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UNDERSTANDING SUPPORT FOR COST-INEFFECTIVE ENVIRONMENTAL POLICY INSTRUMENTS

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ABSTRACT

Many governments use environmental standards rather than more cost-effective market-based instruments like pollution taxes or cap-and-trade. We investigate whether and how economic literacy shapes voter support for cost-ineffective policy instruments. We compare the preferences and beliefs of a probability-based, representative sample of Americans to those of expert environmental economists, and we study the effects of educational videos designed to induce greater economic expertise. In the probability-based sample, respondents prefer the weakest environmental targets for consumer taxes and the strongest targets for standards, suggesting that policymakers face tradeoffs between policy stringency and cost-effectiveness. In contrast to expert environmental economists, these respondents believe that market-based instruments increase consumer energy bills more than standards do. Educational videos explaining pass-through and cost-effectiveness affect policy support and move beliefs in the probability-based sample closer to those of experts. To formally study the economic implications of these results, we develop a model of politically constrained policy design. Political constraints alone can lead market-based instruments to be set below the Pigouvian benchmark, while voters' imperfect economic literacy can flip the politically constrained planner from choosing a market-based instrument to a less cost-effective standard. We conclude that misunderstanding economic principles is an important reason why voters support cost-ineffective policies.

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1 Introduction

The development of market-based policies for environmental goods, including taxes and cap-and-trade, represents one of economists' most important contributions to environmental policy. Standards, also called command-and-control regulation, represent an alternative policy instrument that mandates levels of emission rates, total emissions, required technologies, or ambient environmental quality.

Textbooks emphasize that market-based instruments can minimize the cost of achieving a level of pollution reduction, and so be cost effective, because they equate marginal abatement costs across pollution sources. Canonical sources emphasize that standards are not cost effective because they do not in general equate marginal abatement costs. Economists emphasize this advantage of market-based instruments. In a University of Chicago poll of leading economists (Clark Center 2011), for example, 90 percent agreed that a carbon tax would reduce costs relative to alternatives, while only 2 percent disagreed.[1]

In practice, however, environmental laws often rely on standards rather than market-based instruments. This includes many components of the US Clean Air Act, Clean Water Act, Endangered Species Act, National Environmental Policy Act, Safe Drinking Water Act, central parts of China's War on Pollution (Greenstone et al. 2021), India's air and water pollution policies (Greenstone and Hanna 2014; Duflo et al. 2018; Jack and Ryan 2026), vehicle air pollution policy in most middle and high-income countries (Davis 2008; Jacobsen et al. 2023), and deforestation policy in Brazil, Indonesia, and other tropical regions (Burgess et al. 2012; Balboni et al. 2023). Governments are spending trillions of dollars to advance the energy transition and address climate change (International Energy Agency 2024), as the cost of not addressing climate change is also estimated to be enormous (Burke et al. 2023). With such large stakes, why do many regulations use standards, rather than market-based instruments that can maximize the environmental benefit per dollar of spending?

We use survey experiments to assess whether support for cost-ineffective standards reflects misunderstanding of economic principles. We first use a probability-based survey of Americans to elicit support for and beliefs about standards and market-based environmental policies. We benchmark these preferences and beliefs to those of expert environmental economists. To better understand the role of economic literacy and the consequences of attempting to increase it, we study how informational videos about allocative efficiency and the economic incidence of taxes impact respondents' support for and beliefs about various environmental policies. We also study alternative mechanisms through which the video could have affected beliefs and preferences, including the possibility of experimenter demand.

[1]The poll asked respondents to evaluate the following statement: "A tax on the carbon content of fuels would be a less expensive way to reduce carbon-dioxide emissions than would a collection of policies such as "corporate average fuel economy" requirements for automobiles."

Our main analysis uses AmeriSpeak, a probability-based panel designed to be representative of the U.S. population. To investigate how selection into surveys on observables and unobservables relates to support for and beliefs about environmental policy, we simultaneously ran an identical survey on a Prolific convenience sample.

We first summarize stated beliefs and preferences from the AmeriSpeak control group. Like in other surveys (Leiserowitz 2006; Rabe and Borick 2012; Dechezleprêtre et al. 2025), we find that Americans support standards more than market-based instruments, and particularly disfavor consumer taxes. In contrast to other surveys, we hold the effect of each policy instrument on pollution constant, and so turn off environmental impacts as an explanation for preferences over policy instruments.

We then study how this support varies with policy stringency. We measure preferences for policy stringency by asking respondents about the pollution reduction they prefer for a given policy instrument, in a specific setting we describe (greenhouse gas emissions from US power plants). Consistent with their ranking of instruments, AmeriSpeak participants also prefer weaker regulation under market-based instruments and stricter regulation under standards. The preference for weaker regulation when market-based instruments—and in particular consumer taxes—are used generates a tradeoff between policy stringency and cost-effectiveness. This tradeoff may explain why some environmental organizations prefer standards: using standards increases public support for stricter regulation. This tradeoff also matters because climate change research suggests that optimal climate policy should be far more stringent than current climate policy.[2] Because of people's preferences, standards therefore might improve welfare in a second-best world, as they could move government policy closer to optimal levels of stringency, but in a cost-ineffective way.

We then elicit beliefs about policy instruments and energy prices, holding environmental outcomes fixed across instruments. We find two important differences between the AmeriSpeak sample and the expert sample. First, respondents in the AmeriSpeak sample believe, on average, that consumer and producer taxes have different effects on consumer energy bills; most experts believe these instruments have similar effects on bills. Second, the AmeriSpeak respondents believe, on average, that environmental standards lead to lower consumer energy bills than market-based policies do, particularly consumer taxes; most experts believe the opposite.

We hypothesize that these two differences between the AmeriSpeak and expert samples may arise because many Americans have limited understanding of economic principles—they may not realize that costs are passed through from firms to consumers, or that standards

[2]Climate change research suggests that the optimal tax on carbon (the "social cost of carbon") is around $200, with estimates ranging up to $1,000 (Rennert et al. 2022; Bilal and Känzig 2024), while the current global mean carbon price on carbon emissions from all countries is around an order of magnitude lower (World Bank 2024).

fail to equate marginal abatement costs across firms. Therefore, we randomly show the AmeriSpeak and Prolific respondents two simple informational interventions that explain these economic principles. We randomly assign participants to a video explaining economic incidence, a video explaining allocative efficiency, or a control group. (The control group watches a video at the survey's end, to keep total survey time, and thus attrition, constant).

The videos affect beliefs and preferences across policy instruments. The incidence video makes support for consumer versus producer taxes more similar, and also moves participants' beliefs about policy impacts closer to those of environmental economists. The allocative efficiency video increases support for market-based instruments relative to standards, though the evidence for this is weaker, and the video's effects vary across populations.

Three mechanisms could account for the effects of our videos on beliefs and preferences. The first is lack of economic literacy, which may involve either systematically biased beliefs or an inability to reason through the equilibrium implications of policies (Dreyfuss 2025). The second is expert persuasion, where people might simply be persuaded by expert advice without fully understanding it. The third is experimenter demand, where individuals provided responses they did not actually believe in order to please the experimenters. These mechanisms have different implications. If experimenter demand primarily explains results, then the results have limited external relevance; but if the other channels drive the effects, then policymakers can implement policies to increase support for cost-effective instruments. An auxiliary survey on Prolific shows that experimenter demand is unlikely to drive our results. We inform a random subset of respondents at the outset that researchers will closely scrutinize their responses, and find that this statement substantially increases perceived scrutiny (measured at the end of the survey) but does not alter the videos' effects on beliefs and preferences. Instead, we provide evidence suggesting that the videos function at least partly through increasing economic literacy, potentially including understanding of and attention to equilibrium effects, though some may also operate through expert persuasion.

Our focus on understanding how economic literacy affects preferences across environmental policy instruments matters for both positive and normative economics. To study the economic implications of our empirical results, we develop a simple model of politically constrained policy design, building on Dreyfuss (2025). In addition to requiring that policies must satisfy the standard feasibility constraints, our model also introduces a political feasibility constraint: a policy's political attractiveness is a monotonic function of voters' perceptions of its net benefits, and this attractiveness must clear a threshold. The model has two main results. With economically literate voters, the politically constrained planner always selects an emissions tax (or other market-based instrument), although political constraints can push the implementable tax strictly below the Pigouvian level. With sufficiently imperfect economic literacy about how each instrument translates into prices and emissions,

the planner instead chooses a uniform standard—not because standards are cheaper, but because standards relax the political feasibility constraint by enough to permit substantially more emissions reduction. Combining our survey evidence with the model, a benchmark calibration finds that standards may generate greater welfare than consumer taxes if standards are up to 3.9 times more costly than consumer taxes, and may generate greater welfare than cap-and-trade if standards are up to 2.1 times more costly than cap-and-trade.

Our main contribution to growing research using environmental surveys and lab experiments is a design that investigates how economic literacy affects voter support for cost-ineffective policy instruments. Douenne and Fabre (2022) and Dechezleprêtre et al. (2025) study how private costs, perceived environmental effectiveness, and distributional incidence affect support for climate policy and beliefs about its impacts, while Andre et al. (2024) study global support for climate action. We also build on prior work by investigating economic mechanisms that determine equilibrium effects of policy instruments and focusing on the choice of policy instrument rather than support for climate policy overall. A broader literature uses survey, lab experiments, and related methods to study preferences around climate change and associated policies (Cherry et al. 2012; Millner and Ollivier 2016; Douenne and Fabre 2022; Funke et al. 2025). These papers find that policy support depends on policy impact, language, framing, and the perceived benefits and distributional effects of policies (Kallbekken et al. 2011; Drews and Van den Bergh 2016; Baranzini and Carattini 2017; Maestre-Andrés et al. 2019), that people are generally averse to carbon taxes (Carattini et al. 2018), that people prefer emissions trading over carbon taxation (Funke et al. 2025), and that revenue recycling increases support (Beiser-McGrath and Bernauer 2019; Mohammadzadeh Valencia et al. 2024), especially when made salient (Klenert et al. 2018).[3]

We also contribute to a largely theoretical literature that studies how political constraints can lead to inefficient policy design. Dal Bó et al. (2018) use a variant of a prisoner's dilemma lab experiment to suggest that voters may support bad policies because they underappreciate how policies lead to new equilibrium behavior. Bisin et al. (2015) explain how voters' self-control problems can rationalize policies that restrain the government's response to voters, such as balanced budget requirements. Dreyfuss (2025) focuses on political constraints in the presence of equilibrium neglect, shows how it can make efficient reforms politically infeasible, and uses this framework to study politically favorable off-path modifications to a given policy. Our results instead focus on how political constraints with economically literate voters influence policy design, and how incomplete economic literacy among voters influences instrument choice.

[3]A classic economics literature compares the properties of different environmental policy instruments. For example, Weitzman (1974) essentially compares price instruments like pollution taxes with quantity instruments like cap-and-trade under certainty versus uncertainty, and Stavins (2010) compares standards to market-based instruments.

Additionally, we make a methodological contribution to the literature using large-scale surveys to study people's perceptions of and preferences over public policy. By simultaneously running identical surveys on Prolific (convenience sample) and AmeriSpeak (probability-based sample), we are able to show how responses vary by observed and unobserved dimensions of selection into convenience samples. Prior work comparing convenience and probability-based samples has typically used simple survey questions (Tang et al. 2022; Mercer and Lau 2023; Jordan et al. 2025) and often found similar effects when running the same experiments on convenience and representative samples (Mullinix et al. 2015; Coppock et al. 2018). In the environmental policy domain, we find differences in beliefs, preferences, and information treatment effects between the convenience and representative samples. Moreover, these effects are not fully explained by differences in demographics. This suggests that to accurately understand citizens' (environmental) policy preferences, it may not always be enough to generate representative samples that match the population on demographics, and thus that probability-based sampling schemes may be an important tool.

The paper proceeds as follows. Section 2 describes the experimental design. Section 3 discusses support for environmental policy instruments. Section 4 analyzes the experimental interventions and discusses mechanisms. Section 5 presents and analyzes our model of politically constrained policy design. Section 6 concludes.

2 Experimental Design

This subsection describes our main survey experiment and two additional surveys we conducted.

2.1 Sample

Our main results use a sample from AmeriSpeak, a high quality panel. AmeriSpeak fielded this survey from March 28 to May 22, 2023. The National Opinion Research Center (NORC) designs AmeriSpeak to represent the US population. The probability-based AmeriSpeak panel primarily recruits participants by randomly selecting households from the NORC National Frame. To reduce selection bias, AmeriSpeak recruits the participants using mailings, telephone contact, and in-person visits offering enhanced incentives. Additionally, participants may complete the survey online or by phone. To reduce attrition and fatigue, on average AmeriSpeak invites panelists to participate in only two to three studies per month (AmeriSpeak 2025). AmeriSpeak is used in selected economics papers (e.g., Haaland and Roth 2017; Ferey et al. 2024; Mui and Schoefer 2024; Allcott et al. 2025) and the NORC National Frame it samples from is used in landmark studies, such as the General Social

Survey.

We simultaneously ran an essentially identical survey on Prolific between April 3 and April 24, 2023.[4] Prolific is an online platform that connects researchers with participants for online research studies. Participants complete tasks in exchange for monetary incentives. Most Prolific participants spend 1-8 weekly hours on the platform, suggesting they complete many more studies than AmeriSpeak participants (Eyal et al. 2021). The rapidly growing set of survey experiment papers in economics (e.g., Enke et al. 2023; Delfino 2024; Engelmann et al. 2024) often use Prolific or similar online platforms like MTurk, given their low cost and flexibility. However, these convenience samples come with the possible tradeoff of lower representativeness, which we use the simultaneous AmeriSpeak and Prolific surveys to analyze.[5]

For both AmeriSpeak and Prolific, we recruited participants aged 18 or older, living in the US. These filters produced a final analysis sample of 1,817 AmeriSpeak and 1,899 Prolific participants. AmeriSpeak cost approximately $20 per respondent and Prolific cost about $3.50 per respondent.

Table 1 provides demographic summaries of our samples and benchmarks from the Current Population Survey (CPS) and Gallup. Both the unweighted and weighted AmeriSpeak means are near those of the CPS and Gallup. For example, 29 percent of AmeriSpeak respondents and 30 percent of CPS respondents are older than 60. Similarly, 61 percent of AmeriSpeak respondents and 62 percent of Gallup respondents believe that human activity causes climate change. Like other online platforms, our Prolific sample is younger and more liberal than AmeriSpeak or the CPS. Only 12 percent of Prolific participants are older than 60, and 77 percent of Prolific participants believe human activity causes climate change. These shares differ from AmeriSpeak, the CPS, and Gallup by 15 percentage points or more. We report comparisons between platforms both with and without controls. Any differences that remain after controlling for demographics imply "unobservable" differences due to the two different methods of recruitment: a probability-based versus an opt-in sampling scheme.

Expert Survey

We also obtained responses of expert environmental economists. On June 2, 2024, we emailed 195 environmental economists, selected primarily from environmental/energy economics groups in the National Bureau of Economic Research (NBER) and the Centre for Eco-

[4]In addition to information collected in our survey, for all AmeriSpeak participants, we received a list of standard demographic variables and financial profile variables. To obtain the same variables for Prolific respondents, we appended at the end of the Prolific survey the same questions asked in AmeriSpeak.

[5]Prolific is an opt-in platform which relies on methods such as online advertising and referrals (e.g. via word-of-mouth, friends, and university partnerships) to recruit participants, and thus Prolific samples are unlikely to be representative of the population.

nomic Policy Research (CEPR), inviting them to take a shortened version of the AmeriSpeak and Prolific survey. The invitation used text similar to that shown in Appendix C. On July 16, 2024, we emailed 683 additional experts who had recently published relevant articles on environmental economics in top general-interest or field journals.

This survey obtained a good response rate and successfully reached genuine experts. We obtained 292 complete responses, a response rate of 33%. A question at the end of the survey found that 98% of respondents had published at least one paper in environmental economics. The first survey included responses from 42 NBER affiliates and 7 CEPR affiliates. In the second survey, 90% of respondents held academic appointments (in contrast to government or industry jobs, for example).[6]

Auxiliary Survey

We conducted an additional survey on Prolific between April 30 and May 8, 2024 with 1,914 participants. The auxiliary survey sought to study the mechanisms underlying treatment effects. This survey was identical to the original survey but also randomized a cue that altered the degree to which participants felt the researchers were observing them, and added two questions at the end of the survey to validate the randomized cue's intended effects.

2.2 Primary Survey Design and Randomization

Figure 1 summarizes the survey design.[7]

2.2.1 Policy Descriptions

After participants consented to participate, the survey described the following four environmental policy instruments:

> (i) **A tax on power plants** requires power plants to pay for each unit of greenhouse gas emissions they emit.
>
> (ii) A **tax on consumers** requires consumers to pay for each unit of electricity they purchase; the tax reflects the greenhouse gas emissions from producing the electricity.

[6] To provide some insight on the survey composition, our email invitations provided separate survey links to some groups (e.g., NBER CEPR affiliates, or individuals with academic appointments). In the second expert survey, we also randomized some of the survey questions. For our main analysis, to make the survey comparable, we focus on 181 experts who saw the same questions that our main sample saw.

[7] The detailed survey instructions and prompts can be found in the following link: `https://www.dropbox.com/scl/fi/086jixt4pm5d6ljqyvjoa/Appendix_experimental-design.pdf?rlkey=rvh84zxea4dl2x6c6h6ei5c3k&st=81bsi4um&raw=1`

(iii) A **standard** sets a maximum limit on each plant's emissions rate so that each plant must emit less than what the standard indicates.

(iv) A **cap-and-trade** market lets power plants buy and sell pollution permits to cover their total pollution emissions each year. The government reduces pollution by determining the total number of permits allocated to firms (the "cap"). Each permit gives the firm the right to emit one ton of pollution. So if one power plant wants to increase its pollution emissions, it must find another power plant willing to sell permits and the other plant must decrease its emissions.

After reading these descriptions, participants answered comprehension questions. We showed participants descriptions of policy instruments and asked them to match the description to the correct instrument. The descriptions in these questions used a different wording than the explanations we provided participants so participants would not immediately recognize the correct answer due to identical text. A participant who answered a question incorrectly received a second opportunity to answer it. In each question, participants could click a link to review descriptions of the policy instruments. We automatically screen participants out of the survey who twice failed to match all policy instruments with correct definitions.

2.2.2 Outcomes: Environmental Policy Questions

For each environmental policy instrument, we described a scenario where governments use the policy to reduce greenhouse gas emissions by 20 percent by the year 2026.[8] We randomized the order of the policy instruments across participants.

After the survey explained each policy scenario, we elicited participants' beliefs about how each policy would impact monthly household electricity bills and inequality. Existing research suggests that consumers care substantially about electricity bills, and inequality has provided an important recent political force against market-based policy instruments. To estimate the perceived effects of each policy instrument on prices, we told participants that the mean household has a monthly electricity bill of $112 and asked how participants expect each policy instrument to affect monthly electricity bills, in dollars. To estimate the perceived effect of each policy on inequality, we asked participants whether they thought the effect of the instrument on inequality would be a substantial decrease, modest decrease, no effect, modest increase, or substantial increase.

We then used three questions to assess support for each policy instrument. First, we asked whether participants would support the policy instrument, oppose it, or if they were not sure. Second, to measure the intensive margin of policy support, we asked participants what

[8]We generally use "policy instrument" to characterize the choice between standards, consumer taxes, producer taxes, or cap-and-trade, and "policy scenarios" to characterize a specific description like a policy that decreases greenhouse gases by 20 percent in 2026.

percent emissions reduction they would prefer for each policy instrument. Rather than having each policy reduce emissions by 20%, participants could choose any number between 0% and 35%, in 5% increments, with additional options of preferring to increase emissions or to reduce emissions by 40% or more. The survey reminded participants that a larger reduction in emissions implies a stricter policy.[9] Third, after participants answered questions on all four policy scenarios, we asked participants to rank the four policies. Regardless of whether a participant supports or opposes climate change policy overall, the rankings allow ordinal comparisons of stated preferences across policy instruments. Additionally, after ranking the policies, we asked participants in an open-ended question to describe the reasoning behind their ranking and, in the following survey page, to mark all the considerations that led to their ranking.

2.2.3 Experimental Conditions

We randomly assigned participants to one of three groups: allocative efficiency (25%), pass-through (25%), or control (50%). Participants in the allocative efficiency and pass-through treatments saw the associated videos at the beginning of the survey, just after passing the quiz on the description of policy instruments. Participants in the control group saw either the allocative efficiency or pass-through video at the end of the survey. We also had the control group view the videos so that we could understand and potentially address any attrition the videos themselves introduce.

The pass-through video (Jiang et al. 2025b) explained the concepts of incidence and pass-through in non-technical language, by comparing a tax on consumers and a tax on producers. The video explained how a commodity tax on businesses can be passed through to consumer prices, and how the tax-inclusive price of an example product (gasoline) is the same whether the tax is collected from consumers or businesses.

The allocative efficiency video (Jiang et al. 2025a) explained the concept of cost effectiveness in non-technical language. The video compared a tax on emissions with a standard. The video defined cost-effectiveness as the lowest-cost way to achieve an outcome. The video then explained that a tax or cap-and-trade have greater cost effectiveness than a standard because price-based policies allow power plants with lower costs of reducing emissions to decrease emissions the most, while a standard forces power plants with both high and low marginal costs to decrease emissions.

After watching each video, we asked participants to answer two questions assessing understanding of the video's concepts. For the allocative efficiency group, we first asked re-

[9]For example, for taxes on producers we used the following wording: "Now suppose you can choose the tax rate that power plants pay for the greenhouse gas emissions associated with their electricity use. A higher tax rate will lead to fewer emissions. All changes in emission rates will occur by the year 2026 and are calculated relative to current emission levels. What tax rate would you choose?"

spondents to indicate the definition of allocative efficiency. We then asked them to indicate the reason why economists think pollution standards and pollution taxes have different cost effectiveness. For the pass-through group, we first asked under which environmental tax system (tax on consumers or producers) would consumers end up paying more for gas. We then asked them under which environmental tax system would companies' profits be higher.

The randomization successfully balanced observed characteristics. Table 2 shows that covariates have similar values in the AmeriSpeak treatment and control groups, and an F test fails to reject the hypothesis that all covariates are equal (p=0.269). Appendix Table A1 shows that the Prolific sample is balanced as well.

2.2.4 Demographics and Other Opinions

AmeriSpeak collects demographic data on its panel, including educational attainment, age, gender, income, and ethnicity. The end of our Prolific survey includes similar demographic questions.

We also elicited respondents' opinions about climate change and government policy. We asked whether participants believe the government intervenes too much in the economy, whether the government should do more to protect the environment, whether climate change is primarily due to human activity or natural Earth patterns, how important it is to address climate change, and which of a list of gases trap heat in the Earth's atmosphere. Finally, we asked participants questions designed to assess financial literacy, from Lusardi and Mitchell (2011).

2.3 Additional Surveys

Expert Survey

The expert surveys were shortened versions of our main survey, with the same questions concerning respondents' beliefs on the effects of each of our four policy scenarios. We elicited beliefs on the effects on electricity bills, effects on inequality, and whether the respondent would support each policy. We also asked questions about respondents' expertise (educational attainment and publishing an environmental economics paper).

Auxiliary Survey to Address Experimenter Demand

To test for experimenter demand effects, we conducted an additional experiment where we manipulated the degree to which participants felt that the researchers were observing them, building on the design of Bursztyn et al. (2020). We randomized participants into a control group, a *scrutiny* treatment, and an *anonymity* treatment. We crossed these conditions with

the three conditions (control, pass-through video, allocative efficiency video) from our main survey experiment.

The scrutiny treatment showed participants the following message after the consent form and before the rest of the survey:

> We would like to inform you that **the researchers will precisely and carefully scrutinize your answers**, so we strongly urge you to answer carefully.

The anonymity treatment instead showed the following message:

> We would like to inform you that **the answers you give to the survey will be completely anonymous**. No one, not even the researchers, will be able to match the answers you give to your name.

Both statements are true for all respondents, but they induce variation in participants' perceptions of the extent to which the experimenters scrutinize their responses. To ensure that the treatments had their desired effect, we included a manipulation check at the end of the survey. The question asked participants to what extent they believed the researchers will observe their answers and carefully scrutinize them, with answers chosen on a 1 to 5 scale.[10]

To analyze additional mechanisms that could mediate the effect of the videos, at the end of this survey, we also asked participants how much they trust experts.

2.4 Quality Controls

We took several steps to ensure that responses had high quality. First, the beginning of the survey validates that participants can see video and hear audio while taking the survey.[11] Second, to ensure that participants do not skip important information, we require participants to spend at least 35 seconds on the page defining the policy instruments, and to wait until the videos finish before proceeding. Third, the survey automatically ended for participants who, in both of two attempts, incorrectly answer comprehension questions on the policy instruments. Fourth, we exclude participants whose survey duration was less than

[10]Participants could choose an integer between 1 and 5, where 1 means "My answers are completely anonymous. No one, not even the researchers, will be able to match my answers to my name" and 5 means "The researchers will precisely and carefully scrutinize my answers." Note the tradeoff between generating variation in experimenter demand and deceiving participants. We chose not to deceive participants, and therefore options 1 and 5 do not completely contradict each other, but can still proxy how much participants felt the researchers were observing them.

[11]Specifically, we presented respondents with a short test video and asked whether participants were able to see the video and hear the audio. The survey automatically ended for those who did not respond that both audio and video worked.

a third of the median survey duration, and we exclude participants who answered less than half of the environmental policy questions.[12]

Most participants felt that the survey was clear and impartial. Although the survey addresses complex policies, among all AmeriSpeak and Prolific participants, 88% of them thought that the survey was somewhat or very easy to understand, 81% of them perceived the videos as somewhat or very trustworthy, and only 19% thought that the researchers had a left-wing or right-wing bias.[13]

3 Support for Environmental Policy Instruments

This section presents descriptive survey results. We describe beliefs and preferences, compare AmeriSpeak to environmental economists, and analyze heterogeneity in observed and unobserved characteristics. Unless otherwise noted, descriptive results in this section summarize the AmeriSpeak control group.[14]

3.1 Policy Preferences and Beliefs

Policy Support

Figure 2 presents various measures of opinions among the AmeriSpeak control group about the four policy instruments—consumer taxes, producer taxes, cap-and-trade, and standards, which were all described as decreasing emissions by 20 percent. Panel a reports the share of participants that support each policy instrument, as opposed to stating "not sure" or "oppose." Consumer taxes receive the least support, while standards and producer taxes receive the most support. Standards receive more support than any market-based instrument ($p < 0.05$ for all comparisons). All policy instruments, however, are supported by less than forty percent of participants.

