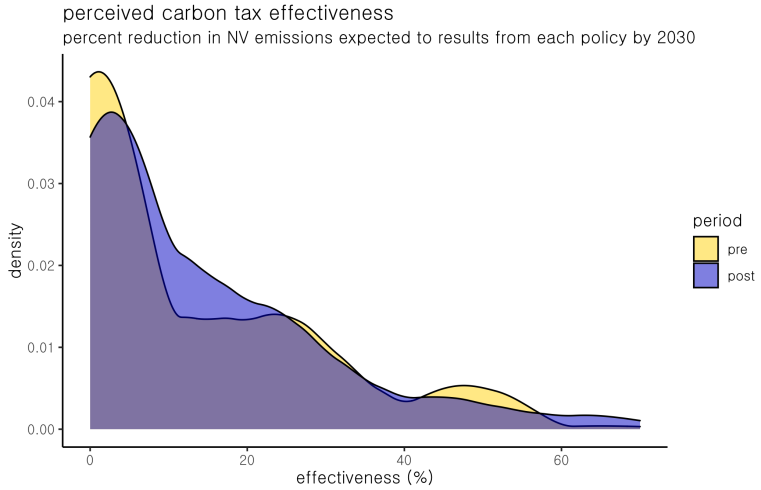
Question 7 effectiveness low

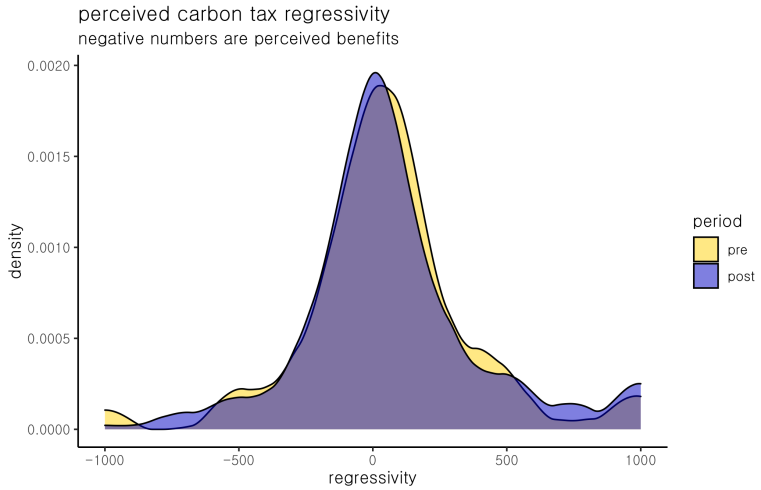
The Congressional Budget Office (2016)

B Supplementary Figures

B.1 Prior vs. Posterior Beliefs about Carbon Taxes







B.2 Prior vs. Posterior Beliefs about Renewable Portfolio Standards