The significantly lower support for consumer taxes (14% of respondents) compared to producer taxes (27%) suggests that respondents do not believe that these taxes have identical incidence ($p < 0.01$). This contrasts with conventional economic wisdom on physical

[12]The member agreement of AmeriSpeak requires panelists to have the option to skip questions. Therefore, no AmeriSpeak questions require responses. To keep the surveys similar, we also did not require Prolific respondents to answer questions, besides demographics. To suppress item non-response, we use soft prompts (a reminder of missing answers before moving to the next page) for crucial questions such as those about support, preferred emissions reduction, and impact on electricity bills of each policy.

[13]We randomized whether we described the survey as affiliated with UC Berkeley or the NBER, but found no effect on these bias perceptions or on the main survey outcomes.

[14]We present unweighted results, for simplicity and transparency, and since Table 1 shows that weights do not substantially change sample composition. Appendix Figures A1, A2, A12, and A13 show that we obtain similar estimates of preferences over policy instruments and the effects of interventions when using AmeriSpeak's survey weights.

neutrality that tax incidence is independent of who physically remits payment to the government (Jenkin 1871; Weyl and Fabinger 2013), although unequal incidence is in principle possible in the presence of additional frictions, such as when consumer taxes are not fully salient (e.g., Chetty et al. 2009; Taubinsky and Rees-Jones 2018).

Panel b of Figure 2 presents a variation on panel a. For each policy, panel b reports the difference between the fraction of participants supporting the policy minus the fraction opposing the policy (net support). A similar number of individuals support versus oppose standards, implying net support of zero. Cap-and-trade, producer taxes, and especially consumer taxes, in contrast, receive negative net support. Overall, the patterns of net support in panel b closely mirror the patterns of overall support in panel a.

Panel c of Figure 2 instead summarizes people's rankings of the four policy instruments. Recall that a separate survey prompt asked participants to rank the four policy instruments from most preferred to least preferred (again, under the assumption that each policy instrument would reduce emissions by 20 percent). To summarize this data, we first normalize the ranks to be between 0 and 1, with 1 assigned to the most preferred policy instrument, 0 to the least preferred, and values of $1/3$ and $2/3$ assigned to the middle two. We then take the average rank for each policy instrument. The pattern in panel c resembles that of panels a and b, with an even more pronounced preference for standards. About half of participants rank standards first and 80% rank them first or second. In contrast, only 6% of participants rank consumer taxes first.

Our finding in panels a-c that standards receive more support than taxes echoes findings from several other surveys.[15] Our questions do fix the magnitude of emissions reduction across the different policies, and so confirm the idea from previous work that this is due to respondents perceiving that standards are less economically and socially costly per unit of emissions reduction. Distinct from prior work, these results show that how the tax is administered—in our case, whether the statutory incidence is on consumers or producers—makes an enormous difference in its support. In our data, the difference in support for consumer versus producer taxes is much larger than the difference in support for producer taxes versus standards.

Panel d of Figure 2 studies the intensity of support and shows that participants prefer more strict policy (greater emissions reductions) under standards than under market-based

[15]For example, an AP-NORC/EPIC survey finds that a large majority of Americans support a bill that increases the share of clean energy, but most oppose a $20 carbon tax (AP and NORC 2021). Dechezleprêtre et al. (2025)'s international survey finds higher support for bans on polluting cars and mandatory and subsidized insulation of buildings than for a tax on flying and a tax on fossil fuels. Douenne and Fabre (2020) find greater French support for insulation standards and vehicle pollutions standards than for carbon taxes, a higher tax on diesel, a meat tax, or urban tolls. Leiserowitz et al. (2025)'s survey of US registered voters finds slightly greater support for regulating carbon dioxide than for requiring fossil fuel companies to pay a carbon tax.

instruments. With a standard, respondents desire an average 13 percent reduction in emissions. Respondents' desired emissions reductions are only slightly weaker with producer taxes ($p = 0.000$) or cap-and-trade ($p = 0.457$) . By contrast, respondents on average prefer far weaker stringency with consumer taxes ($p < 0.01$)—only a 1 to 2 percent emissions reduction. These findings reinforce the implication that all else equal, people believe consumer taxes to be far more economically and socially costly than the other policy instruments.

Figure 3 presents CDFs of the AmeriSpeak control group preferred emission reductions for each instrument, which more flexibly convey the distribution of these preferences. Under a consumer tax, nearly half of respondents prefer 0% change in emissions (i.e., no tax). Under the other policy instruments, less than a third of respondents prefer a 0% change in emissions. More generally, preferred emissions reductions under consumer taxes are first-order stochastically dominated by preferred emissions reductions under each of the other instruments. Additionally, consistent with the policy rankings discussed earlier, respondents slightly prefer larger emission reductions for standards than for producer taxes.

These preferences over emission reductions illustrate political tradeoffs between stringent and cost-effective climate policy and may explain why some environmental organizations support standards over market-based instruments. Although standards achieve less environmental benefit per dollar of abatement, individuals prefer more stringent abatement under standards than under market-based instruments. Implementing an environmental tax on consumers would be unpopular. For example, suppose a policy can only pass with majority support, and further suppose that voters support a policy if it reduces emissions weakly less than their preferred level. The CDFs in Figure 3 indicate that policymakers could then only implement a consumer tax reducing emissions by 5%, or a standard reducing emissions by approximately 15%. Alternatively, Figure 3 also shows that cap-and-trade and producer taxes can reach desired support at nearly the same levels of intended emissions reduction.

Broad Drivers of Preferences over Policy Instruments

To provide insights into the factors influencing support for environmental policies, we asked respondents what considerations influenced their rankings of the policy instruments. We find that the impacts on electricity bills are the most important consideration, listed by 69.8% of participants. Fairness and effects on inequality are also considered important variables and listed by 54.9% and 39.6% of participants. We also ask about two alternative explanations that could explain support for standards, enforceability and government revenue (e.g., individuals may oppose taxes since they do not like the use of tax revenue). However, we find that these considerations are mentioned less often: only 32.1% of participants mention the

policy instruments' enforceability and only 10.5% list effects on government revenue.[16]

Figure 4 summarizes participants' beliefs about how the different policies influence electricity bills and inequality, again holding the emissions decrease fixed across policy instruments at 20%. Panel a shows that participants believe that consumer taxes will have by far the largest impact on electricity bills of any of the policy instruments ($p < 0.01$ for all comparisons).[17] These beliefs can help explain the unpopularity of consumer taxes.

Additionally, Figure 4 shows that participants believe that producer taxes will increase electricity bills more than standards or cap-and-trade ($p < 0.01$ for both tests), but there is no statistical difference between standards and cap-and-trade.

Panel b of Figure 4 shows that beliefs about how each policy affects inequality resemble beliefs about how each policy affects electricity bills. Consumer taxes are believed to increase inequality more than any other instrument ($p < 0.01$ for all comparisons), producer taxes are believed to increase inequality more than standards and cap-and-trade ($p < 0.01$ for both comparisons), but cap-and-trade and standards are statistically indistinguishable ($p = 0.429$).

It is arguably not surprising that respondents' beliefs about the policies' impacts on energy bills resemble beliefs about the impacts on inequality. If lower-income households devote a larger share of expenditure to energy than richer households do (Grainger and Kolstad 2010; Rausch et al. 2011; Goulder et al. 2019), then a uniform increase in consumers' bills would lead to lower-income households devoting a larger share of their budget to energy expenditure.

3.2 Heterogeneity in Support for Policy Instruments

Expert Preferences and Beliefs

Our results so far show that people believe standards to be more cost-effective policies than market-based instruments, and that people also believe that consumer taxes are the least desirable instrument, compared even to producer taxes. While these beliefs seem inconsistent with classic arguments from environmental economics, they may be correct under certain markets with specific frictions or if participants focused on tax-inclusive costs. Therefore, to

[16] To further assess the importance of enforceability, an auxiliary survey asked participants to rank policies but assuming perfect enforceability:

> Now suppose you knew each of the policies would be implemented properly and enforced with no loopholes, how would you rank the policies?

Adding this text hardly changed participants' rankings. Therefore, we do not focus further on enforceability.

[17] It is theoretically possible that consumer taxes increase electricity bills more than standards if individuals have in mind the *tax-inclusive* price and if the additional costs due to an inefficient allocation of emission reduction are sufficiently low. The next section shows that most environmental experts do not believe that consumer taxes increase consumer bills more than producer taxes.

better understand whether consumers suffer from misperceptions, we benchmark the survey results with our expert survey.

Figure 5 presents the difference between the perceived impact of standard and market-based instruments on electricity bills, for different samples. While the control groups in both our representative AmeriSpeak sample and the Prolific sample believe that standards increase costs less than market-based instruments, experts believe the opposite. This suggests that experts are more likely to understand and consider allocative efficiency principles.

Appendix Figure A3 compares the difference in perceptions of how consumer and producer taxes affect electricity bills. Panel a shows that in the AmeriSpeak control group, 43% of respondents believe the difference in the effects of consumer and producer taxes on electricity bills is below \$5 (i.e., they believe that consumer and producer taxes have similar effects on bills). Panel b shows that the corresponding value among experts is 61%.[18] While experts were more likely to think consumer and producer taxes have similar effects, 33 percent of experts did forecast that the impact of consumer taxes on electricity bills is at least \$5 larger than producer taxes.[19]

Variation by Observables

Our survey echoes the common finding of large differences in support for climate change policy across demographic groups (Appendix Figure A4). Some groups have relatively high support for environmental policy, regardless of the instrument, while other groups have relatively low support for all instruments. For example, higher-income, college-educated individuals, and non-Black/non-Hispanic individuals have relatively high support for all these instruments. To give another example, the bottom section of the graph shows that conservatives and liberals have non-overlapping support across instruments–only 15 percent of conservatives support the most popular instrument (standards), while nearly 20 percent of liberals support the least popular instrument (consumer taxes).

In contrast to this common finding of large differences in overall support for climate policy across demographic groups, we find that relative preferences across environmental policy instruments are much more similar across demographic groups. In every demographic group, standards have the strongest support (orange triangles), consumer taxes have the lowest support (blue circles), and producer taxes and cap-and-trade have intermediate support. These similar rankings across instruments suggest that quantitative patterns about

[18] Appendix Figure A5 presents the same data as a distribution (CDF).

[19] Several dozen experts sent informal emails in response to the survey invitation, so we replied with a description of this aggregate finding and solicited hypotheses to explain it. The most common response focused on electricity market regulation—vertically integrated utilities face state regulators who must approve electricity rates. Regulators might limit firms' ability to pass producer taxes through to consumer prices, which could make consumer taxes increase prices more than producer taxes.

preferences across policy instruments may generalize more easily than preferences for the level of environmental policy overall.

Unobservable Selection into Study Participation

Although AmeriSpeak provides a high-quality sample where participants cannot simply opt in, but instead are recruited via a representative, probability-based selection procedure, there may still be unobservable selection into agreeing to become a member of AmeriSpeak. This could affect the national representativeness of our findings, even when we weight responses to match US demographics. To study selection on unobservables in survey platforms, and to clarify the extent to which high-quality probability-based samples yield different conclusions than commonly used convenience samples, we compare the AmeriSpeak and Prolific samples. Any systematic differences that remain between the AmeriSpeak and Prolific samples after we control for demographics—and which therefore are attributable to unobservable covariates of willingness to take our survey—provide insight into the extent to which policy support might differ between AmeriSpeak and the US population. If, for instance, environmental policy support is typically slightly lower in the AmeriSpeak than the Prolific sample—indicating that unobservable correlates of willingness to participate in surveys are negatively related to support of environmental policies—then we might similarly expect environmental policy support among all Americans to be slightly lower than in the AmeriSpeak sample. On the other hand, if we find no differences between AmeriSpeak and Prolific samples conditional on observable demographics, then that would suggest that the (reweighted) AmeriSpeak sample well approximates the views of American adults.

Figure 2 for AmeriSpeak and Appendix Figure A6 for Prolific show separate results for each survey sample; the two graphs have similar layout. To facilitate the comparison, Figure 6 graphs the difference between the two surveys. Within each panel, we separate results by instrument (consumer tax, producer tax, cap-and-trade, standard). Within the instrument for a given panel, the first point (blue circle) shows the unadjusted value in Prolific minus AmeriSpeak. The second point (red square) shows the Prolific-AmeriSpeak difference after adjusting for demographic controls (age, gender, race, education, marital status, employment status, income). The third point (green diamond) shows the difference after adjusting for demographics, party affiliation and ideology. The fourth point (orange triangle) shows the difference after also adjusting for environmental opinions and financial literacy.

Figure 6 shows that adjusting for demographics along with political variables, general attitudes, and financial literacy significantly reduces, though does not always eliminate, the differences in preferences between the AmeriSpeak and Prolific samples. Overall, panel a shows that Prolific respondents support all four environmental policy instruments by 5 to 15 percentage points more than AmeriSpeak respondents do, and panel d shows that Prolific

participants prefer more aggressive emissions reduction. This is unsurprising, as Prolific has younger, more educated, and more liberal respondents. The squares, diamonds, and triangles show that linearly adjusting for demographics and other respondent characteristics help close the gap between the Prolific and AmeriSpeak samples. For studying policy support in panel a, the controls eliminate around half the gap, while for studying desired emissions reductions in panel d, the controls eliminate all of the gap. Ideology and political party affiliation have the most explanatory power.

Overall, the comparison between the Prolific and AmeriSpeak samples suggests that there is both selection on observables and unobservables predicting policy support. The degree of selection varies by outcome, and controlling for observable demographics eliminates much but not all of the gap.

4 Effects of Information on Understanding of and Support for Policy

This section assesses how randomized exposure to informational videos affects support for different environmental policy instruments. The comparison to our expert sample suggests that many patterns of support that we have studied thus far may be due to a lack of economic literacy. To more directly study this possibility, we randomly expose participants to explanations of the key relevant economic principles.

4.1 Effects on Policy Support

Pass-Through Video

Panel a of Figure 7 shows that the AmeriSpeak control group supports producer taxes 13 percentage points more than consumer taxes. Remarkably, the pass-through video closes this gap to 2 percentage points. Panels b through d show similarly large treatment effects, with the pass-through video closing much of the gap in support and desired emissions reduction.

Appendix Figure A7 provides a summary of how the pass-through treatment influenced support and beliefs about bills and inequality for each of the four policy instruments. Panel a of Figure A7, for instance, shows that the pass-through video increased support for consumer taxes and decreased support for producer taxes ($p = 0.04$ and 0.01, respectively). Panel a of Figure A7 also shows that the pass-through video reduced support for standards, though it had a statistically insignificant effect on support for cap-and-trade. This could be consistent with respondents absorbing deeper principles from the pass-through video. Respondents may have come to better appreciate that more generally, policies like standards increase prices

by increasing production costs. The results in the remaining panels of Appendix Figures A7 and A8 mirror these findings. Appendix Figure A9 shows that the effects of the video on the difference between consumer and producer taxes are very similar in the Prolific sample

Panel c of Appendix Figure A3 shows that the pass-through treatment moves the percent of respondents that believe consumer and producer taxes have the same impact on electricity bills away from the control group ($p < 0.01$ for testing equal proportion of people believing consumer and producer taxes have the same impact between the two groups) and closer to the experts ($p = 0.536$).

Allocative Efficiency Video

The allocative efficiency video had largely insignificant and small results on difference in support for standards versus market-based instruments in the AmeriSpeak sample. Figure 8 shows that the effects of the allocative efficiency video are statistically indistinguishable from zero for all outcomes other than the normalized average ranks of all policies. Panel c shows that for the normalized average rank, the video closed some of the gap in support for standards versus market-based instruments. These limited effects in the sample could reflect the limited importance of beliefs in this domain or the complexity of teaching this concept to a broad audience in a short video. Appendix Figure A7 provides a more detailed summary of how the allocative efficiency video influenced support for each of the four policy instruments.

In the Prolific sample, the allocative efficiency video had a stronger effect on beliefs and policy support (in expected directions); see Appendix Figure A10. These differences between the AmeriSpeak and Prolific samples could be explained by Prolific respondents being more attentive, better trained at comprehending short experimental interventions, and generally more educated.[20] Consistent with this hypothesis, we provide evidence in Section 4.3 that the allocative efficiency video was more complex and that the video had a stronger effect among more educated people in AmeriSpeak.

4.2 Perceived Policy Impacts on Bills and Inequality

Figure 7, panel e, shows that the control group believes producer taxes cost $4 less per month than consumer taxes. The pass-through video completely eliminated this difference.

Overall, the three-minute pass-through video led AmeriSpeak respondents to hold similar beliefs about incidence as do participants in our expert survey. In the AmeriSpeak control group, 43% of participants thought the difference in the effects of consumer and producer

[20] Appendix Figure A11 shows that controlling for observables closes some of the gaps between the effects found on Prolific and AmeriSpeak but not all of them, highlighting that online samples may not be sufficient to understand how interventions affect people's preferences, even when controlling for demographics.

taxes on electricity bills was below $5/month (Appendix Figure A3), and the pass-through video increased this share considerably, to 64%. Remarkably, the expert environmental economists had nearly the same share (61%). If everyone in the treatment arm watched the video, then the video had a relatively high persuasion rate (DellaVigna and Gentzkow 2010) of 36%. In other words, for respondents who did not initially believe that consumer and producer taxes have similar effects on bills, the video changed the minds of one in three.

As with policy support, Figure 8 shows that the allocative efficiency video did not have a statistically significant effect on beliefs about the impacts of standards versus market-based policies on electricity bills and inequality. This lack of significant effects is perhaps due to the concepts in the allocative efficiency video being more complex and therefore more difficult to quickly comprehend.

4.3 Mechanisms and Robustness

The videos could affect beliefs and preferences via three potential mechanisms. First, *economic literacy* may explain results. Economic literacy may operate through knowledge-participants may learn the principles that the video explains. Economic literacy can also operate through salience-the control group may understand how behavioral responses affect outcomes, but the videos could decrease equilibrium neglect (Dreyfuss 2025). Second, *expert persuasion* could explain results. Participants may not understand the details, but still believe the videos' main message. For example, the videos may make respondents believe that standards increase abatement costs relative to market-based instruments, even if participants do not understand the mechanisms for how allocative efficiency decreases costs. For example, expert persuasion may help explain why people believe that carbon dioxide emissions contribute to climate change (i.e., because of the strong scientific consensus supporting this pathway), even if many people who believe this do not understand the mechanisms (e.g., greenhouse gases trap heat in the atmosphere). Third, *experimenter demand* may explain results. Participants may not believe or understand the videos, but still understand what message the videos seek to convey and then repeat that message to please the researchers.

These three mechanisms have different implications. If experimenter demand primarily accounts for results, then the results have limited external relevance. On the other hand, if economic literacy or expert persuasion drive the effects, policymakers can implement policies to increase support for cost-effective instruments. Classes providing more than a three-minute video can improve economic literacy, while advertisements and media coverage may be able to convince people through expert persuasion.

Economic Literacy and Information Processing

Three types of evidence suggest that the videos improve economic literacy, but that this improvement was modulated by respondents' ability to process the informational content of the videos. First, the allocative efficiency video improved economic understanding. The end of the survey asked about environmental policies that would reduce pollution from two factories. In this question, Factory 1 emits high levels of pollution and has high marginal abatement costs, while Factory 2 emits low levels of pollution and has low marginal abatement costs. We then asked which factory would reduce pollution more in response to a tax. Participants could answer Factory 1, Factory 2, or "Same" for each question. The correct answer is that Factory 2 should respond more to a tax.

Appendix Figure A14 shows that the allocative efficiency video moderately increased the share of individuals giving the correct answer from 64% to 71% ($p < 0.01$). While this result suggests that at least some participants understood and recalled some of the lessons from the videos, it is far from stark. Answering this question requires less sophisticated reasoning than fully working through how a tax or a standard would influence electricity bills or inequality. Many of the respondents who answered the question correctly (in both the treatment and control group) still preferred standards over taxes.

Second, responses to open-ended questions showed learning. After each video, we asked respondents, "in one or two sentences, describe what the video is about." We provide a large language model, Claude Opus 4.6, with links to each video. We then share the text responses to the aforementioned questions and request classification of each response's video understanding (1 = poor, 2 = partial, 3 = sufficient), based on a grading rubric included in the prompt. Appendix D provides more details on the classification.

Appendix Table A3 summarizes the score distributions. We find that in the AmeriSpeak sample, the allocative efficiency video is mostly poorly understood (45.4%) with little high understanding (12.9%), while the pass-through video yields a majority with high understanding (55.5%). These stark differences in comprehension across the two videos are consistent with the larger treatment effects of the pass-through video. We also find greater understanding of the allocative efficiency video among the Prolific sample (27.6% high understanding and 42.5% partial understanding), which can explain why the video had an effect among that sample.

Third, educated respondents, who arguably can better process complex information, learned more from the allocative efficiency video. Consistent with the allocative efficiency video being more complex, we find that while the treatment effects of the pass-through video differ little by education level (Appendix Figure A15), the treatment effects of the allocative efficiency video are significantly different (Appendix Figure A16). The allocative efficiency video has significant effects on policy ranking and on the perceived impacts on electricity

bills for college graduates ($p < 0.01$), but not for non-college graduates ($p = 0.64$). An F-test also finds that treatment effects on all outcomes are jointly significant for the college graduates but not for non-college graduates. Treatment effects on all outcomes are also somewhat greater for college graduates compared to non-college graduates ($p = 0.04$).

Expert Persuasion

To provide some direct evidence on the role of expert persuasion in accounting for the videos' treatment effects, we separate results by whether participants indicate that they trust experts completely or not. Appendix Figure A18 finds that the pass-through video treatment effect does not vary by trust in experts ($p = 0.75$). The effects of the allocative efficiency video, in contrast, are larger among participants who trust more in experts ($p = 0.02$). Because we do not experimentally vary trust in experts, this variable may correlate with other forces that determine treatment effects. Thus, we cannot rule out that expert persuasion may drive some of the effects of the allocative efficiency video, though the evidence from this channel is observational.

Experimenter demand Our auxiliary survey, which experimentally varied participants' perceived anonymity along with the video they watched (Section 2.1), allows us to examine the extent to which experimenter demand may have contributed to the videos' effects on respondents' answers. Appendix Figure A17 shows that the scrutiny and anonymity treatments substantially manipulated perceived anonymity. Compared to participants in the anonymity treatment, participants in the scrutiny treatment were far more likely to answer that they felt like their answers would be scrutinized. The difference between the treatments is 1.8 points on the 5-point scale (s.e.=0.08). The information on anonymity and scrutiny was randomly provided in the beginning of the survey, while the manipulation check was asked at the end, implying that participants remembered they were being observed more closely throughout the entire survey. Participants in the control group, who received no message about anonymity or scrutiny, responded similarly to the anonymity treatment, implying that participants in the main sample believed their responses to be mostly anonymous.

Figure 9 shows that despite substantially altering perceived anonymity, the treatment effects of both videos are essentially identical across the scrutiny, anonymity, and control conditions. While this result does not rule out any form of experimenter demand, it suggests that the effects of the video do not stem from participants perceiving that they were being viewed and attempting to please the experimenter with the answer they think the experimenter expects.

5 A Model of Politically Constrained Policy Design

This section develops a simple framework that organizes the empirical patterns documented in Sections 3 and 4. The model has three ingredients. First, different sources of emissions have different marginal abatement costs, so a uniform standard is strictly less cost-effective than an emissions tax. Second, voters differ in the weight they place on the emissions externality, and policy adoption requires a minimal level of political attractiveness, which is a function of voters' perceived benefits of the policy. Third, voters may underweight equilibrium responses when evaluating policies. This section presents the model, along with a quantitative interpretation; the proofs are in Appendix B.

5.1 Setup

There are two market segments, indexed by $j \in \{1, 2\}$, with prices p_j and demands $q_j = D_j(p_j)$, where $D_j'(\cdot) < 0$ over the relevant price range. The representative consumer has utility

$$\sum_{j=1}^{2} U_j(q_j) + (y - p_1 q_1 - p_2 q_2),$$

where y is income and $y - p_1 q_1 - p_2 q_2$ is spending on the numeraire good. Firms are perfectly competitive, so prices equal unit production costs including any tax payments. The unregulated baseline price in segment j is a_j, the baseline quantity is $q_j^0 = D_j(a_j)$, and baseline emissions per unit are $\bar{e}$. Baseline total emissions are $E_0 = \sum_{j=1}^{2} q_j^0 \bar{e}$. Throughout, x without a subscript denotes aggregate emissions reductions relative to this baseline, while x_j denotes the reduction in emissions intensity in segment j. Thus residual emissions intensity in segment j is $\bar{e} - x_j$.

The unit production cost in segment j is

$$a_j + K_j(x_j),$$

where the marginal abatement cost, K_j, is twice continuously differentiable and strictly convex, $K_j(0) = K_j'(0) = 0$, and the relevant policy choices are interior. We assume marginal abatement costs are strictly convex and heterogeneous across segments, with segment 1 having lower marginal abatement costs than segment 2. The constant marginal external harm from emissions is $\varphi > 0$.

We compare two instruments: a uniform emissions tax τ levied on all emissions, with revenue rebated lump sum, and a uniform emissions standard σ that mandates the same emissions intensity in both segments. We focus on a producer-side emissions tax without loss of generality; theoretical results for any other market-based policy that achieves equality in

marginal costs of emissions reduction would be identical qualitatively, though quantitatively would involve different salience parameters in Sections 5.4 and 5.5. We focus on positive interior policies for which quantities are positive, emissions-intensity reductions lie in $(0, \bar{e})$, and demand responses are nonzero.

5.2 Welfare and the Cost-Effectiveness Ranking

To implement total emissions reduction x, define the private-surplus cost under instrument $r \in \{\tau, \sigma\}$ as $C_r(x)$. Lemma 2 in Appendix B.1 characterizes these costs. The lemma shows that taxes achieve abatement in the most economically efficient manner: the tax cost function is the value of a minimization problem over all possible quantities (q_1, q_2) and all segment-specific emissions-intensity reductions (x_1, x_2). The standard cost function, however, takes the minimum over a smaller set—it therefore does not achieve abatement in the most efficient manner possible, and is therefore more costly. The intuition is the textbook allocative efficiency principle: the tax equates marginal abatement costs across segments and prices residual emissions on the output margin, while the uniform standard generally does neither (e.g., Stavins, 2010).

On the relevant interior range, we assume C_τ and C_σ are continuously differentiable and strictly convex, with $C_r(0) = C_r'(0) = 0$. Social welfare is

$$W_r(x) = \varphi x - C_r(x) \tag{1}$$

up to a constant. The Pigouvian tax $\tau^{FB} = \varphi$ implements the first-best reduction x_τ^{FB} characterized by

$$C_\tau'(x_\tau^{FB}) = \varphi \tag{2}$$

and maximizes welfare.

5.3 Politically Constrained Policy Design with Economically Literate Consumers

We now incorporate political feasibility constraints, building on Dreyfuss (2025). Individuals i have preference weights $\theta_i \sim F$ on the emissions externality, where F has a positive density on a non-degenerate interval $[0, \bar{\theta}]$ with $\bar{\theta} > 1$. We interpret θ_i as capturing altruism toward future generations, beliefs about climate damages, or the weight the voter places on external harm relative to current private costs. An economically literate voter understands how each policy maps into true private-surplus costs and emissions reductions. Individual i then

evaluates policy r at stringency x by

$$v_i^r(x) = \theta_i \varphi x - C_r(x),$$

Given the distribution G^r of v_i^r, we assume political attractiveness is given by $S(G^r) \in [-1, 1]$, where S is monotonic in the first-order stochastic dominance order, with $S(G^r) < 1$ if $G^r(0) > 0$, and $S(G^r) \leq 0$ if $G^r(0) = 1$. $\underline{S} \in (-1, 1)$ denotes the minimum attractiveness required for political feasibility.[21] For example, attractiveness could be about how many voters evaluate the policy positively versus negatively: $S(G^r) = (1 - G^r(0)) - G^r(0) = 1 - 2G^r(0)$ (equivalently, political attractiveness scales linearly with how many voters perceive positive net benefits from the policy). Or, more generally, the relevant measure of political attractiveness could instead be determined by how many voters meaningfully like versus dislike the policy, with approximately indifferent voters not influencing its political feasibility: $S(G^r) = (1 - G^r(\bar{\alpha})) - G^r(\underline{\alpha})$, for $\underline{\alpha} \leq 0 \leq \bar{\alpha}$.[22]

Even with a fully economically literate population, the attractiveness constraint can bind, and the optimal politically constrained tax can fall below the Pigouvian level. What political constraints with otherwise literate voters cannot do is rationalize a standard: the tax strictly dominates at every stringency, both on welfare grounds and on political grounds. Proposition 1 collects these two facts. We formalize this as follows:

Proposition 1. *Suppose the assumptions above hold and marginal abatement costs are heterogeneous. (i) For every emissions reduction $x > 0$, the tax strictly dominates the standard—$W_\tau(x) > W_\sigma(x)$ and $v_i^\tau(x) > v_i^\sigma(x)$ $\forall$ i —so the politically constrained planner always selects the tax. (ii) There exists a threshold $\bar{s} < 1$ such that whenever the political attractiveness threshold satisfies $\underline{S} \geq \bar{s}$, the politically constrained optimal tax is strictly below the Pigouvian level, $\tau^{PC} < \varphi$.*

Proposition 1 shows that while with economically literate voters, political feasibility constraints can influence policy—and in particular push the optimal tax below the Pigouvian benchmark—they cannot rationalize choosing standards over market-based policies.

5.4 Imperfect Economic Literacy and Perceived Price Impacts

To rationalize support for standards, we build on Dreyfuss (2025) to allow voters to underweight equilibrium adjustments relative to mechanically salient effects. The direct and

[21] Subject to these regularity conditions, this framework can accommodate arbitrary political attractiveness functions $S(\cdot)$. For example, firm owners might have outsized influence through interest groups they manage, as in Grossman and Helpman (1994)'s "Protection for Sale," or preferences of individual policymakers could have outsized weight.

[22] When no policy meets the political feasibility constraint, we assume the planner chooses the status quo.

equilibrium margins differ across instruments, and our empirical results discipline which margins voters miss. Under a standard, the salient direct effect is the mandated emissions reduction. The less salient equilibrium effects are that compliance costs are passed through into consumer prices and that demand responds to those higher prices. Under a tax, the salient direct effect is the mechanical price increase from applying the tax to baseline emissions. The less salient equilibrium effects are all behavioral responses to the tax: firms reduce emissions intensity and consumers reduce consumption. These responses shrink the tax base—lowering the actual total impact on posted prices—and contribute to the policy's environmental benefit.

We model tax misperceptions as follows. Let $q^*_{j,\tau}(\tau)$ denote equilibrium demand in segment j under tax τ, and let $x^*_{j,\tau}(\tau)$ denote the corresponding emissions-intensity reduction. The true aggregate emissions reduction induced by the tax is

$$x_\tau(\tau) = E_0 - \sum_{j=1}^{2} q^*_{j,\tau}(\tau)(\bar{e} - x^*_{j,\tau}(\tau)).$$

A voter with attention weight $\eta_\tau \in [0,1]$ perceives a fraction η_τ of each equilibrium response away from the unregulated baseline:

$$\widetilde{x}_{j,\tau}(\tau;\eta_\tau) = \eta_\tau x^*_{j,\tau}(\tau) \text{ and } \widetilde{q}_{j,\tau}(\tau;\eta_\tau) = q^0_j + \eta_\tau \left(q^*_{j,\tau}(\tau) - q^0_j\right)$$

Thus tax-side salience captures underappreciation of all equilibrium responses that reduce emissions and shrink the tax base, including both firm abatement responses and consumer demand responses.

The standard analogously involves an attention weight $\eta_\sigma \in [0,1]$ on the pass-through of compliance costs into prices and on the associated demand response. Let x denote the aggregate emissions reduction implemented by a standard, let $x^*_\sigma(x)$ denote the common emissions-intensity reduction required to implement it, and let $q^*_{j,\sigma}(x)$ denote equilibrium demand in segment j under that standard. A voter perceives the posted price and demand in segment j to be

$$\widetilde{p}_{j,\sigma}(x;\eta_\sigma) = a_j + \eta_\sigma K_j(x^*_\sigma(x)) \text{ and } \widetilde{q}_{j,\sigma}(x;\eta_\sigma) = D_j\left(\widetilde{p}_{j,\sigma}(x;\eta_\sigma)\right).$$

At $\eta_\sigma = 1$, voters perceive the true compliance-cost pass-through and the true demand response. At $\eta_\sigma = 0$, voters perceive no price increase and no demand response from the standard, while the aggregate emissions reduction from the standard remains salient.

These perceptions determine voters' overall perceived payoffs from the two instruments. For a tax τ paired with the announced lump-sum transfer $T_\tau(\tau)$, let $\widetilde{x}_\tau(\tau;\eta_\tau)$ denote the

aggregate emissions reduction implied by voters' perceived tax allocation, and let $\widetilde{B}_\tau(\tau;\eta_\tau)$ denote the perceived net burden of the tax. The perceived net burden is the perceived private-surplus loss of deviating from the private optimum less the announced transfer $T_\tau(\tau)$; see Appendix B.3 for a formal definition and derivation. Voter i's perceived payoff from the tax is

$$\widetilde{v}_i^\tau(\tau;\eta_\tau) = \theta_i\varphi\widetilde{x}_\tau(\tau;\eta_\tau) - \widetilde{B}_\tau(\tau;\eta_\tau).$$

For a standard that implements aggregate emissions reduction x, let $\widetilde{B}_\sigma(x;\eta_\sigma)$ denote the perceived private-surplus burden from the standard-induced price and demand changes. Voter i's perceived payoff from the standard is

$$\widetilde{v}_i^\sigma(x;\eta_\sigma) = \theta_i\varphi x - \widetilde{B}_\sigma(x;\eta_\sigma).$$

We let $\widetilde{G}^\tau(\tau;\eta_\tau)$ and $\widetilde{G}^\sigma(x;\eta_\sigma)$ denote the distributions of the perceived payoffs $\widetilde{v}_i^\tau(\tau;\eta_\tau)$ and $\widetilde{v}_i^\sigma(x;\eta_\sigma)$, writing $\widetilde{G}^r$ when the arguments are clear from context. As before, a policy is politically feasible if $S\big(\widetilde{G}^r\big) \geq \underline{S}$. We begin with several comparative statics that illustrate how our model captures the link between voters' literacy and political attractiveness.

Lemma 1. *For every positive interior tax τ, $\widetilde{v}_i^\tau(\tau;\eta_\tau)$ is strictly increasing in η_τ; for every positive interior standard-induced aggregate reduction x, $\widetilde{v}_i^\sigma(x;\eta_\sigma)$ is strictly decreasing in η_σ. Thus, lower economic literacy makes taxes less politically attractive and makes standards more politically attractive.*

The lemma shows how lower economic literacy leads people to prefer standards more relative to taxes. To further connect this to our survey elicitations of perceived effects of a tax for a particular level of emissions, we also show that for a given level of perceived emissions reduction by the tax, people like it less.

Corollary 1. *Fix a target perceived emissions reduction $\widehat{x} > 0$, and let $\mathcal{B}_\tau(\widehat{x};\eta_\tau)$ denote the minimum perceived net burden among taxes that voters perceive as delivering at least $\widehat{x}$. Then $\mathcal{B}_\tau(\widehat{x};\eta_\tau)$ is strictly decreasing in tax-side attention η_τ. Hence, holding fixed the emissions reduction that voters perceive the tax to deliver, lower economic literacy makes voters like the tax less.*

When η_σ and η_τ are both sufficiently small, voters perceive the standard as cheap—because compliance pass-through is underweighted—and the tax as expensive and environmentally weak—because equilibrium responses are underweighted on both margins. This is the pattern documented by the survey results in Section 3: respondents support standards more strongly than market-based instruments (Figure 2), prefer stricter reductions under standards (Figure 3), and believe market-based instruments raise bills by more than standards do when emissions reductions are held fixed (Figure 4).

5.5 Instrument Choice with Imperfect Economic Literacy

The planner chooses the size of each instrument—a tax rate τ paired with the announced lump-sum transfer $T_\tau(\tau)$, or a uniform emissions standard that implements aggregate emissions reduction x—to maximize true welfare subject to political feasibility:

$$\max_{\tau \geq 0} \left\{ \varphi x_\tau(\tau) - C_\tau(x_\tau(\tau)) : S\big(\widetilde{G}^\tau(\tau; \eta_\tau)\big) \geq \underline{S} \right\},$$

$$\max_{x \geq 0} \left\{ \varphi x - C_\sigma(x) : S\big(\widetilde{G}^\sigma(x; \eta_\sigma)\big) \geq \underline{S} \right\}.$$

The planner selects the standard whenever the constrained maximum in the second problem exceeds the constrained maximum in the first. Because the standard is strictly less cost-effective at every emissions reduction, it can only beat the tax when the political attractiveness constraint binds tightly enough on the tax to bring its constrained welfare below that of the standard.

In what follows, let δ_0 denote the degenerate payoff distribution that places all mass on zero, and let $S_0 \equiv S(\delta_0)$ denote the political attractiveness of a policy to which every voter is exactly indifferent. When $S(G^r) = 1 - 2G^r(0)$, $S_0 = -1$ and generally, $S_0 \leq 0$.

Proposition 2. *Suppose marginal abatement costs are heterogeneous. (i) Fix any threshold $\underline{S} \in (S_0, 1)$ at which some welfare-improving standard is feasible under accurate perceptions ($\eta_\sigma = 1$). Then for all sufficiently small η_τ, the planner strictly prefers the standard, regardless of η_σ. (ii) There is a threshold $S^\dagger < 1$ such that, whenever $\underline{S} > S^\dagger$ and the welfare-maximizing standard is feasible at some salience $\eta'_\sigma > 0$, the planner strictly prefers the standard for all $\eta_\sigma \leq \eta'_\sigma$ and all η_τ.*

Part (i) of Proposition 2 studies how misunderstanding of market-based policies influences the planner's choice. When equilibrium responses to the tax are sufficiently underappreciated, only very small taxes become politically feasible, and the planner is then better off relying on standards. Part (ii) studies how misunderstanding of standards influences what policy instrument is best for welfare, given political feasibility constraints. If the political feasibility threshold is high enough, an optimal Pigouvian tax is not feasible, even when voters are fully economically literate (see Proposition 1). More generally, the higher the threshold, the lower the benefits of the optimal politically constrained tax. But when the price effect of the standard is sufficiently non-salient, the unconstrained standard optimum can become politically feasible and the planner then strictly prefers the standard regardless of how voters perceive the tax.

5.6 Quantitative Interpretation of the Model

The model shows that incomplete economic literacy can make a standard (constrained) optimal. This subsection asks whether survey magnitudes make this quantitatively relevant.

We focus on welfare comparisons. Let x_r^{PF} denote the largest politically feasible emissions reduction under instrument r. Equation (1) implies that standards generate greater welfare than market-based instrument m (consumer tax, producer tax, or cap-and-trade) if $\varphi\left(x_\sigma^{PF} - x_m^{PF}\right) > C_\sigma(x_\sigma^{PF}) - C_m(x_m^{PF})$. Here the left-hand side equals the standards' additional environmental benefits and the right-hand side represents standards' greater costs.

To estimate benchmark welfare comparisons, we assume costs for instrument r are quadratic over the relevant range, $C_r \approx \kappa_r x^2$, with $\kappa_\sigma > \kappa_m$. Define $\Lambda_m \equiv \kappa_\sigma/\kappa_m > 1$ as a standard's cost disadvantage relative to market-based instrument m. Substituting into (1) yields a simple condition for standards to yield greater welfare than market-based instrument m:

$$\Lambda_m < \frac{2x_m^{FB}\left(x_\sigma^{PF} - x_m^{PF}\right) + (x_m^{PF})^2}{(x_\sigma^{PF})^2}. \tag{3}$$

While fully structurally estimating the model is beyond the scope of this paper, we report a back-of-the-envelope approximation for the key terms in equation (3). We assume first-best abatement is $x_\tau^{FB} = 50\%$, though alternatively discuss 90%. We adopt the net support criterion for political feasibility. Our political feasibility threshold corresponds to the case where the fraction supporting is at least as large as the fraction opposing. Appendix B.5 reports results instead assuming the political feasibility criterion is majority support.

We approximate x_r^{PF} by assuming that the shares of voters who support and oppose a policy are each proportional to the share whose preferred abatement falls on the relevant side of a policy's stringency. We calibrate these proportions to the surveyed abatement level of 20%. For example, Panel a of Figure 2 shows that 23% of respondents support cap-and-trade delivering 20% abatement, while Figure 3 shows that 42% prefer a reduction of at least 20% under cap-and-trade. Applying this 23/42 ratio to the preferred-abatement shares in Figure 3 yields support for cap-and-trade achieving different possible reductions. For policy opposition, the corresponding ratio is 37/58.[23] The share who support a policy is lower than the fraction who prefer abatement weakly higher than the proposed abatement level because, as the model assumes, supporting a policy means that utility is higher than some benchmark. Having support decline and opposition increase with the proposed level of emissions is fully consistent with the model, since in the model, support and preferred

[23]Although we calculate these ratios from the underlying data, they can also be approximated from the figures. Panel b of Figure 2 shows that net support for cap-and-trade is -14%. Combining with the 23% support in Panel a implies that 37% oppose cap-and-trade. Figure 3 shows that 58% prefer cap-and-trade achieving less than 20% abatement.

emissions reduction are both increasing in θ_i.

We calculate x_r^{PF} by identifying the largest gridpoint in Figure 3 where net support is non-negative. For cap-and-trade, at the gridpoint of 10%, applying values from above implies $34\% = (23/42) \times 62\%$ supporting and $24\% = (37/58) \times 38\%$ opposing, giving net support of +9.7%. Net support turns to -4.5% by the 15% gridpoint, where support falls to $27\% = (23/42) \times 50\%$ and opposition rises to $32\% = (37/58) \times 50\%$. Linearly interpolating between these two gridpoints, net support for cap-and-trade equals zero at $13.4\% = 10\% + 5\% \times [9.7/(9.7+4.5)]$. The other policy instruments involve analogous interpolation between adjacent gridpoints to find where net support equals zero. Applying this procedure to each policy instrument yields the following politically feasible levels: x_r^{PF}= (19.5%, 4.8%, 15.0%, 13.4%) under standards, consumer taxes, producer taxes, and cap-and-trade.

Equation (3) then implies that the planner prefers standards over consumer taxes if standards are up to 3.9 times as costly as consumer taxes, over producer taxes if they are up to 1.8 times as costly, and over cap-and-trade if standards are up to 2.1 times as costly.[24]

The implied dollar values are large. Assume a social cost of carbon of \$200/ton (Rennert et al. 2022) and U.S. power sector emissions of 1.5 billion tons CO_2 annually (EIA 2026). Equation (1) implies that relative to no policy, a politically feasible consumer tax provides \$13.7 billion in annual welfare gains. The politically feasible standard generates greater welfare than the consumer tax as long as the standard's compliance costs do not exceed \$45 billion.

Back-of-the-envelope estimates also indicate that economic literacy shrinks the case for standards. Suppose the pass-through video raises abatement under the politically feasible consumer tax from 4.8% to 8% while lowering feasible stringency under the producer tax from 15% to 12.5% and holding the standard fixed at 19.5%. The annual welfare gain from consumer taxes then rises from \$13.7 billion to \$22 billion, and the maximum compliance cost the planner accepts for politically feasible standards falls from \$45 to \$36 billion.

6 Conclusions

Economists often lament that environmental policy relies on cost-ineffective standards rather than market-based instruments like cap-and-trade markets or pollution taxes. The stakes are high, as public and private actors are spending trillions of dollars to address climate change and invest in renewable energy, and many major environmental policies in high- and middle-income countries rely heavily on standards.

We study how limited understanding of economic principles affects these patterns. We

[24]If first-best abatement is 90%, the maximum cost ratio Λ_m at which standards outperform other instruments rises to 7.0 for consumer taxes, 2.7 for producer taxes, and 3.4 for cap-and-trade.

use a national probability-based survey and an experiment with short informational videos on tax incidence and allocative efficiency. Our cross-sectional comparison of descriptive patterns between voters and experts reveals differences in beliefs about how standards versus market-based instruments affect energy bills. Informational videos about economic principles that are reasonably easy for participants to understand move people's beliefs and preferences closer to those of economic experts. Our analysis of mechanisms suggests that economic literacy helps explain the effects of the videos; expert persuasion plays a small role and we largely exclude a role for experimenter demand. Our model of politically constrained design shows how these empirical patterns can lead a welfare-maximizing planner to choose standards, and our calibration suggests that politically feasible standards may generate several billion dollars in greater annual welfare than politically feasible market-based instruments.

Our analysis leaves several questions open for future work. To what extent do the beliefs and preferences we analyze influence policy in non-environmental domains? How does the policymaking and regulatory process combine these beliefs with influence from interest groups to produce the policies that governments implement? Finally, what forces have led governments in specific settings to still adopt market-based environmental policies?

More broadly, the results and theoretical framework of this paper are a useful step toward developing rigorous approaches to evaluating optimal policy design under political constraints. We see substantial scope for extending the approach to other domains in which the political feasibility of cost-effective instruments is constrained by voters' beliefs, from labor markets to housing, health care, and trade.

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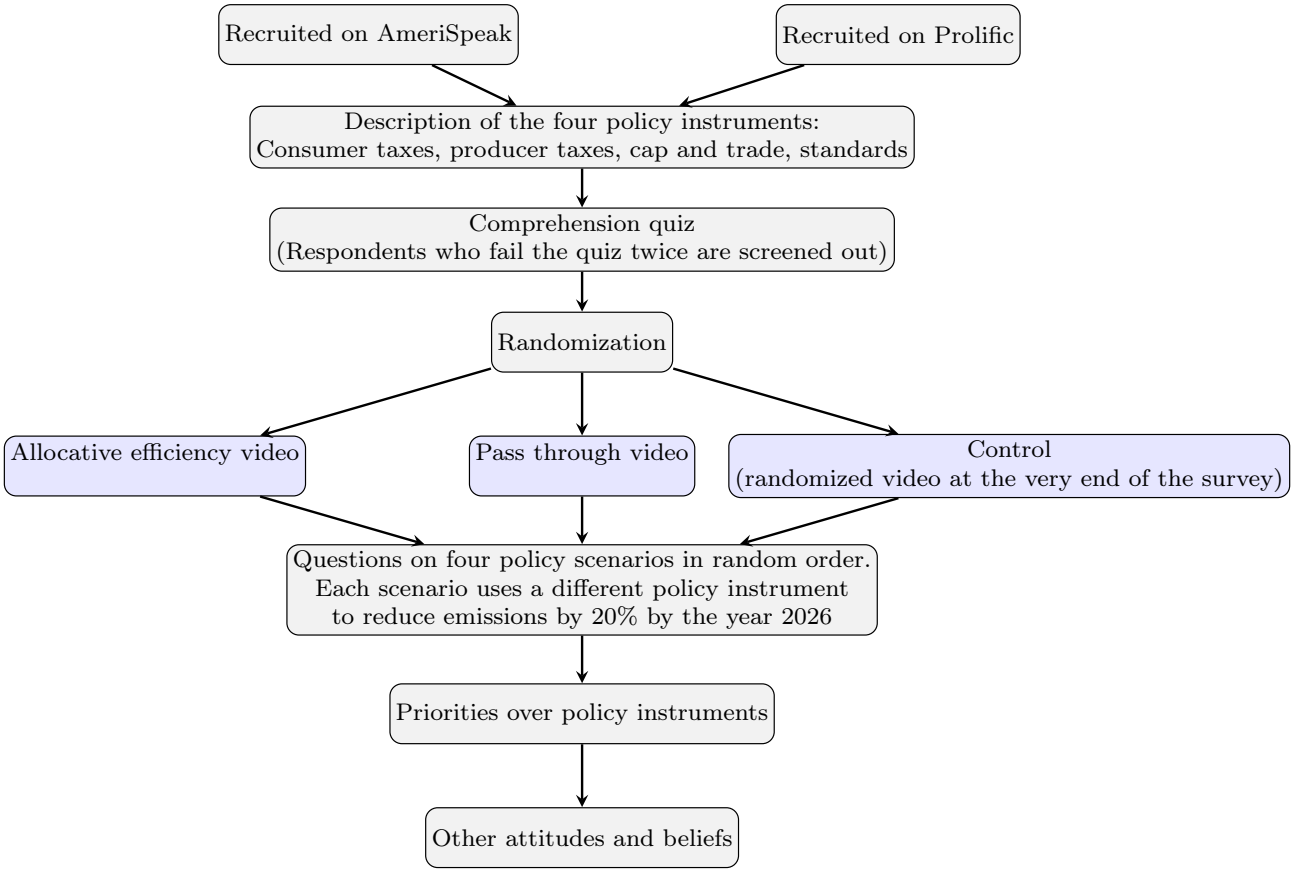
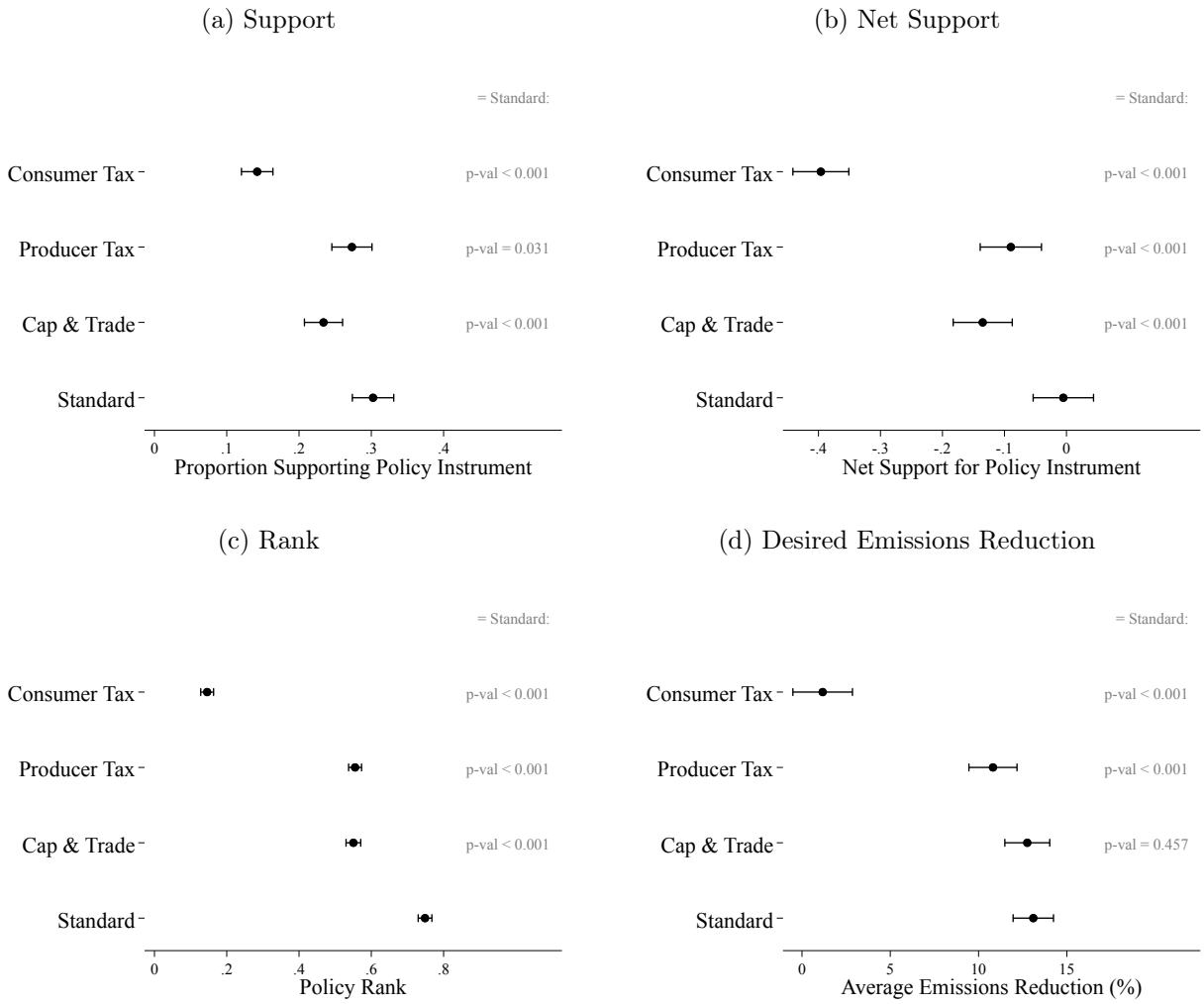
Figure 1: Consort Diagram for Main Surveys



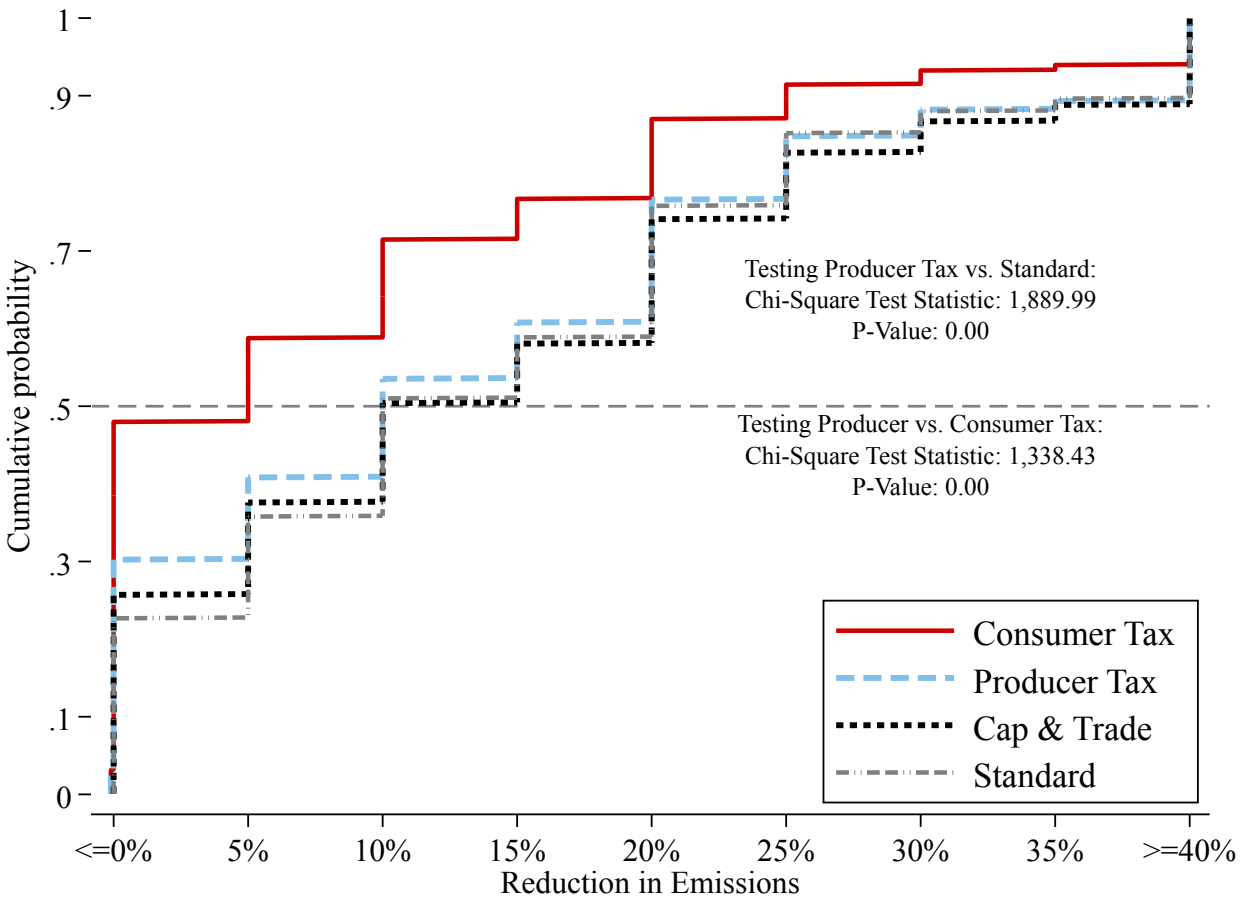
Notes: This figure summarizes our main survey design. We conducted nearly identical surveys on both AmeriSpeak and Prolific in March-May, 2023. Our final analysis sample includes 1,817 AmeriSpeak and 1,899 Prolific participants. Participants in the survey were randomly assigned to one of three groups: allocative efficiency (25%), pass-through (25%), or control (50%). Participants in the allocative efficiency and pass-through treatments saw the associated videos at the beginning of the survey, after passing the quiz on the description of policy instruments. Participants in the control group saw either the allocative efficiency or pass-through video at the end of the survey, after answering all questions.

Figure 2: Preferences Over Policy Instruments



Notes: Figure uses the AmeriSpeak control group. In Panel a, the outcome is an indicator for supporting each policy. In Panel b, the outcome is an indicator for supporting each policy minus an indicator for not supporting this policy (1=yes, 0=not sure, -1=no). In Panel c, the outcome is rank, which originally ranges from 1 to 4 for each policy and is normalized to 0-1 range (0 for ranking last and 1 for ranking first). In Panel d, the outcome is the percent reduction in emissions the respondent prefers for each policy. Since the original question includes options such as no reduction or an increase in emissions and 40% or more, tobit regressions are applied with lower-censoring limit = 0 and upper-censoring limit = 40. We show the p-values of testing equality in means between each market-based instrument and standard. When pooling market-based instruments, the average support is 0.216 (vs. 0.302 for standard, p-value = 0.000); the average net support is -0.207 (vs. -0.005 for standard, p-value = 0.000); the average adjusted rank is 0.417 (vs. 0.749 for standard, p-value = 0.000); and the average desired emissions reduction is 8.691 (vs. 12.837 for standard, p-value = 0.000).

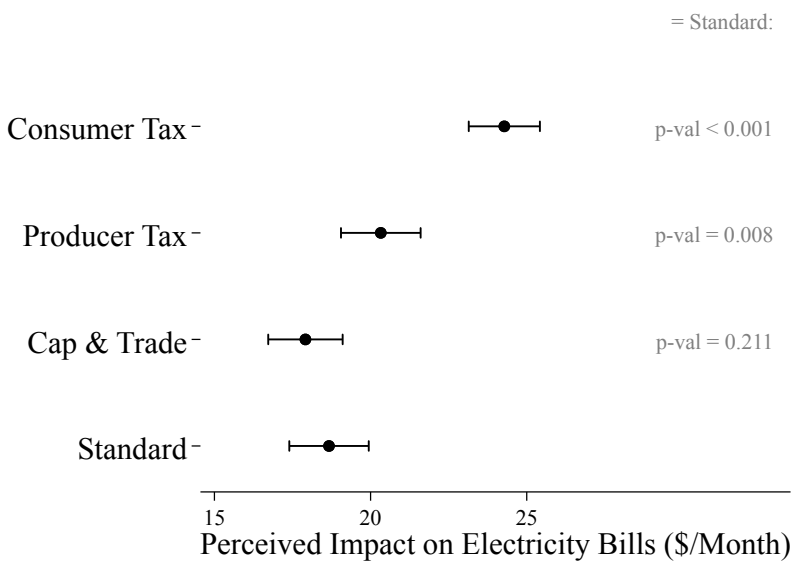
Figure 3: Distribution of Preferred Emissions Reduction, by Policy Instrument



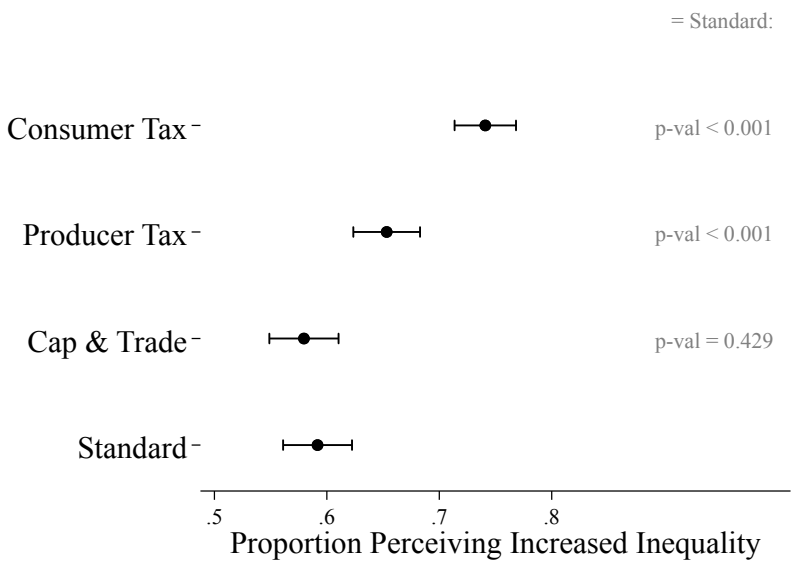
Notes: Figure uses the AmeriSpeak control group and shows the CDFs of participants' preferred emissions reductions. The text shows the p-values from chi-square test of independence between pairs of policies. About 1-5% of the respondents indicated preferring an increase in emissions across policies; for simplicity, the figure is presented after winsorizing them at 0%.

Figure 4: Perceived Effects of Policy Instruments on Electricity Bills and Inequality

(a) Impact on Electricity Bills ($/Month)

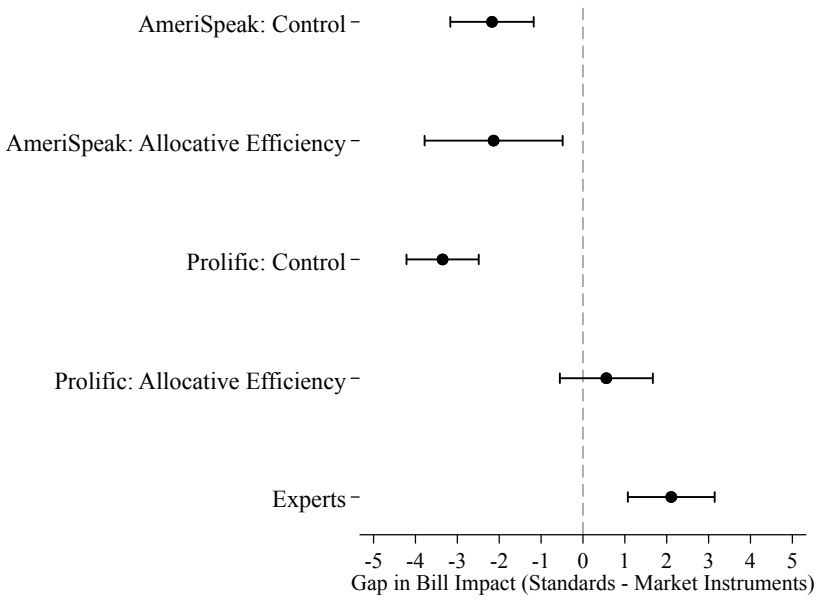


(b) Impact on Inequality



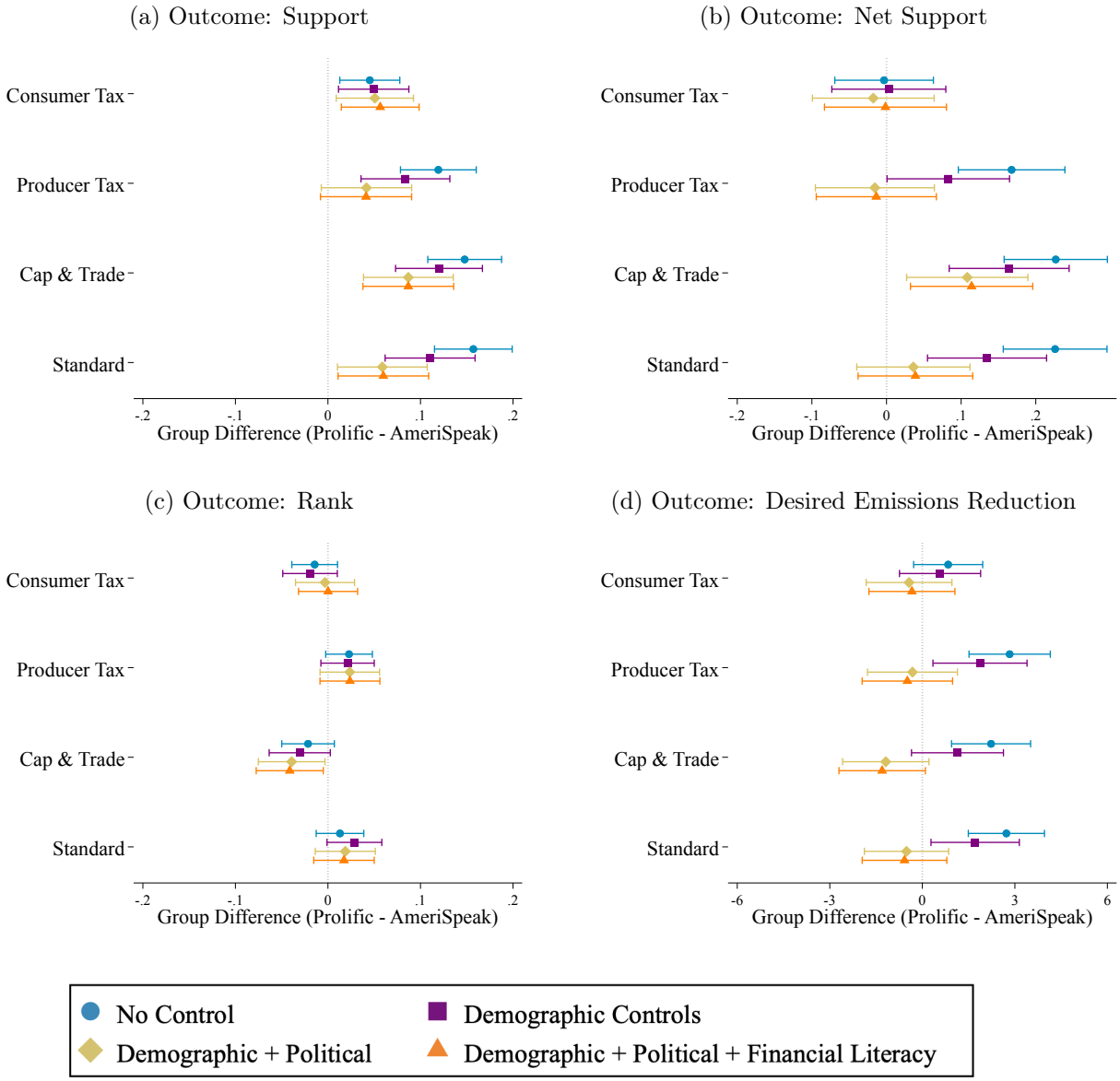
Notes: Figures use the AmeriSpeak control group. In panel a, the outcome is the perceived impact of each policy instrument on electricity bills (in dollars). In panel b, the outcome is an indicator for believing that a policy instrument increases inequality. We show the p-values of testing equality in means between each market-based instrument and standard. When pooling market-based instruments, the average perceived impact on electricity bills is 20.841 (vs. 18.669 for standard, p-value = 0.000); the average perceived impact on inequality is 0.658 (vs. 0.592 for standard, p-value = 0.000).

Figure 5: Difference in Electricity Bills Between Standards and Market-Based Instruments, by Sample and Treatment



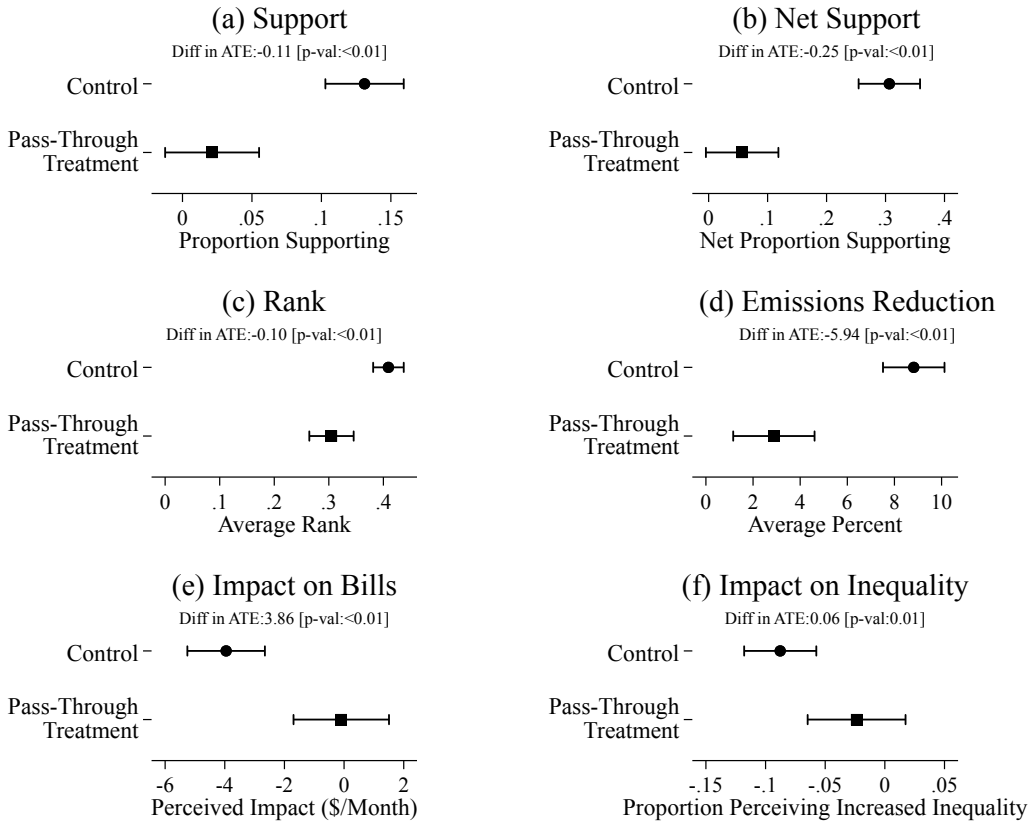
Notes: Figure shows the perceived difference in the impact of standards and market-based instruments on consumer electricity bills in $/month across different samples. We pool all market-based instruments (consumer taxes, producer taxes, and cap-and-trade). "Allocative Efficiency" represents the treatment group that watched the allocative efficiency video.

Figure 6: Preferences Over Policy Instruments, AmeriSpeak Versus Prolific



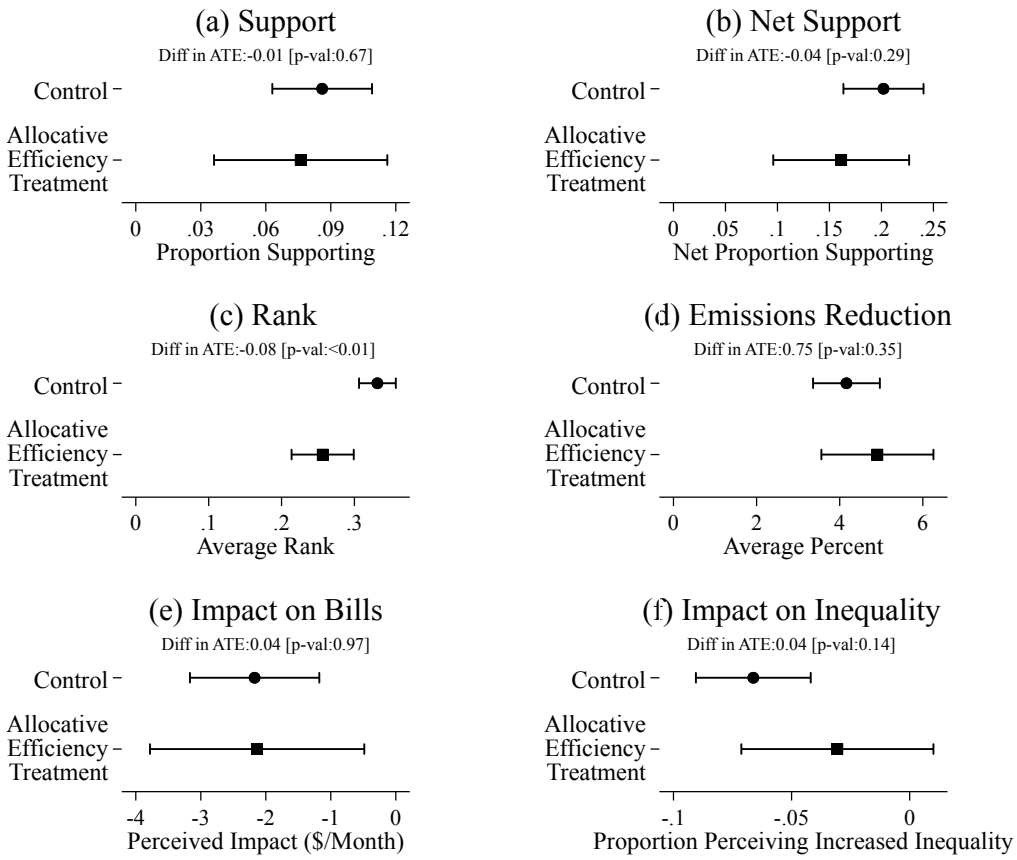
Notes: Figures pool AmeriSpeak and Prolific control groups. We regress the outcomes on an indicator for Prolific sample with different sets of controls to estimate the group difference. In Panel a, the outcome is an indicator for supporting each policy. In Panel b, the outcome is an indicator for supporting each policy minus an indicator for not supporting this policy (1=yes, 0=not sure, -1=no). In Panel c, the outcome is rank, which originally ranges from 1 to 4 for each policy and is normalized to 0-1 range (0 for ranking last and 1 for ranking first). In Panel d, the outcome is the desired percent reduction in emissions the respondent chooses for each policy. Since the original question includes options such as no reduction or an increase in emissions and 40% or more, tobit regressions are applied with lower-censoring limit = 0 and upper-censoring limit = 40. Demographic controls include gender, age, race, education level, marital status, employment status, household income. Political controls include political party affiliation, ideology, beliefs about the role of government intervention on environmental protection and the cause of global warming. Financial literacy controls check participants' basic understanding of interest rates, inflation, and returns. We also tested no difference in the baseline of all policies (all four coefficients = 0). For support, net support, and desired emission reduction, the p-values in the no control condition are less than 0.01 (rejecting no difference). For rank, the p-value is 0.14. After adding demographic controls, the p-value is less than 0.01 for support and net support, 0.06 for rank, and 0.11 for desired emissions reduction. With demographic and political controls, the p-value is 0.003 for support, 0.036 for net support, 0.131 for rank, and 0.492 for desired emissions reduction. With full controls, the p-value is 0.002 for support, 0.037 for net support, 0.124 for rank, and 0.428 for desired emissions reduction.

Figure 7: Effects of the Pass-Through Video on the Gap between Producer Tax and Consumer Tax



Notes: In Panel a, the outcome variable is an indicator for supporting each policy. In Panel b, the outcome variable is an indicator for supporting each policy minus an indicator for not supporting this policy (1=support, 0=not sure, -1=don't support). In Panel c, the outcome variable is rank, which originally ranges from 1 to 4 for each policy and is normalized to 0-1 range (0 for ranking last and 1 for ranking first). In Panel d, the outcome variable is the desired percent reduction in emissions the respondent chooses for each policy. In Panel e, the outcome variable is the perceived impact on electricity bills for each policy (in dollars). In Panel f, the outcome variable is an indicator for believing whether a policy increases inequality. For each outcome we calculate the difference between the answers for producer tax and consumer tax and show the results for participants in the control group and the pass-through treatment. In each panel, the p-values are derived from testing the hypothesis that the differences between the producer tax and consumer tax are equal in the control group and the treatment group watching the pass-through video. The p-value for testing zero treatment effects across all outcomes is displayed at the bottom of the figure.

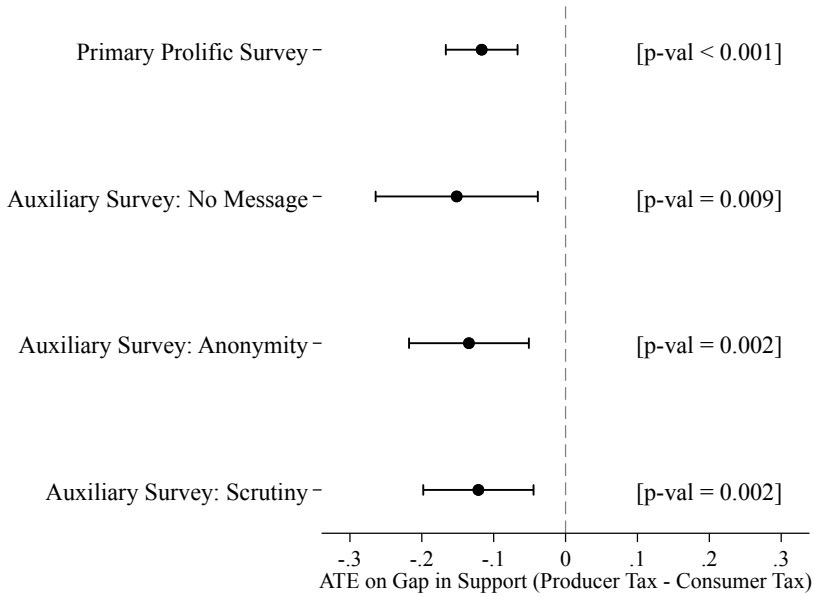
Figure 8: Effects of the Allocative Efficiency Video on the Gap between Standards and Market-Based Instruments



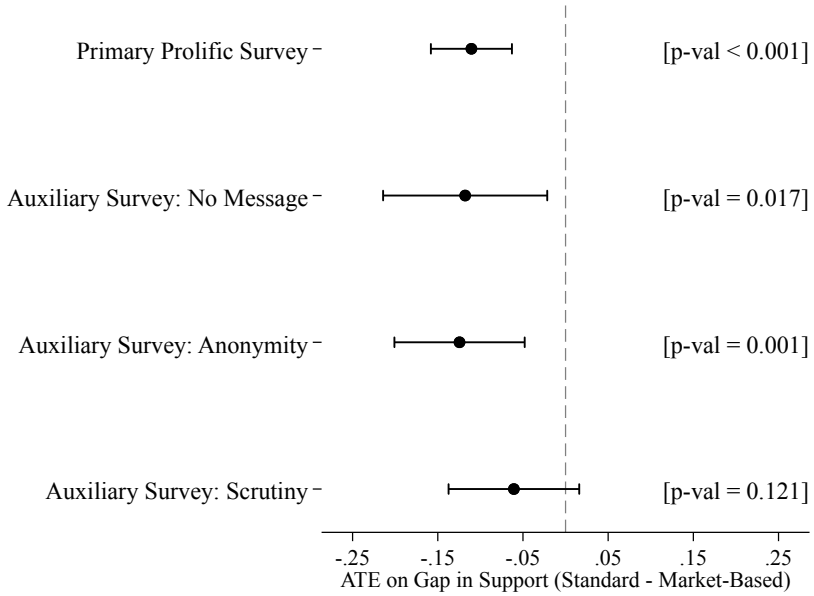
Notes: In Panel a, the outcome variable is an indicator for supporting each policy. In Panel b, the outcome variable is an indicator for supporting each policy minus an indicator for not supporting this policy (1=support, 0=not sure, -1=don't support). In Panel c, the outcome variable is rank, which originally ranges from 1 to 4 for each policy and is normalized to 0-1 range (0 for ranking last and 1 for ranking first). In Panel d, the outcome variable is the desired percent reduction in emissions the respondent chooses for each policy. In Panel e, the outcome variable is the perceived impact on electricity bills for each policy (in dollars). In Panel f, the outcome variable is an indicator for believing whether a policy increases inequality. For each outcome, we calculate the difference between the answers for market-based instruments (consumer taxes, producer taxes, and cap-and-trade) and for standards and show the results for participants in the control group and the allocative efficiency treatment. In each panel, the p-values are derived from testing the hypothesis that the differences between market-based instruments and standards are equal in the control group and the treatment group watching the allocative efficiency video. The p-value for testing zero treatment effects across all outcomes is displayed at the bottom of the figure.

Figure 9: Impact of Anonymity Treatment on Video's Effects on Support for Different Policy Instruments

(a) Effect of Pass-Through Video



(b) Effect of Allocative Efficiency Video



Notes: Figure shows effects of the indicated videos on the support gap between the policy instruments of interest. Panel a shows the effect of the pass-through video on the support gap between taxing consumers and producers. Panel b shows the effect of the allocative efficiency video on the support gap between standard and other market-based policies aggregated. In each panel, the first row shows the treatment effect in primary Prolific sample, and the other estimates show the treatment effect of the auxiliary survey on Prolific by the no-message, anonymity, or scrutiny conditions. The p-value of each column is also displayed. ATE is average treatment effect.

Table 1: Demographics and Beliefs of Survey Respondents and US Population

	AmeriSpeak	Prolific	Prolific (Auxiliary Survey)	AmeriSpeak (Weighted)	CPS	Gallup
	(1)	(2)	(3)	(4)	(5)	(6)
Male	51%	57%	41%	49%	49%	50%
Over age 60	29%	12%	8%	29%	30%	-
College grad	41%	55%	57%	37%	34%	35%
Married	52%	33%	37%	50%	48%	46%
Employed	64%	76%	76%	60%	60%	-
Household income $<$ \$35,000	22%	26%	23%	25%	24%	-
Household income $<$ \$60,000	42%	50%	44%	44%	41%	-
Household income $<$ \$100,000	68%	77%	72%	68%	63%	-
Self-identified liberal	27%	44%	41%	25%	-	25%
Government should protect enviro. more	69%	77%	78%	68%	-	56%
Human activity causing climate change	61%	77%	76%	59%	-	62%
Median age	45	38	38	47	47	-
Number of observations	1,817	1,899	1,914	1,817	-	-

Notes: Columns (1)-(3) show the demographics of our primary AmeriSpeak sample, the Prolific sample used for the same survey, and the Prolific sample of our auxiliary survey. Column (4) shows the demographics of AmeriSpeak after reweighting (using the weights provided by AmeriSpeak) to resemble the population obtained from Current Population Survey (Feb / March Supplement 2023). The reweighting uses the following variables: age, gender, census division, race/ethnicity, education, housing tenure, household phone status, age×gender, age×race/ethnicity. The last two columns show the demographics of the US population for comparison. The statistics on gender, age, education, marital status, employment status, and household income use the Current Population Survey (Feb / March Supplement 2023). The statistics related to political ideology, political party affiliation, and environmental opinions use the 2023 Gallup poll.

Table 2: Balance Table for the AmeriSpeak Sample

	Control	Pass Through (PT)	Allocative Efficiency (AE)	Control - PT	Control - AE
	Mean	Mean	Mean	T-test	T-test
	(1)	(2)	(3)	(4)	(5)
Male	0.513	0.481	0.538	0.032	-0.025
Age 18-29	0.169	0.168	0.218	0.001	-0.049**
Age 30-44	0.323	0.322	0.303	0.000	0.020
Age 45-59	0.217	0.227	0.201	-0.011	0.016
White	0.671	0.687	0.700	-0.016	-0.028
Black	0.097	0.100	0.082	-0.003	0.015
College graduate	0.400	0.412	0.437	-0.012	-0.037
Married	0.534	0.512	0.494	0.022	0.040
Working	0.640	0.671	0.615	-0.030	0.025
Income less than 30,000	0.172	0.185	0.191	-0.012	-0.019
Income 30,000-60,000	0.256	0.237	0.221	0.019	0.035
Income 60,000-100,000	0.260	0.254	0.270	0.007	-0.010
Liberal	0.268	0.254	0.261	0.015	0.008
Conservative	0.212	0.254	0.246	-0.042*	-0.034
Democrat	0.512	0.472	0.484	0.040	0.028
Republican	0.311	0.360	0.357	-0.049*	-0.046
Earth warmer due to human activity	0.598	0.559	0.598	0.039	-0.000
Gov. should protect enviro. more	0.685	0.635	0.705	0.050*	-0.019
P-value for F-test on all variables				0.850	0.269
Number of observations	992	442	403		

Notes: Table uses the AmeriSpeak sample that passes the screening conditions and composes our final sample. Columns (1)-(3) show the distribution of demographic characteristics across the control, pass-through treatment, and allocative efficiency treatment groups. Column (4) presents the testing of the difference between the control and pass-through treatment group. Column (5) presents the testing of the difference between the control and allocative efficiency treatment group. *Liberal* categorizes respondents who self-identify as very liberal or somewhat liberal (1 or 2 on a 5-point scale); *Conservative* categorizes respondents who self-identify as very conservative or somewhat conservative (4 or 5 on a 5-point scale). The bottom row shows the p-values of the F-test on all variables being equal between two groups. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Online Appendix

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A Supplementary Figures and Tables

Table A1: Balance Table (Prolific Sample)

	Control	Pass Through (PT)	Allocative Efficiency (AE)	Control - PT	Control - AE
	Mean	Mean	Mean	T-test	T-test
	(1)	(2)	(3)	(4)	(5)
Male	0.567	0.578	0.574	-0.011	-0.007
Age 18-29	0.224	0.231	0.239	-0.007	-0.015
Age 30-44	0.417	0.426	0.403	-0.009	0.014
Age 45-59	0.245	0.215	0.230	0.029	0.015
White	0.740	0.760	0.786	-0.020	-0.046*
Black	0.100	0.100	0.090	-0.000	0.010
College graduate	0.541	0.592	0.550	-0.050*	-0.008
Married	0.339	0.327	0.324	0.012	0.014
Working	0.751	0.760	0.770	-0.008	-0.019
Income less than 30,000	0.230	0.202	0.212	0.028	0.018
Income 30,000-60,000	0.263	0.290	0.324	-0.027	-0.061**
Income 60,000-100,000	0.256	0.288	0.267	-0.031	-0.011
Liberal	0.570	0.569	0.592	0.001	-0.022
Conservative	0.215	0.220	0.209	-0.005	0.006
Democrat	0.491	0.508	0.534	-0.017	-0.043
Republican	0.174	0.168	0.149	0.006	0.025
Earth warmer due to human activities	0.771	0.780	0.766	-0.009	0.005
Gov. should do more to protect the environment	0.770	0.744	0.786	0.026	-0.016
P-value for F-test on all variables				0.703	0.270

Notes: Table uses the Prolific sample that passes the screening conditions and composes our final sample. Columns (1)-(3) show the distribution of demographic characteristics across the control, pass-through treatment, and allocative efficiency treatment group. Column (4) presents the testing of the difference between the control and pass-through treatment group. Column (5) presents the testing of the difference between the control and allocative efficiency treatment group. In Columns (4)-(5), we use * for p-value < 0.1, ** for p-value < 0.05, and *** for p-value < 0.01. *Liberal* categorizes respondents who self-identify as extremely liberal, liberal, or slightly liberal (1-3 on a 7-point scale); *Conservative* categorizes respondents who self-identify as extremely conservative, conservative, or slightly conservative (5-7 on a 7-point scale). The bottom row shows the p-values of the F-test on all variables being equal between two groups.

Table A2: Pairwise Tests of Equal Baseline Preferences and Perceived Effects

	Support	Net Support	Rank	Emissions	Bills	Inequality
Standard - Cap & Trade	0.069***	0.130***	0.198***	-0.146	0.755	0.012
Standard - Producer Tax	0.029**	0.085***	0.194***	0.870***	-1.658***	-0.061***
Standard - Consumer Tax	0.160***	0.391***	0.603***	5.684***	-5.613***	-0.149***
Cap & Trade - Producer Tax	-0.039**	-0.045*	-0.005	1.016***	-2.413***	-0.074***
Cap & Trade - Consumer Tax	0.092***	0.261***	0.405***	5.830***	-6.368***	-0.161***
Producer Tax - Consumer Tax	0.131***	0.306***	0.409***	4.814***	-3.955***	-0.088***

Notes: For each outcome in the column, we test pairwise whether the outcome for two policy instruments is equal in the AmeriSpeak control sample. The differences are shown in the cells. We use * for p-value $<$ 0.1, ** for p-value < 0.05, and *** for p-value < 0.01.

Table A3: Video Understanding Across Samples and Videos, Free Entry Responses

(a) Pass-Through Treatment

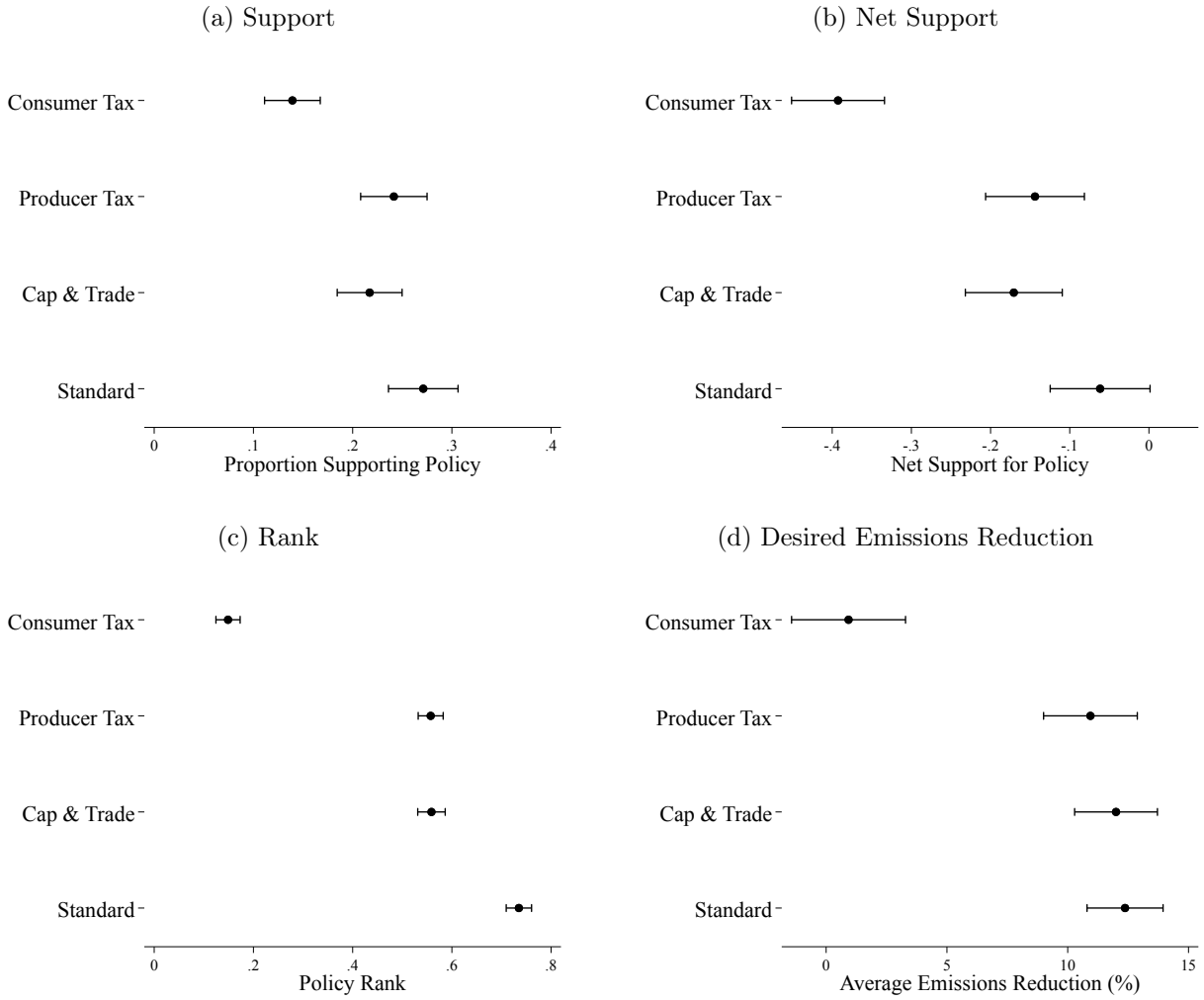
	Understanding = 1	Understanding = 2	Understanding = 3
AmeriSpeak	19.58%	24.91%	55.50%
Prolific	12.51%	18.87%	68.61%

(b) Allocative Efficiency Treatment

	Understanding = 1	Understanding = 2	Understanding = 3
AmeriSpeak	45.42%	41.68%	12.90%
Prolific	29.94%	42.49%	27.58%

Notes: Each cell displays the percent of respondents categorized in an understanding score in AmeriSpeak / Prolific sample. We use Claude Opus 4.6 to analyze responses to the question "in one or two sentences, describe what the video is about" after each video. Our prompt includes the link to the video and requests the model to rate the demonstrated level of video understanding (1=poor, 2=partial, 3=sufficient). Appendix D provides more details on the classification.

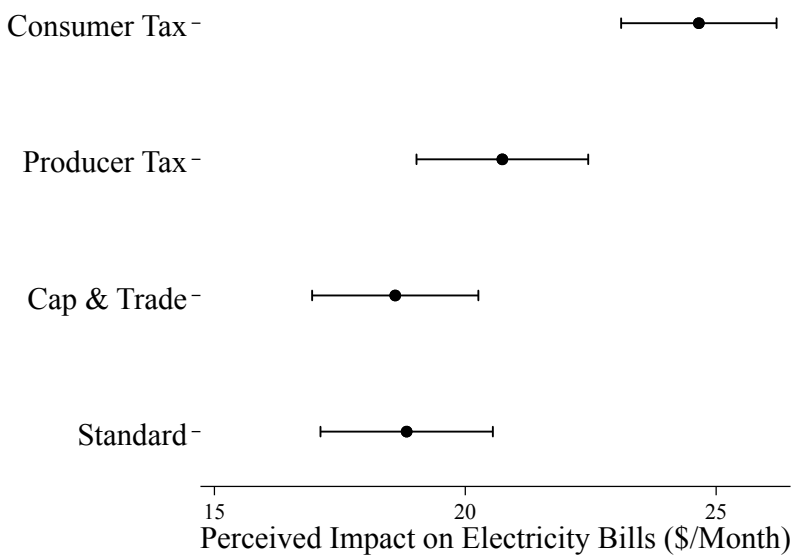
Figure A1: Policy Preferences: Control Group (AmeriSpeak Control Group, Weighted)



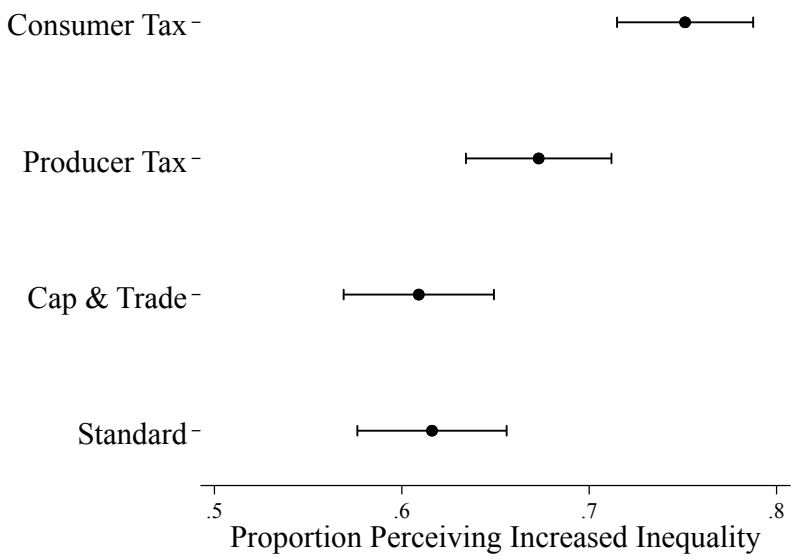
Notes: Figure uses the AmeriSpeak control group and applies the weights provided by NORC. In Panel a, the outcome variable is an indicator for supporting each policy. In Panel b, the outcome variable is an indicator for supporting each policy minus an indicator for not supporting this policy (1=yes, 0=not sure, -1=no). In Panel c, the outcome variable is rank, which originally ranges from 1 to 4 for each policy and is normalized to 0-1 range (0 for ranking last and 1 for ranking first). In Panel d, the outcome variable is the desired percent reduction in emissions the respondent chooses for each policy.

Figure A2: Perceived Impacts of Policies on Electricity Bills and Inequality (AmeriSpeak Control Group, Weighted)

(a) Impact on Electricity Bills ($/Month)



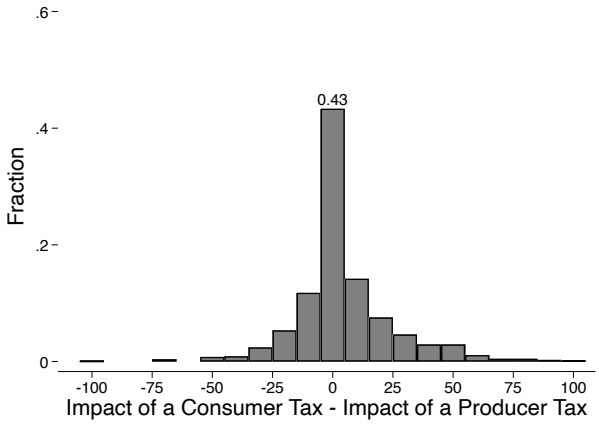
(b) Impact on Increasing Inequality



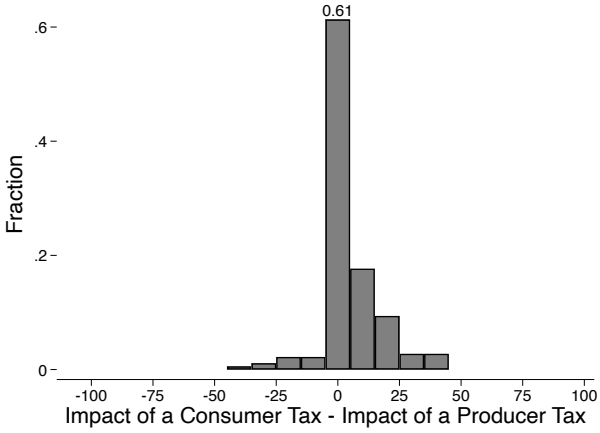
Notes: Figures use the AmeriSpeak control group and apply the weights provided by NORC. In panel a, the outcome variable is the perceived impact on electricity bills for each policy (in dollars). In Panel b, the outcome variable is an indicator for believing that a policy increases inequality.

Figure A3: Perceived Impacts of Consumer Versus Producer Taxes on Electricity Bills

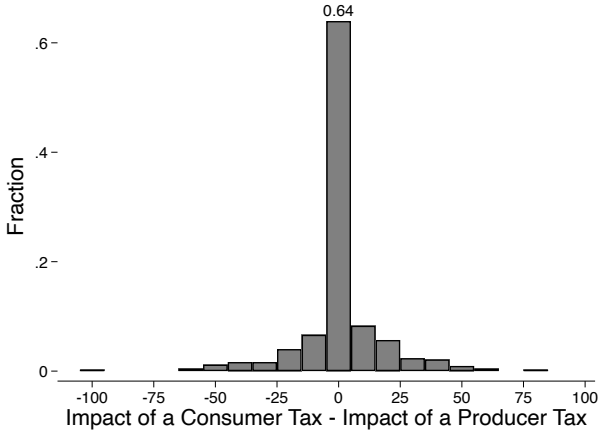
(a) Control Group



(b) Experts

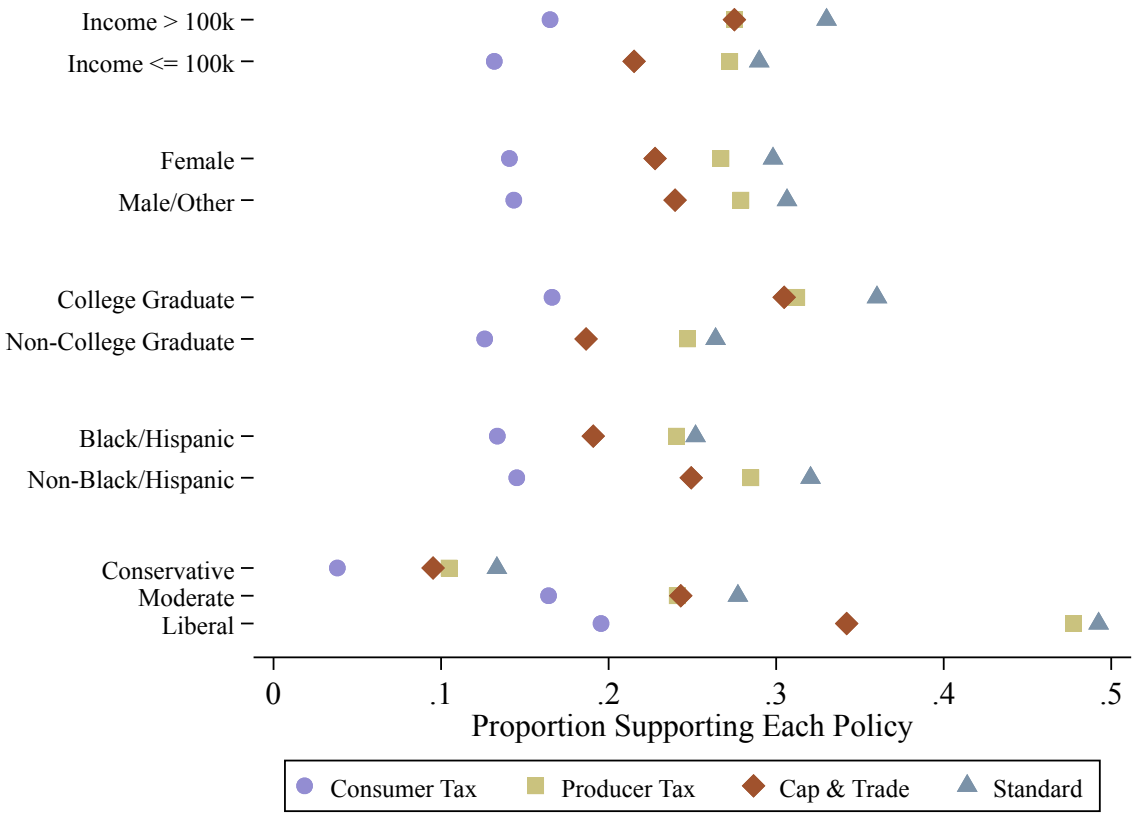


(c) Pass-through Treatment Group



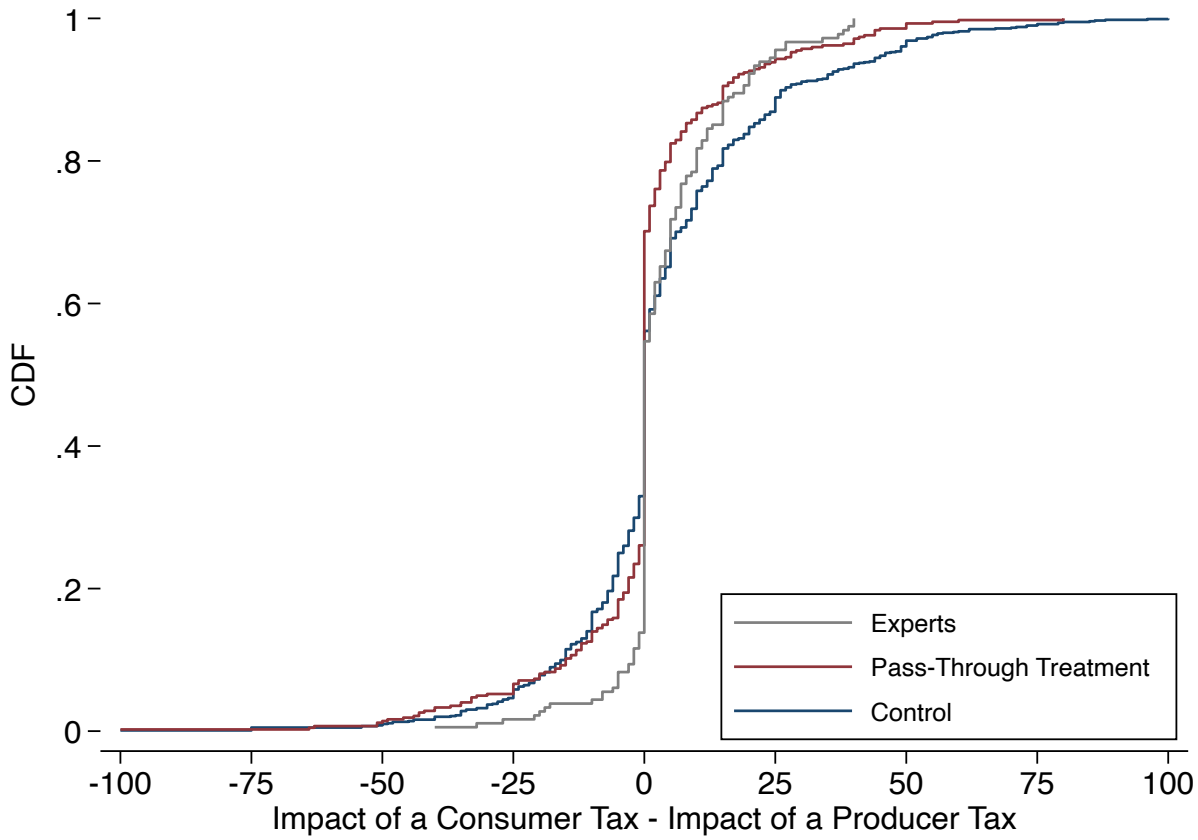
Notes: Values are in $/Month. Figures show the within-person difference in perceiving the impact of a consumer tax and a producer tax across different groups / samples. Each bin has width of $5. The total number of expert responses we analyze is 181. The p-value of testing equality in mean between the control group and experts is <0.01; the p-value of testing equality in mean between the control group and the pass-through treatment group is <0.01; the p-value of testing equality in mean between experts and the pass-through treatment group is 0.536.

Figure A4: Policy Support: Heterogeneity by Demographics



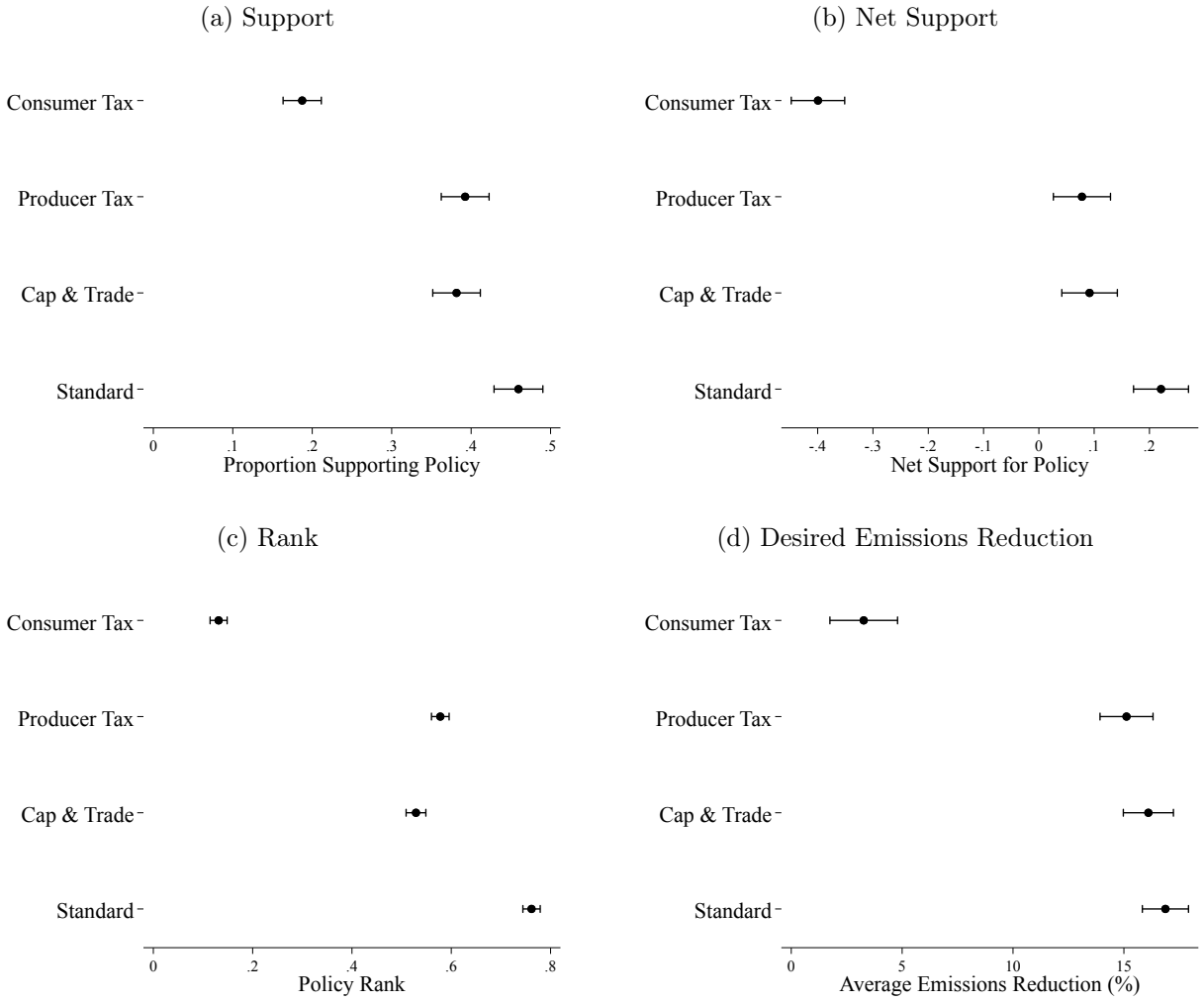
Notes: The figure uses the AmeriSpeak control group. The outcome variable is an indicator for supporting each policy and the figure shows the support for each policy instrument by demographic group.

Figure A5: Perceived Impact of Consumer Versus Producer Taxes on Electricity Bills, CDF



Notes: Values are in $/month. Figure shows the within-person difference in perceiving the impact of a consumer tax and a producer tax across different groups / samples (the CDF version of Table A3). The total number of expert responses we analyze is 181.

Figure A6: Preferences Over Policy Instruments (Prolific Control Group)



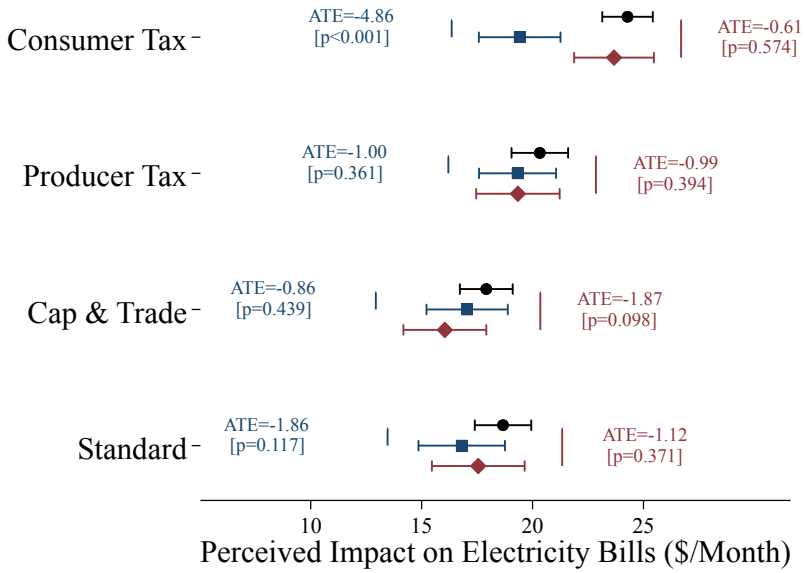
Notes: In Panel a, the outcome variable is an indicator for supporting each policy. In Panel b, the outcome variable is an indicator for supporting each policy minus an indicator for not supporting this policy (1=yes, 0=not sure, -1=no). In Panel c, the outcome variable is rank, which originally ranges from 1 to 4 for each policy and is normalized to 0-1 range (0 for ranking last and 1 for ranking first). In Panel d, the outcome variable is the desired percent reduction in emissions the respondent chooses for each policy.

Figure A7: Effects of Informational Videos on Policy Preferences

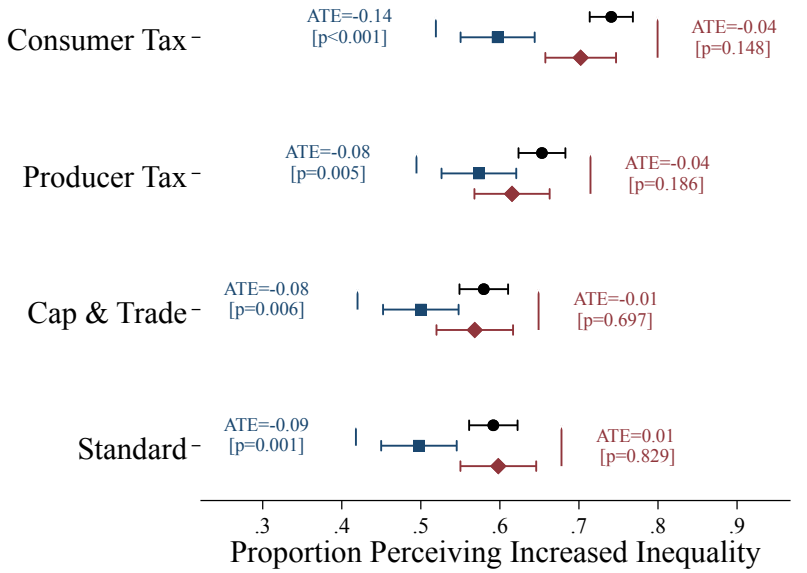
Notes: Each panel shows the effect of the indicated treatment on respondent preferences for each policy. In panel a, the outcome variable is an indicator for supporting each policy. In Panel b, the outcome variable is an indicator for supporting each policy minus an indicator for not supporting this policy (1=yes, 0=not sure, -1=no). In panel c, the outcome variable is rank, which originally ranges from 1 to 4 for each policy and is normalized to 0-1 range (0 for ranking last and 1 for ranking first). In Panel d, the outcome variable is the percent reduction in emissions the respondent chooses for each policy. The text in each figure shows the average treatment effects (ATEs) and their p-values.

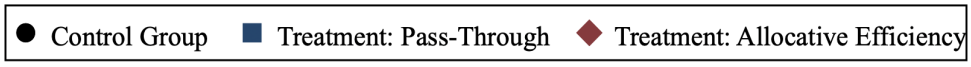
Figure A8: Effect of Informational Videos on Perceived Impact of Policy Instruments on Electricity Bills and Inequality

(a) Policy Impact on Electricity Bills ($/Month)



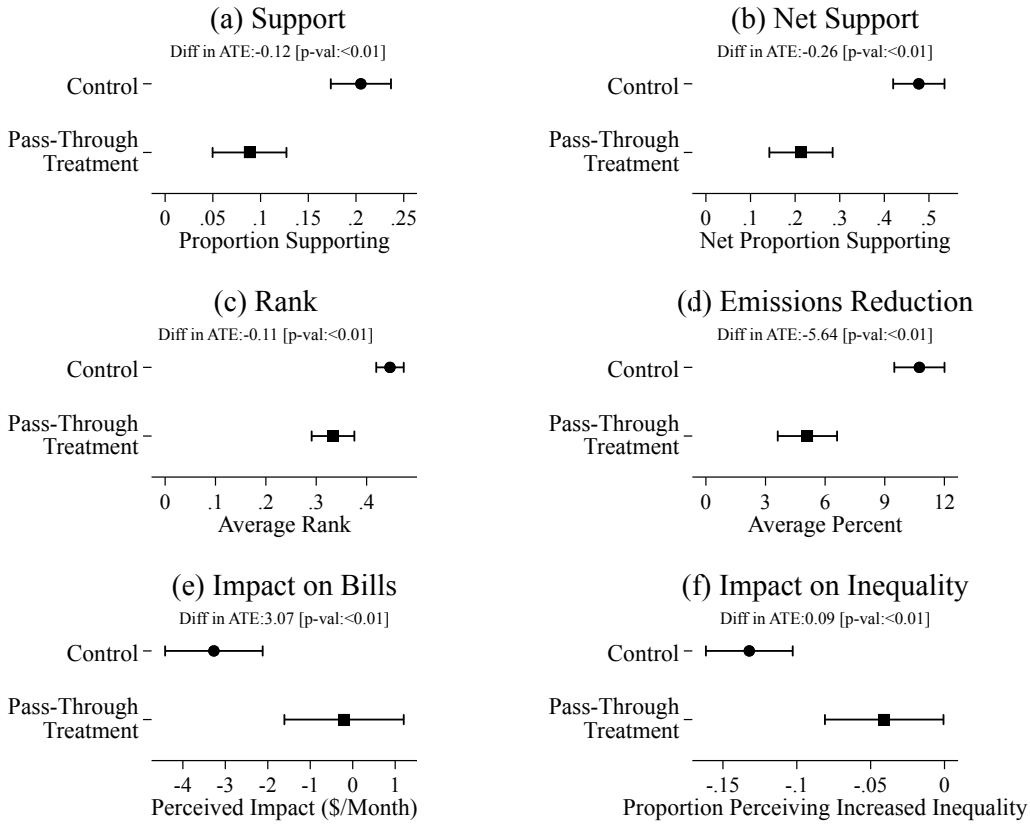
(b) Policy Impact on Inequality





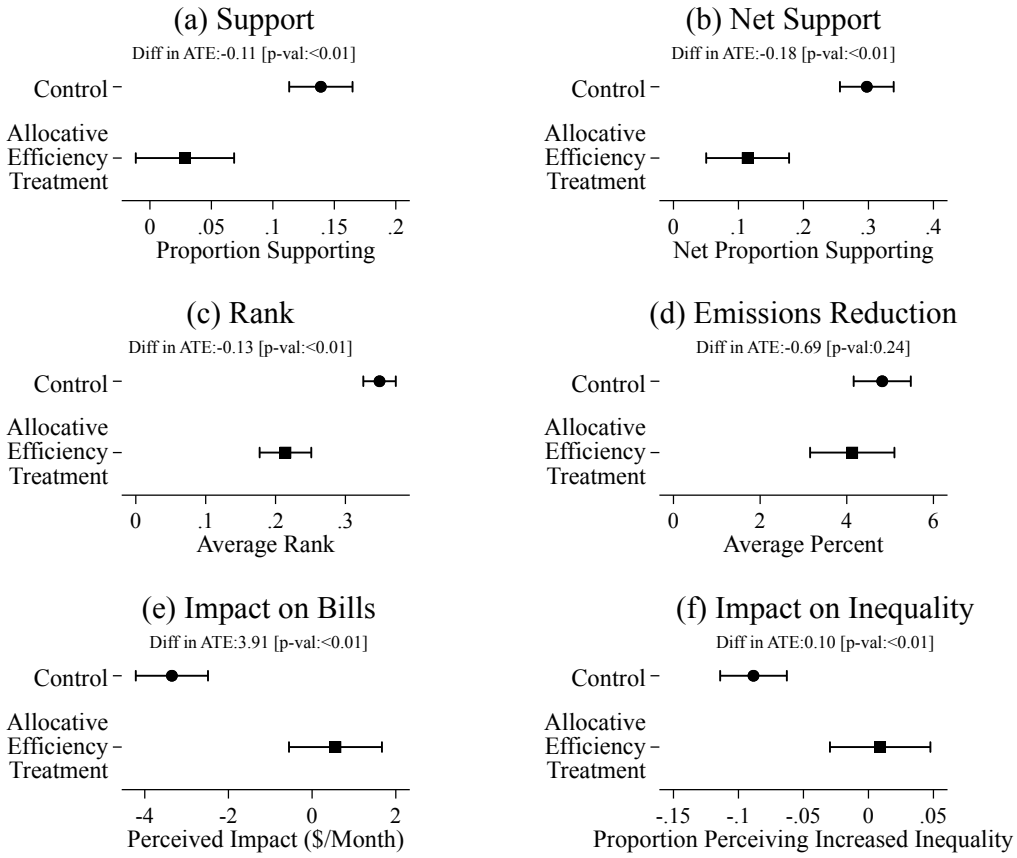
Notes: Each panel shows the effect of the indicated treatment on respondents' beliefs about how the policies impact electricity bills and inequality. For panel a, the outcome variable is the perceived impact on electricity bills for each policy (in dollars). For Panel b, the outcome variable is an indicator for believing whether a policy increases inequality. The text shows the average treatment effects (ATEs) and their p-values.

Figure A9: Effects of the Pass-Through Video on the Gap between Producer Tax and Consumer Tax (Prolific)



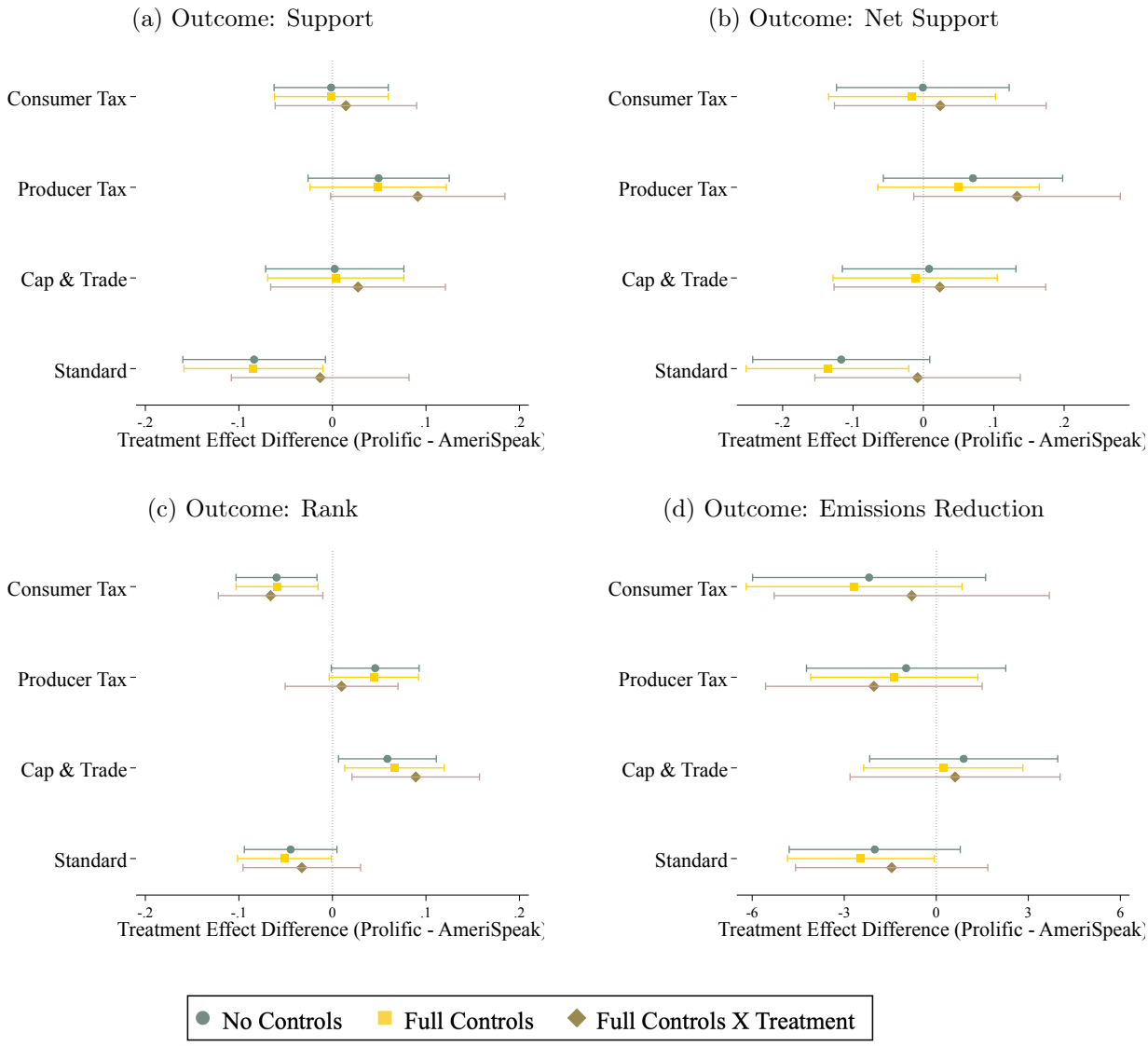
Notes: In Panel a, the outcome variable is an indicator for supporting each policy. In Panel b, the outcome variable is an indicator for supporting each policy minus an indicator for not supporting this policy (1=support, 0=not sure, -1=don't support). In Panel c, the outcome variable is rank, which originally ranges from 1 to 4 for each policy and is normalized to 0-1 range (0 for ranking last and 1 for ranking first). In Panel d, the outcome variable is the desired percent reduction in emissions the respondent chooses for each policy. In Panel e, the outcome variable is the perceived impact on electricity bills for each policy (in dollars). In Panel f, the outcome variable is an indicator for believing whether a policy increases inequality. For each outcome we calculate the difference between the answers for producer tax and consumer tax and show the results for participants in the control group and the pass-through treatment. The p-values are derived from testing the hypothesis that the differences between the producer tax and consumer tax are equal in the control group and the treatment group watching the pass-through video. The p-value for testing zero treatment effects across all outcomes is also displayed under each panel.

Figure A10: Effects of the Allocative Efficiency Video on the Gap between Standards and Market-Based Instruments (Prolific)



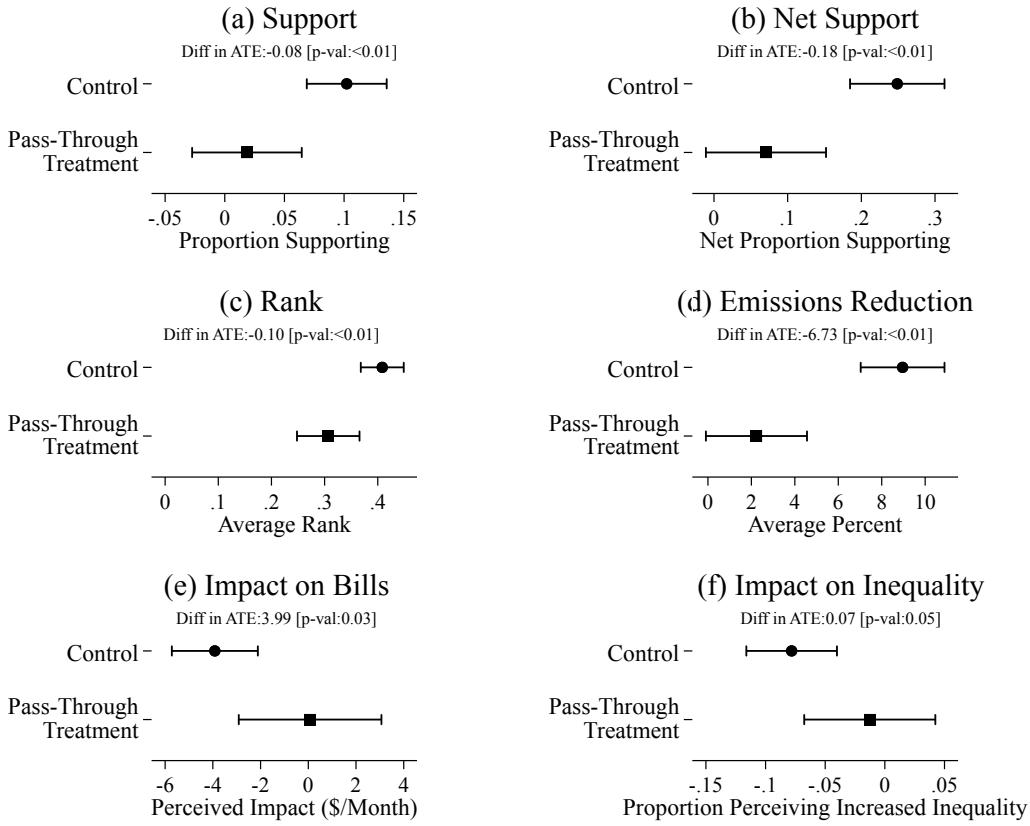
Notes: In Panel a, the outcome variable is an indicator for supporting each policy. In Panel b, the outcome variable is an indicator for supporting each policy minus an indicator for not supporting this policy (1=support, 0=not sure, -1=don't support). In Panel c, the outcome variable is rank, which originally ranges from 1 to 4 for each policy and is normalized to 0-1 range (0 for ranking last and 1 for ranking first). In Panel d, the outcome variable is the desired percent reduction in emissions the respondent chooses for each policy. In Panel e, the outcome variable is the perceived impact on electricity bills for each policy (in dollars). In Panel f, the outcome variable is an indicator for believing whether a policy increases inequality. For each outcome, we calculate the difference between the answers for market-based instruments (consumer taxes, producer taxes, and cap-and-trade) and for standards and show the results for participants in the control group and the allocative efficiency treatment. The p-values are derived from testing the hypothesis that the differences between market-based instruments and standards are equal in the control group and the treatment group watching the allocative efficiency video. The p-value for testing zero treatment effects across all outcomes is also displayed under each panel.

Figure A11: Effects of Allocative Efficiency Informational Video, by Platform and Controls



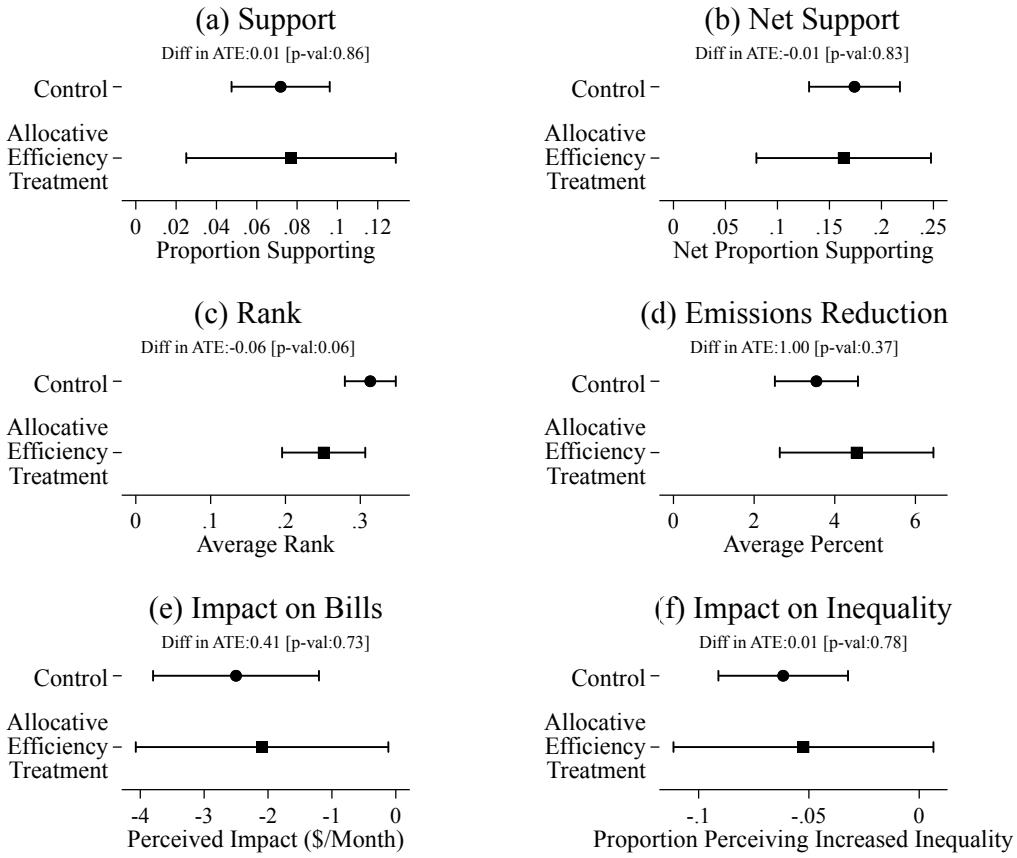
Notes: The figures above show the difference in treatment effect between the two samples (Prolific - AmeriSpeak). In Panel a, the outcome variable is an indicator for supporting each policy. In Panel b, the outcome variable is rank, which originally ranges from 1 to 4 for each policy and is normalized to 0-1 range (0 for ranking last and 1 for ranking first). In Panel c, the outcome variable is the percent reduction in emissions the respondent chooses for each policy. Since the original question includes options such as no reduction or an increase in emissions and 40% or more, tobit regressions are applied with lower-censoring limit = 0 and upper-censoring limit = 40. In Panel d, the outcome variable is the perceived impact on electricity bills for each policy (in dollars). In e, the outcome variable is an indicator for believing whether a policy increases inequality. The two treatments are watching a video on pass-through and watching a video on allocative efficiency. Demographic controls include gender, age, race, education level, marital status, employment status, household income, political party affiliation, and political ideology. Additional controls include the opinion about the role of government intervention on environmental protection and financial literacy. Below each panel, the results of testing the joint hypothesis of no difference in the treatment effect of all policies (all four coefficients = 0) with or without control are displayed. Testing the joint hypothesis of no difference in the treatment effect across all policies and outcomes (all twenty coefficients = 0) gives a p-value of 0.0016 without controls, a p-value of 0.0014 with full controls, and a p-value of 0.1082 when treatment effects are interacted with controls.

Figure A12: Effects of the Pass-Through Video on the Gap between Producer Tax and Consumer Tax (Weighted AmeriSpeak)



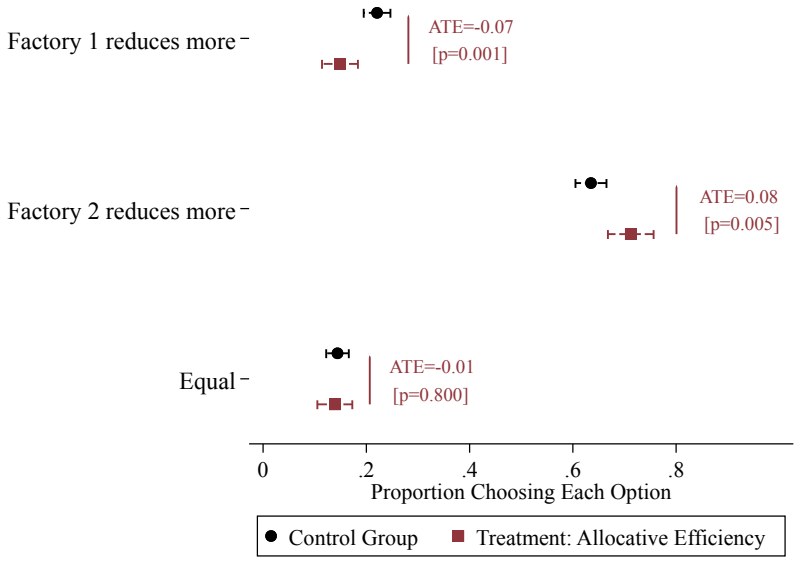
Notes: In Panel a, the outcome variable is an indicator for supporting each policy. In Panel b, the outcome variable is an indicator for supporting each policy minus an indicator for not supporting this policy (1=support, 0=not sure, -1=don't support). In Panel c, the outcome variable is rank, which originally ranges from 1 to 4 for each policy and is normalized to 0-1 range (0 for ranking last and 1 for ranking first). In Panel d, the outcome variable is the desired percent reduction in emissions the respondent chooses for each policy. In Panel e, the outcome variable is the perceived impact on electricity bills for each policy (in dollars). In Panel f, the outcome variable is an indicator for believing whether a policy increases inequality. For each outcome we calculate the difference between the answers for producer tax and consumer tax and show the results for participants in the control group and the pass-through treatment. The p-values are derived from testing the hypothesis that the differences between the producer tax and consumer tax are equal in the control group and the treatment group watching the pass-through video. The p-value for testing zero treatment effects across all outcomes is also displayed under each panel. We apply the final weight variable provided by NORC.

Figure A13: Effects of the Allocative Efficiency Video on the Gap between Standards and Market-Based Instruments (Weighted AmeriSpeak)



Notes: In Panel a, the outcome variable is an indicator for supporting each policy. In Panel b, the outcome variable is an indicator for supporting each policy minus an indicator for not supporting this policy (1=support, 0=not sure, -1=don't support). In Panel c, the outcome variable is rank, which originally ranges from 1 to 4 for each policy and is normalized to 0-1 range (0 for ranking last and 1 for ranking first). In Panel d, the outcome variable is the desired percent reduction in emissions the respondent chooses for each policy. In Panel e, the outcome variable is the perceived impact on electricity bills for each policy (in dollars). In Panel f, the outcome variable is an indicator for believing whether a policy increases inequality. For each outcome, we calculate the difference between the answers for market-based instruments (consumer taxes, producer taxes, and cap-and-trade) and for standards and show the results for participants in the control group and the allocative efficiency treatment. The p-values are derived from testing the hypothesis that the differences between market-based instruments and standards are equal in the control group and the treatment group watching the allocative efficiency video. The p-value for testing zero treatment effects across all outcomes is also displayed under each panel. We apply the final weight variable provided by NORC.

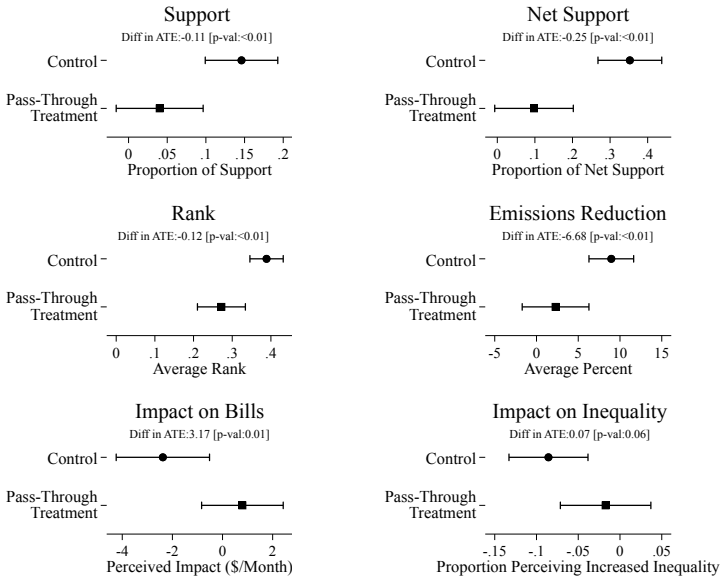
Figure A14: Effect of Informational Videos on Comprehension of Allocative Efficiency



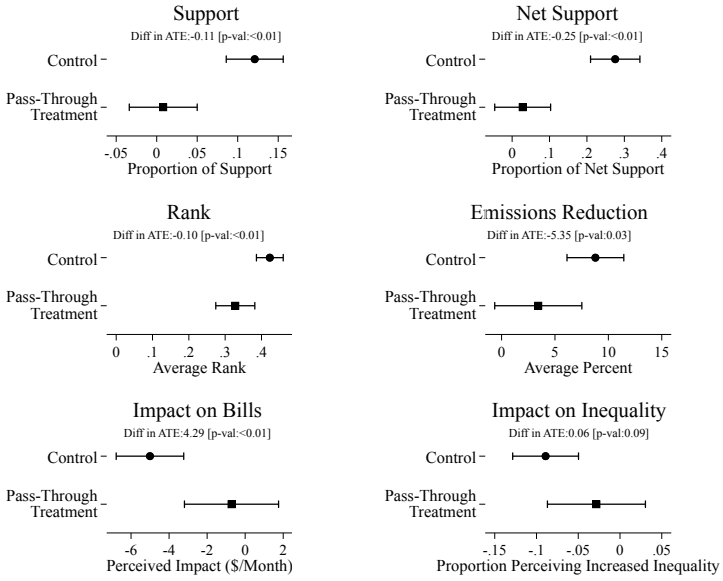
Notes: Figure uses responses from AmeriSpeak control and allocative efficiency treatment group to show the effect of the allocative efficiency video on understanding the concept of allocative efficiency. Participants were asked to consider two factories: Factory 1 is high pollution and high marginal cost of abatement; Factory 2 is low pollution and low cost of abatement. They choose which company reduces pollution more (or equally) if the government sets a tax that requires power plants to pay for each unit of greenhouse gas emissions they emit (assuming the tax will result in a total reduction of 50 tons of emissions).

Figure A15: Impacts of Pass-Through Video, by Education Level

(a) College or Above



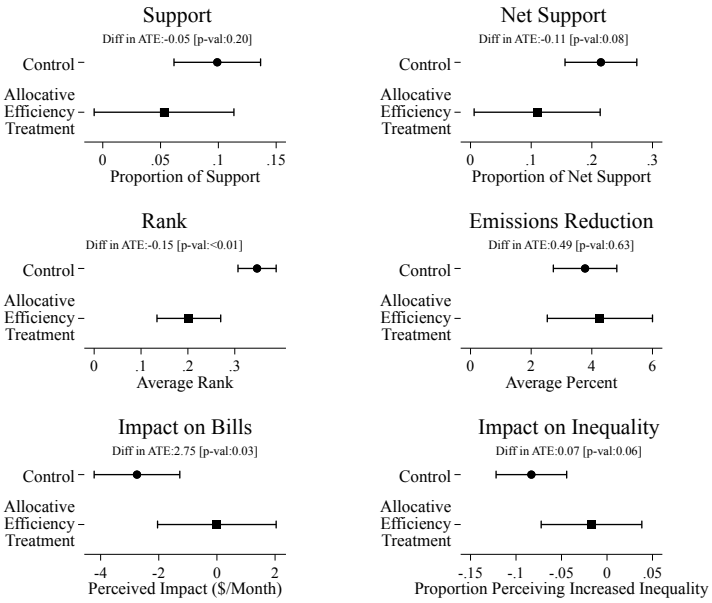
(b) Non-College



Notes: The panels show the effect of pass-through videos on each outcome for college vs. non-college AmeriSpeak respondents. The p-value for testing zero treatment effects across all outcomes is also displayed under each panel. We also test whether the treatment effects across all outcomes are different for college graduates than non-college, and the p-value from the F test is 0.48.

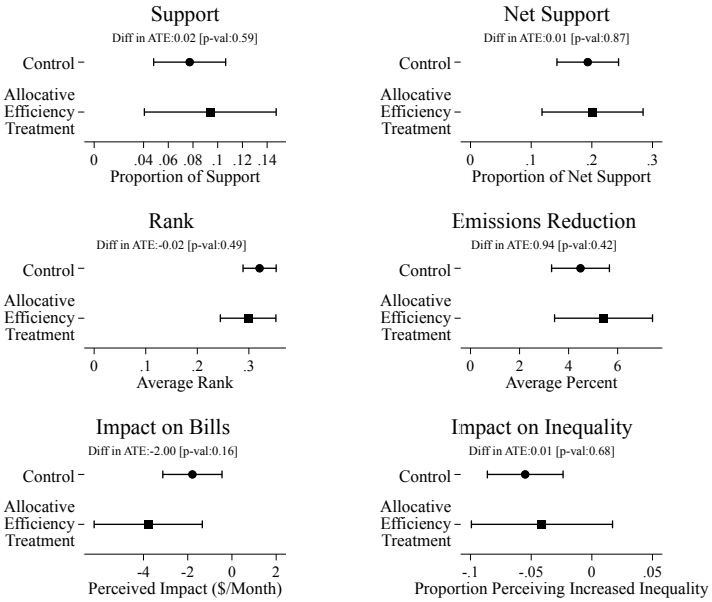
Figure A16: Effects of Allocative Efficiency Video on Policy Preferences and Beliefs, by Education

(a) College or Above



Average Difference: Standard - Market-Based Instruments (p-val < 0.01 from F-test)

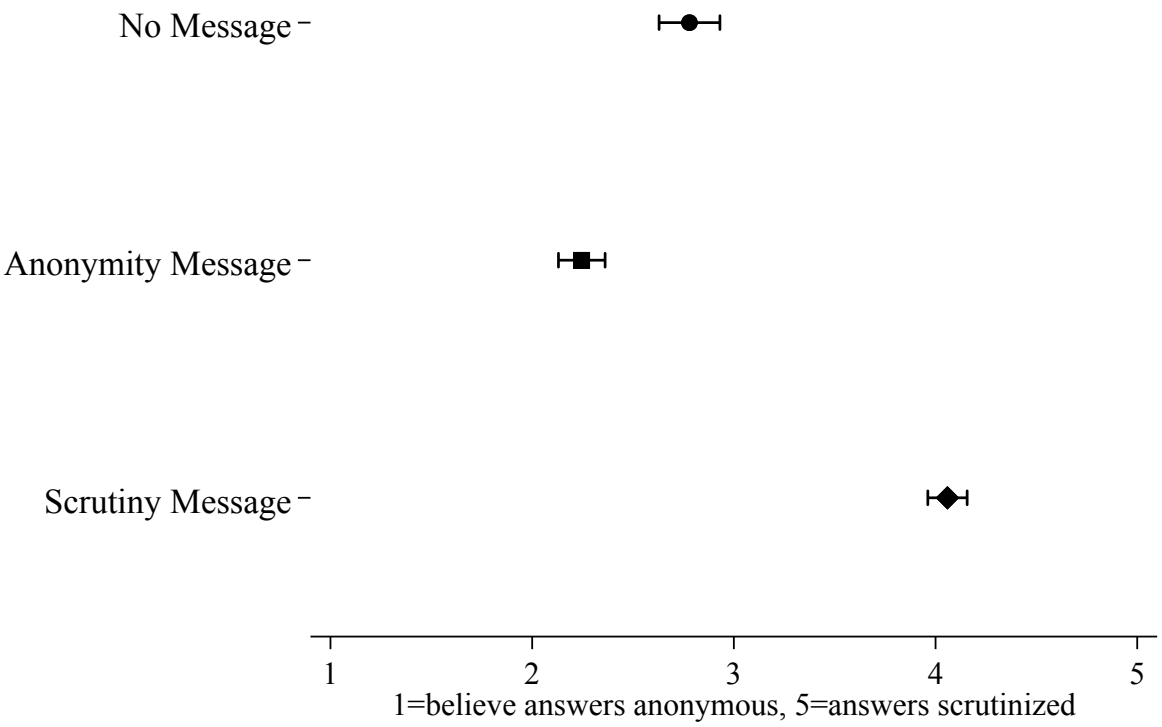
(b) Non-College



Average Difference: Standard - Market-Based Instruments (p-val = 0.64 from F-test)

Notes: The panels show the treatment effect on each outcome for college vs. non-college AmeriSpeak sample. The p-value for testing zero treatment effects across all outcomes is also displayed under each panel. We also test whether the treatment effects across all outcomes are different for college graduates than non-college, and the p-value from the F test is 0.04.

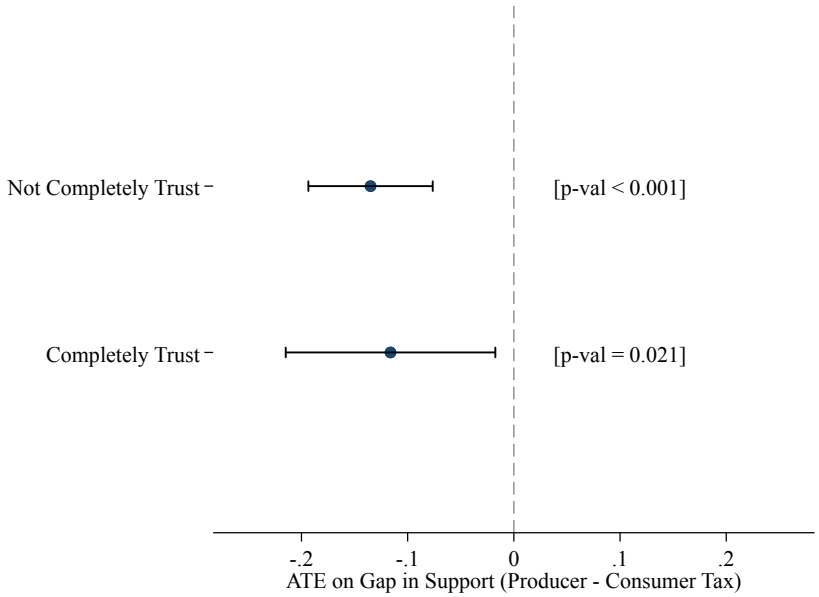
Figure A17: Effects of Anonymity and Scrutiny Treatments on Perceived Scrutiny



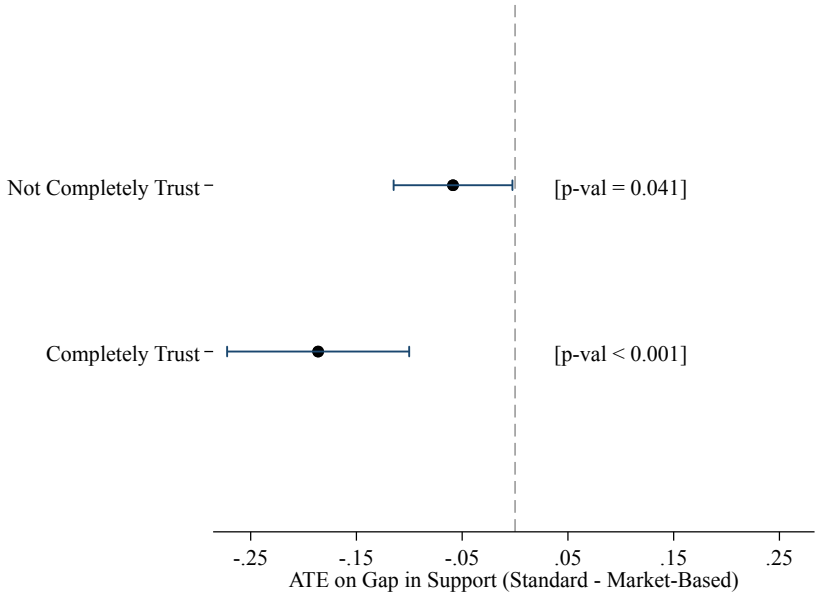
Notes: The figure shows the average belief of how much the researchers scrutinize responses (1 = believe answers are completely anonymous and 5 = believe answers are carefully scrutinized) across the three groups.

Figure A18: Effect of Informational Videos on Support for Policies, by Trust in Expert

(a) Effects of Pass-Through Treatment



(b) Effects of Allocative Efficiency Treatment



Notes: Each panel shows the effect of the indicated treatment on respondent support of the policies.

B Additional Model Results

B.1 Proofs and Derivations: Cost Minimization and the Cost-Effectiveness Comparison

Define the private-surplus cost of an allocation, relative to the unregulated baseline, by

$$L(q_1, q_2, x_1, x_2) \equiv \sum_{j=1}^{2} \left\{ U_j(q_j^0) - U_j(q_j) - a_j(q_j^0 - q_j) + q_j K_j(x_j) \right\}.$$

This object includes both the resource cost of abatement and the surplus cost of any reduction in consumption. Because tax revenue is rebated lump sum, true social surplus depends only on this private-surplus cost and on the avoided external harm.

Lemma 2. *For any positive interior aggregate emissions reduction x, the private-surplus costs of the tax and the standard are*

$$C_\tau(x) = \min_{\substack{q_1, q_2 \geq 0 \\ x_1, x_2 \in [0, \bar{e}]}} \left\{ L(q_1, q_2, x_1, x_2) : E_0 - \sum_{j=1}^{2} q_j(\bar{e} - x_j) \geq x \right\}$$

and

$$C_\sigma(x) = \min_{\substack{x_1, x_2 \in [0, \bar{e}] \\ x_1 = x_2}} \Big\{ L\left(D_1(a_1 + K_1(x_1)), D_2(a_2 + K_2(x_2)), x_1, x_2\right) : E_0 - \sum_{j=1}^{2} D_j(a_j + K_j(x_j))(\bar{e} - x_j) \geq x \Big\}.$$

Thus, $C_\tau(x) < C_\sigma(x)$.

Proof. The least-cost allocation that implements total emissions reduction x solves

$$C_\tau(x) = \min_{\substack{q_1, q_2 \geq 0 \\ x_1, x_2 \in [0, \bar{e}]}} \left\{ L(q_1, q_2, x_1, x_2) : E_0 - \sum_{j=1}^{2} q_j(\bar{e} - x_j) \geq x \right\}.$$

Let $\lambda(x)$ be the multiplier on the emissions constraint. The interior first-order conditions are

$$K_j'(x_j^\tau) = \lambda(x),$$

and

$$U_j'(q_j^\tau) = a_j + K_j(x_j^\tau) + \lambda(x)(\bar{e} - x_j^\tau).$$

These are exactly the equilibrium conditions under a uniform emissions tax $\tau = \lambda(x)$. In

segment j, the firm chooses x_j to minimize

$$a_j + K_j(x_j) + \tau(\bar{e} - x_j),$$

which gives $K_j'(x_j^\tau) = \tau$, and the competitive price is

$$p_j^\tau = a_j + K_j(x_j^\tau) + \tau(\bar{e} - x_j^\tau),$$

so demand satisfies $q_j^\tau = D_j(p_j^\tau)$. By the envelope theorem,

$$C_\tau'(x) = \lambda(x) = \tau(x).$$

Thus the emissions tax implements the least private-surplus-cost allocation for any interior emissions reduction x.

A uniform emissions-rate standard mandates a common emissions-intensity reduction in both segments. Under such a standard, the price in segment j is $a_j + K_j(x_j)$, quantity is $D_j(a_j + K_j(x_j))$, and the standard imposes $x_1 = x_2$. Hence the least private-surplus cost of achieving aggregate emissions reduction x using a standard is

$$C_\sigma(x) = \min_{\substack{x_1, x_2 \in [0,\bar{e}] \\ x_1 = x_2}} \Big\{ L\left(D_1(a_1 + K_1(x_1)), D_2(a_2 + K_2(x_2)), x_1, x_2\right) : E_0 - \sum_{j=1}^{2} D_j(a_j + K_j(x_j))(\bar{e} - x_j) \geq x \Big\}.$$

The tax problem minimizes over all segment-specific quantities and emissions intensities. The standard restricts the feasible set to allocations with a common emissions intensity and with quantities determined by demand at the standard-induced prices. Therefore

$$C_\tau(x) \leq C_\sigma(x)$$

for every feasible emissions reduction x.

For positive interior reductions, the inequality is strict under heterogeneous marginal abatement costs. Suppose, toward a contradiction, that equality held at some positive interior x. Then the allocation induced by the optimal standard would also solve the tax cost-minimization problem. Since $x > 0$, the common emissions-intensity reduction under the standard is strictly positive. But any interior solution to the tax problem must satisfy $K_1'(x_1^\tau) = K_2'(x_2^\tau) = \lambda(x)$, while a uniform standard has $x_1 = x_2 > 0$ and hence $K_1'(x_1) < K_2'(x_2)$ by the maintained heterogeneity assumption. The standard allocation therefore cannot solve the tax problem. Thus $C_\sigma(x) > C_\tau(x)$ for every positive interior

emissions reduction $x > 0$. □ □

B.2 Proof of Proposition 1

Proof. By Lemma 2, $C_\sigma(x) > C_\tau(x)$ for every positive interior emissions reduction $x > 0$. Since true welfare is $W_r(x) = \varphi x - C_r(x)$,

$$W_\tau(x) - W_\sigma(x) = C_\sigma(x) - C_\tau(x) > 0.$$

The same cost comparison delivers voter-by-voter dominance: for every voter i,

$$v_i^\tau(x) - v_i^\sigma(x) = C_\sigma(x) - C_\tau(x) > 0,$$

so replacing the standard with the tax at the same stringency raises every voter's payoff by the common amount $C_\sigma(x) - C_\tau(x) > 0$. Let G_x^r denote the distribution of $v_i^r(x)$ across voters, so that the political attractiveness of instrument r at stringency x is $S(G_x^r)$. A common positive shift in payoffs implies $G_x^\tau(t) = G_x^\sigma\left(t - [C_\sigma(x) - C_\tau(x)]\right) \leq G_x^\sigma(t)$ for all t, so G_x^τ first-order stochastically dominates G_x^σ. Because S is monotonic in the first-order stochastic dominance order, $S(G_x^\tau) \geq S(G_x^\sigma)$. Hence any politically feasible standard at stringency x is strictly dominated by the tax at the same x, which is itself politically feasible, so the politically constrained planner selects the tax.

For part (ii), let x_τ^{FB} denote the first-best tax-induced emissions reduction, characterized by $C_\tau'(x_\tau^{FB}) = \varphi$, and define the cutoff type

$$\theta^{FB} \equiv \frac{C_\tau(x_\tau^{FB})}{\varphi x_\tau^{FB}}.$$

Voter i's payoff from the tax at stringency x is weakly negative if and only if $\theta_i \leq C_\tau(x)/(\varphi x)$, so $G_x^\tau(0) = F\left(C_\tau(x)/(\varphi x)\right)$. Since C_τ is strictly convex with $C_\tau(0) = C_\tau'(0) = 0$,

$$0 < \theta^{FB} = \frac{C_\tau(x_\tau^{FB})}{C_\tau'(x_\tau^{FB}) x_\tau^{FB}} < 1,$$

and $C_\tau(x)/x$ is strictly increasing for $x > 0$. Hence for every $x \geq x_\tau^{FB}$,

$$G_x^\tau(0) = F\left(\frac{C_\tau(x)}{\varphi x}\right) \geq F(\theta^{FB}) > 0,$$

where the final inequality holds because F has positive density on $[0, \bar{\theta}]$ and $\theta^{FB} \in (0, 1)$. In words, at every stringency at or above the first-best level, a strictly positive mass of voters weakly loses from the tax.

The assumptions on S imply $S(G_x^\tau) < 1$ at each such x, but not yet a bound that is uniform in x; we therefore construct a single dominating distribution. Because residual emissions are nonnegative, every attainable emissions reduction satisfies $x \leq E_0$, so voter payoffs satisfy $v_i^\tau(x) \leq \bar{\theta}\varphi E_0 \equiv \bar{v}$. Let H denote the two-point payoff distribution that places mass $F(\theta^{FB})$ on 0 and mass $1 - F(\theta^{FB})$ on $\bar{v}$. For every $x \geq x_\tau^{FB}$, H first-order stochastically dominates G_x^τ: $H(t) = 0 \leq G_x^\tau(t)$ for $t < 0$; $H(t) = F(\theta^{FB}) \leq G_x^\tau(0) \leq G_x^\tau(t)$ for $t \in [0, \bar{v})$; and $H(t) = G_x^\tau(t) = 1$ for $t \geq \bar{v}$. Because S is monotonic in the first-order stochastic dominance order, $S(G_x^\tau) \leq S(H)$ for every $x \geq x_\tau^{FB}$. Since $H(0) = F(\theta^{FB}) > 0$, the assumption that $S(G) < 1$ whenever $G(0) > 0$ yields $S(H) < 1$.

Define any

$$\bar{s} \in \big(S(H), 1\big).$$

For any $\underline{S} \geq \bar{s}$, every stringency $x \geq x_\tau^{FB}$ satisfies $S(G_x^\tau) \leq S(H) < \underline{S}$ and is therefore politically infeasible. Although the politically feasible set need not be an interval under the general attractiveness function, every politically feasible tax-induced reduction must satisfy $x < x_\tau^{FB}$. By part (i), the politically constrained planner selects the tax, so the constrained optimum satisfies $x_\tau^{PC} < x_\tau^{FB}$. The implementing tax is $\tau^{PC} = C_\tau'(x_\tau^{PC})$. Strict convexity then gives

$$\tau^{PC} = C_\tau'(x_\tau^{PC}) < C_\tau'(x_\tau^{FB}) = \varphi.$$

□ □

B.3 Proof of Lemma 1 and Corollary 1

Proof. We first record the perceived-benefit and perceived-burden objects defined in the main text, then establish the monotonicity claimed in the lemma. For the tax, voters' perceived aggregate emissions reduction is

$$\widetilde{x}_\tau(\tau; \eta_\tau) = E_0 - \sum_{j=1}^{2} \widetilde{q}_{j,\tau}(\tau; \eta_\tau) \left(\bar{e} - \widetilde{x}_{j,\tau}(\tau; \eta_\tau)\right),$$

and their perceived net burden is

$$\begin{aligned}\widetilde{B}_\tau(\tau; \eta_\tau) = L\left(\widetilde{q}_{1,\tau}(\tau; \eta_\tau), \widetilde{q}_{2,\tau}(\tau; \eta_\tau), \widetilde{x}_{1,\tau}(\tau; \eta_\tau), \widetilde{x}_{2,\tau}(\tau; \eta_\tau)\right) \\ + \tau \sum_{j=1}^{2} \widetilde{q}_{j,\tau}(\tau; \eta_\tau) \left(\bar{e} - \widetilde{x}_{j,\tau}(\tau; \eta_\tau)\right) - T_\tau(\tau).\end{aligned}$$

Thus $\widetilde{v}_i^\tau(\tau; \eta_\tau) = \theta_i \varphi \widetilde{x}_\tau(\tau; \eta_\tau) - \widetilde{B}_\tau(\tau; \eta_\tau)$.

At $\eta_\tau = 1$, the perceived allocation equals the true tax equilibrium, and perceived tax

payments exactly equal the announced transfer. Hence

$$\widetilde{v}_i^{\tau}(\tau;1) = \theta_i \varphi x_\tau(\tau) - C_\tau(x_\tau(\tau)).$$

At $\eta_\tau = 0$, voters perceive $\widetilde{q}_{j,\tau} = q_j^0$ and $\widetilde{x}_{j,\tau} = 0$, so they perceive no emissions reduction and no private-surplus loss apart from the mechanical tax payment. Hence

$$\widetilde{v}_i^{\tau}(\tau;0) = -\left[\tau E_0 - T_\tau(\tau)\right].$$

For the strict monotonicity of tax perceptions, fix a positive interior tax τ and suppress the dependence on τ. For each segment, write $q_j^* = q_{j,\tau}^*(\tau)$ and $x_j^* = x_{j,\tau}^*(\tau)$. Since the tax-inclusive price is strictly above the baseline price and $D_j'(p) < 0$, $q_j^* < q_j^0$; since the tax is positive and the solution is interior, $x_j^* > 0$ and $K_j'(x_j^*) = \tau$. Perceived residual emissions in segment j are

$$\left[q_j^0 + \eta_\tau(q_j^* - q_j^0)\right](\bar{e} - \eta_\tau x_j^*),$$

whose derivative with respect to η_τ is

$$(q_j^* - q_j^0)(\bar{e} - \eta_\tau x_j^*) - \left[q_j^0 + \eta_\tau(q_j^* - q_j^0)\right] x_j^* < 0.$$

Thus perceived tax-induced emissions reductions are strictly increasing in η_τ.

The perceived net burden in segment j, before subtracting the transfer, is

$$b_j(\eta_\tau) = U_j(q_j^0) - U_j(\widetilde{q}_{j,\tau}) - a_j(q_j^0 - \widetilde{q}_{j,\tau}) + \widetilde{q}_{j,\tau} K_j(\widetilde{x}_{j,\tau}) + \tau \widetilde{q}_{j,\tau}(\bar{e} - \widetilde{x}_{j,\tau}).$$

Differentiating gives

$$\begin{aligned} b_j'(\eta_\tau) = &\left[a_j + K_j(\widetilde{x}_{j,\tau}) + \tau(\bar{e} - \widetilde{x}_{j,\tau}) - U_j'(\widetilde{q}_{j,\tau})\right](q_j^* - q_j^0) \\ &+ \widetilde{q}_{j,\tau}\left[K_j'(\widetilde{x}_{j,\tau}) - \tau\right] x_j^*. \end{aligned}$$

The first bracket is non-negative: $a_j + K_j(y) + \tau(\bar{e} - y)$ is minimized at $y = x_j^*$, while $U_j'(\widetilde{q}_{j,\tau}) \le U_j'(q_j^*) = a_j + K_j(x_j^*) + \tau(\bar{e} - x_j^*)$. Since $q_j^* - q_j^0 < 0$, the first line is non-positive. The second line is strictly negative whenever $\eta_\tau < 1$ because $K_j'(\widetilde{x}_{j,\tau}) < K_j'(x_j^*) = \tau$. Therefore b_j is strictly decreasing in η_τ on the interior range. The announced transfer does not depend on η_τ, so $\widetilde{B}_\tau(\tau;\eta_\tau)$ is strictly decreasing in η_τ. Combining this with the fact that perceived emissions benefits are strictly increasing in η_τ shows that $\widetilde{v}_i^{\tau}(\tau;\eta_\tau)$ is strictly increasing in η_τ.

For the standard, voters perceive posted price $\widetilde{p}_{j,\sigma}(x;\eta_\sigma) = a_j + \eta_\sigma K_j(x_\sigma^*(x))$ and demand

$\widetilde{q}_{j,\sigma}(x;\eta_\sigma) = D_j(\widetilde{p}_{j,\sigma}(x;\eta_\sigma))$. The perceived private-surplus burden in segment j is

$$U_j(q_j^0) - U_j(\widetilde{q}_{j,\sigma}) - a_j(q_j^0 - \widetilde{q}_{j,\sigma}) + \widetilde{q}_{j,\sigma}\eta_\sigma K_j(x_\sigma^*(x)).$$

At $\eta_\sigma = 1$, this equals the true private-surplus burden induced by the standard; at $\eta_\sigma = 0$, it equals zero. Differentiating and using the demand relation $U_j'(\widetilde{q}_{j,\sigma}) = a_j + \eta_\sigma K_j(x_\sigma^*(x))$ gives

$$\frac{d}{d\eta_\sigma}\left[U_j(q_j^0) - U_j(\widetilde{q}_{j,\sigma}) - a_j(q_j^0 - \widetilde{q}_{j,\sigma}) + \widetilde{q}_{j,\sigma}\eta_\sigma K_j(x_\sigma^*(x))\right] = \widetilde{q}_{j,\sigma}K_j(x_\sigma^*(x)) > 0,$$

where the inequality uses positive quantities and a positive interior standard. The perceived environmental benefit of the standard is the salient aggregate reduction x and does not depend on η_σ. Hence $\widetilde{v}_i^\sigma(x;\eta_\sigma)$ is strictly decreasing in η_σ. At $\eta_\sigma = 1$, $\widetilde{v}_i^\sigma(x;1) = \theta_i\varphi x - C_\sigma(x)$; at $\eta_\sigma = 0$, $\widetilde{v}_i^\sigma(x;0) = \theta_i\varphi x$. $\square$

Turning to Corollary 1, fix $\widehat{x} > 0$ and, for each attention level η_τ, define

$$\mathcal{T}(\widehat{x};\eta_\tau) = \{\tau > 0 : \widetilde{x}_\tau(\tau;\eta_\tau) \geq \widehat{x}\}$$

and

$$\mathcal{B}_\tau(\widehat{x};\eta_\tau) = \min_{\tau\in\mathcal{T}(\widehat{x};\eta_\tau)} \widetilde{B}_\tau(\tau;\eta_\tau),$$

whenever the minimum is well defined.

Consider two attention levels $\eta' < \eta$. As established in the proof of Lemma 1, for every positive interior tax τ, perceived emissions reductions are strictly increasing in attention:

$$\widetilde{x}_\tau(\tau;\eta') < \widetilde{x}_\tau(\tau;\eta).$$

It follows that

$$\mathcal{T}(\widehat{x};\eta') \subseteq \mathcal{T}(\widehat{x};\eta).$$

In words, any tax that lower-attention voters perceive as delivering at least $\widehat{x}$ is also perceived as doing so by higher-attention voters. Next, let τ' attain the lower-attention cost frontier:

$$\tau' \in \arg\min_{\tau\in\mathcal{T}(\widehat{x};\eta')} \widetilde{B}_\tau(\tau;\eta').$$

Since $\widehat{x} > 0$, τ' is a positive interior tax, so facts established above in the proof of Lemma 1 again imply that its perceived net burden is strictly decreasing in attention:

$$\widetilde{B}_\tau(\tau';\eta') > \widetilde{B}_\tau(\tau';\eta).$$

Because $\tau' \in \mathcal{T}(\widehat{x};\eta') \subseteq \mathcal{T}(\widehat{x};\eta)$, we also have

$$\widetilde{B}_\tau(\tau';\eta) \geq \min_{\tau\in\mathcal{T}(\widehat{x};\eta)} \widetilde{B}_\tau(\tau;\eta) = \mathcal{B}_\tau(\widehat{x};\eta).$$

Combining the two preceding inequalities yields

$$\mathcal{B}_\tau(\widehat{x};\eta') = \widetilde{B}_\tau(\tau';\eta') > \mathcal{B}_\tau(\widehat{x};\eta),$$

so $\mathcal{B}_\tau(\widehat{x};\eta_\tau)$ is strictly decreasing in η_τ. Finally, holding fixed the perceived emissions-reduction target $\widehat{x}$, voter i's perceived environmental benefit is $\theta_i\varphi\widehat{x}$, which does not depend on η_τ. The perceived payoff frontier

$$\theta_i\varphi\widehat{x} - \mathcal{B}_\tau(\widehat{x};\eta_\tau)$$

is therefore strictly increasing in η_τ. Equivalently, for a fixed level of perceived emissions reductions, lower tax-side economic literacy makes voters like the tax less. □ □

B.4 Proof of Proposition 2

Proof. Throughout the proof, write $\widetilde{G}^\tau(\tau;\eta_\tau)$ and $\widetilde{G}^\sigma(x;\eta_\sigma)$ for the distributions of perceived payoffs, and let G^τ_x and $\bar{v}$ denote the true-payoff distributions and the payoff bound from Appendix B.2. Lemma 1 delivers two monotonicity facts that we use repeatedly. First, because every voter's perceived tax payoff is strictly increasing in η_τ and equals the true payoff at $\eta_\tau = 1$, the distributions $\widetilde{G}^\tau(\tau;\eta_\tau)$ rise in the first-order stochastic dominance order as η_τ rises, so

$$S\big(\widetilde{G}^\tau(\tau;\eta_\tau)\big) \leq S\big(G^\tau_{x_\tau(\tau)}\big) \qquad \text{for every } \eta_\tau \in [0,1].$$

Second, because every voter's perceived standard payoff is strictly decreasing in η_σ and equals the true payoff at $\eta_\sigma = 1$, the attractiveness of the standard is nonincreasing in η_σ, with

$$S\big(\widetilde{G}^\sigma(x;\eta_\sigma)\big) \geq S\big(G^\sigma_x\big) \qquad \text{for every } \eta_\sigma \in [0,1].$$

In words, misperception can only erode the attractiveness of the tax and only bolster the attractiveness of the standard.

For part (i), fix a threshold $\underline{S} > S_0$ such that some standard with strictly positive true welfare is politically feasible under accurate perceptions: there exists $x_0 > 0$ with $W_\sigma(x_0) > 0$ and $S\big(G^\sigma_{x_0}\big) \geq \underline{S}$. By the second monotonicity fact, the standard at x_0 remains politically feasible for every $\eta_\sigma \in [0,1]$, so the standard's constrained welfare is at least $W_\sigma(x_0) > 0$

regardless of η_σ.

Now consider the tax. For a tax implementing the positive interior reduction x, write $\tau(x) = C'_\tau(x) > 0$. Using the revenue identity $T_\tau(\tau) = \tau\,[E_0 - x_\tau(\tau)]$, every voter's perceived payoff at $\eta_\tau = 0$ equals $-[\tau(x)E_0 - T_\tau(\tau(x))] = -\tau(x)x < 0$. Fix $\varepsilon \in \big(0, W_\sigma(x_0)/\varphi\big)$, and note that $\tau(x)x \geq \tau(\varepsilon)\varepsilon > 0$ for every $x \geq \varepsilon$. Perceived reductions and perceived burdens are continuous in (τ, η_τ), and the implementing taxes for reductions $x \geq \varepsilon$ lie in a compact interior range, so there exists $\bar{\eta}_\tau(\underline{S}) > 0$ at which every voter's perceived payoff from every tax-induced reduction $x \geq \varepsilon$ is weakly negative; because perceived tax payoffs are increasing in η_τ, the same holds for every $\eta_\tau \leq \bar{\eta}_\tau(\underline{S})$. A payoff distribution supported on $(-\infty, 0]$ is first-order stochastically dominated by δ_0, so every such tax has

$$S\big(\widetilde{G}^\tau(\tau(x); \eta_\tau)\big) \leq S(\delta_0) = S_0 < \underline{S}$$

and is politically infeasible. Any politically feasible tax therefore yields true welfare at most $\sup_{y \in [0,\varepsilon]} W_\tau(y) \leq \varphi\varepsilon < W_\sigma(x_0)$, while if no tax is politically feasible the relevant comparison is with the status quo, whose welfare is zero. In either case the planner strictly prefers the standard, establishing part (i).

For part (ii), let x^U_σ denote the unconstrained welfare-maximizing emissions reduction under the standard, with $W_\sigma(x^U_\sigma) > 0$ because $W'_\sigma(0) = \varphi > 0$. Choose $x^\dagger \in (0, x^{FB}_\tau)$ with $W_\tau(x^\dagger) < W_\sigma(x^U_\sigma)$, which is possible because W_τ is continuous with $W_\tau(0) = 0$. Arguing exactly as in the proof of Proposition 1, with $x^\dagger$ in place of x^{FB}_τ, the two-point distribution $H^\dagger$ that places mass $F\big(C_\tau(x^\dagger)/(\varphi x^\dagger)\big) > 0$ on 0 and the remaining mass on $\bar{v}$ first-order stochastically dominates G^τ_x for every $x \geq x^\dagger$. Define

$$S^\dagger \equiv S(H^\dagger) < 1,$$

where the strict inequality holds because $H^\dagger(0) > 0$. Fix any $\underline{S} > S^\dagger$. Combining the dominance bound with the first monotonicity fact, for every $\eta_\tau \in [0, 1]$ and every $x \geq x^\dagger$,

$$S\big(\widetilde{G}^\tau(\tau(x); \eta_\tau)\big) \leq S\big(G^\tau_x\big) \leq S^\dagger < \underline{S},$$

so no tax-induced reduction weakly above $x^\dagger$ is politically feasible at any salience level. Since W_τ is strictly increasing on $[0, x^{FB}_\tau]$, every politically feasible tax yields true welfare strictly below $W_\tau(x^\dagger) < W_\sigma(x^U_\sigma)$, uniformly over $\eta_\tau \in [0, 1]$.

Suppose now that the unconstrained standard optimum is politically feasible at some $\eta'_\sigma \in (0, 1]$, that is, $S\big(\widetilde{G}^\sigma(x^U_\sigma; \eta'_\sigma)\big) \geq \underline{S}$. Because the attractiveness of the standard is nonincreasing in η_σ, the standard at x^U_σ remains politically feasible for every $\eta_\sigma \leq \eta'_\sigma$, and the standard's constrained problem attains its unconstrained maximum $W_\sigma(x^U_\sigma)$. This value

strictly exceeds the politically constrained tax welfare for every $\eta_\tau \in [0, 1]$, and strictly exceeds the status quo welfare of zero, so the planner strictly prefers the standard whenever $\eta_\sigma \leq \eta'_\sigma$, regardless of η_τ. This establishes part (ii). □

B.5 Calibration Under Political Feasibility Criterion of Majority Support

The main text describes a back-of-the-envelope calibration under the political feasibility criterion of net support, where support must weakly exceed opposition. This appendix section instead uses a political feasibility criterion of majority support, under which a policy instrument must obtain support from an absolute majority of voters.

Using majority rather than net support decreases feasible abatement for every policy instrument, because clearing 50% support is harder than out-polling opposition. Under majority support, the politically feasible abatement levels are $x_r^{PF} = (8.3\%, 1.9\%, 4.6\%, \text{ and } 1.7\%)$ under standards, consumer taxes, producer taxes, and cap-and-trade. The standard has substantially greater politically feasible abatement than the market-based instruments.

We use equation˜(3) to calculate the maximum cost ratios Λ at which politically feasible standards generate greater welfare than feasible market-based instruments. Maintaining the assumption from the main text that first-best abatement is $x_\tau^{FB} = 50\%$, we calculate values of $\Lambda = (9.4, 5.6, 9.6)$ for comparisons of standards against consumer taxes, producer taxes, and cap-and-trade. For example, the planner prefers the standard over the consumer tax as long as the standard is no more than 9.4 times as costly as the consumer tax. If first-best abatement is instead $x_\tau^{FB} = 90\%$, these thresholds rise to $\Lambda = (16.8, 9.9, \ 17.3)$ for comparing standards against these three instruments. These Λ cost ratios imply even greater scope than the net support criterion from the main text for politically feasible standards to yield greater welfare than market-based instruments.

The implied dollar values remain large. As in the main text, we assume a social cost of carbon of \$200/ton and 1.5 billion tons of CO_2 per year. The politically feasible consumer tax now delivers only about \$5.5 billion in annual welfare gains, since it abates just 1.9%. The standard's gross environmental benefit at 8.3% abatement is about \$25 billion. The standard therefore generates greater welfare than the feasible consumer tax for any cost under the standard up to \$19 billion. These absolute figures are smaller under majority support than under net support, because every instrument abates less under majority support, although the majority support criterion makes the standard's relative advantage larger.

Economic literacy still shrinks the case for standards under the majority support criterion, though more modestly, because the lower feasible abatement levels provide less scope for literacy to change outcomes. If the pass-through video raises the feasible consumer tax

from 1.9% to 2.2% while leaving feasible abatement under the standard near 8.3%, the annual welfare gain from the consumer tax rises from $5.5 to $6.5 billion, and the maximum compliance cost the planner will accept for the standard falls from about $19 to $18 billion. As under net support, greater economic literacy narrows the scope for standards to outperform market-based instruments.

C Text for Expert Survey Invitation

Our expert survey used the following email invitation or minor variations:

> Hi {firstname},
>
> I hope all is well. To support a paper I'm writing on the political economy of environmental policy, it would be a big help if you could take the following 5-minute survey:
>
> {qualtrics link}
>
> I'm emailing because you are an EEEE (expert in environmental/energy econ); please don't forward this invite. Your responses will be anonymous, including from us the researchers, unless you choose to provide your name at the end.

D LLM Prompt

D.1 Analyzing understanding of the pass-through video

Context

You are a research assistant analyzing open-ended questions in a survey. Use an LLM-based approach (Opus 4.6) with the claude CLI programmatically via subprocess calls to score each response based on semantic understanding. Participants were shown the following video: https://www.dropbox.com/scl/fi/uynse65wgr48ng28qf5pt/Pass-through-Debiasing-v4.mp4?rlkey=va45of7
They were then asked the following quiz questions:

Q1 When will consumers have to pay more, in total, for each gallon of gasoline?

A. When consumers who purchase gasoline have to pay the tax.

B. When gas stations that sell gasoline have to pay the tax.

C. It does not matter who procedurally has to pay the tax. [correct answer]

Q2 The government has decided to set a new tax on vehicles. When will companies have higher profits?

A. When the tax is set on companies producing vehicles.

B. When the tax is set on households buying vehicles.

C. Company profits will be the same regardless of who pays the tax. [correct answer]

D. It depends if the companies producing vehicles are monopolies.

They were then asked "in one or two sentences, describe what the video is about." We want to rate to what extent participants understood the economic principles explained in the video.

Task

Rate to what extent each participant understood the economic principle explained in the video. Provide exactly one number (1, 2, 3, or 99) per response based on the rubric below. Interpret obvious typos and misspellings charitably—score based on the most likely intended meaning.

Scoring Rubric

1 – No / poor understanding. The participant does not seem to understand the video, or displays mistakes or misunderstandings.
Score 1 when the response:

- Does not mention tax or incidence at all.
- Gives a label-like answer with only generic terms and no explanation of any relationship (e.g., “tax on gas,” “taxes,” “how we are taxed,” “basic economics”).
- Explicitly states the wrong conclusion — that who pays the tax DOES matter for the outcome (e.g., “It does matter who pays the taxes on goods,” “taxes will be different if companies pay or consumers pay”).
- Is off-topic, sarcastic, political commentary, or a non-answer.

Examples:

- ‘‘Taxes.’’
- ‘‘Taxing Fuel’’

- ‘‘How we are taxed.’’
- ‘‘Basic economics’’
- ‘‘The government rise taxes on gas’’
- ‘‘Taxation is theft by the threat of force.’’
- ‘‘It’s about corporate greed and companies raising prices.’’
- ‘‘Brain washing the consumer.’’

2 – Partial understanding. The participant shows some understanding but does not clearly state that the outcome is the same regardless of who pays.
Score 2 when the response:

- Describes that the tax can be imposed on producers vs. consumers, but does not discuss whether the outcome, burden, or profits are the same or different.
- Gives a generally correct but vague description (e.g., “comparing a tax on companies and a tax on households”).
- Describes the pass-through mechanism (companies pass the tax to consumers) WITHOUT also stating that both scenarios yield the same outcome. Describing pass-through alone is NOT sufficient for score 3.
- Asks or wonders who pays without stating a conclusion.
- Discusses the topic in generally correct terms but remains noncommittal about the key equivalence.

Examples:

- ‘‘It is comparing the effect of a tax on both companies and households.’’
- ‘‘Taxes - whether they are applied at the gas station/pump or to the households.’’
- ‘‘Who pays the tax, corporate or individual.’’
- ‘‘Tax either on consumers or producers.’’
- ‘‘The video is about the difference between taxing households directly and taxing gas stations.’’
- ‘‘Who is responsible for paying the tax’’

- ‘‘The video was about how texting a gas station can still be paid for by the consumer’’ [describes pass-through only, no equivalence stated]
- ‘‘When companies get taxed they will add the tax on to what the consumer is buying so that way they can still profit.’’ [describes pass-through mechanism only]
- ‘‘Who actually pays a tax in the end, the company or the household.’’ [poses the question without answering it]

3 – Clear understanding of the key economic principle. The participant conveys the idea that the economic outcome / tax burden / profits are the same regardless of who is charged / who pays / who writes the check. Synonyms and paraphrases count.
To qualify for score 3, the response must convey BOTH of these elements:

1. There are two possible policy instruments (tax on companies vs. tax on consumers), AND
2. The economic outcome is equivalent across those scenarios—whether stated as identical costs, identical profits, identical burdens, or the irrelevance of who formally pays.

Element 2 can be expressed in many ways, including:

- Explicitly stating equivalence (“the cost is the same regardless,” “profits don’t change,” “it doesn’t matter who pays”).
- Stating that the consumer always/ultimately/inevitably bears the cost regardless of who is taxed—as long as the response makes clear this holds across BOTH scenarios, not just as a general statement about taxes.

Score based on whether the participant can articulate the principle, regardless of whether they agree with it. A response like “The video claims it doesn’t matter who pays the tax, but I think that’s wrong” should still receive score 3.
Examples:

- ‘‘It doesn’t matter who pays the tax; the burden is the same.’’
- ‘‘The outcome is the same whether consumers or companies are taxed.’’
- ‘‘Who writes the check doesn’t change who really bears the cost.’’
- ‘‘Consumers end up paying even if companies are taxed.’’
- ‘‘The consumer still pays regardless of who’s taxed.’’

- ‘‘Even if the business pays the tax, it is passed to the consumer.’’
- ‘‘Taxes are always passed onto consumers, regardless of whether the tax is levied on them or not.’’
- ‘‘The price is the same whether the gas station or the household pays the tax.’’
- ‘‘An errant hypothesis that procedural changes to taxes don’t effect the total cost to the parties involved.’’ [articulates the principle despite disagreeing]
- ‘‘It doesn’t matter who gets to pay the tax, price will be passed along.’’
- ‘‘Either way we pay higher!’’ [when context clearly implies both tax scenarios]
- ‘‘Taxes will always be paid by consumers in the end.’’ [implies this holds regardless of who is formally taxed]

99 — Blank

The response field is empty or contains only whitespace.

Output Format

Return only the score (1, 2, 3, or 99) next to the column of responses.

D.2 Analyzing understanding of the allocative efficiency video

Context

You are a research assistant analyzing open-ended questions in a survey. Use an LLM-based approach (Opus 4.6) with the claude CLI programmatically via subprocess calls to score each response based on semantic understanding. Participants were shown the following video: https://www.dropbox.com/scl/fi/xfxl9nsxq133an97jbv44/Allocative-Efficiency-v4.mp4?rlkey=qurr171eotl They were then asked the following quiz questions:

Q1 Please indicate the correct definition of cost effectiveness.

A. The cheapest way to achieve a goal [correct answer]

B. The simplest way to achieve a goal

C. The fastest way to achieve a goal

Q2 Which of the following reasons is why economists find that pollution standards and pollution taxes have different cost effectiveness?

A. They lead to different allocation of electricity generation to power plants with high versus low costs to reduce pollution [correct answer].

B. They lead consumers to perceive production costs differently.

C. They lead engineers to innovate different levels of clean energy technology

D. They have different effects on the prices of fossil fuels.

They were then asked "in one or two sentences, describe what the video is about." We want to rate to what extent participants understood the economic principles explained in the video.

Task

Rate to what extent each participant understood the economic principle explained in the video. Provide exactly one number (1, 2, 3, or 99) per response based on the rubric below. Interpret obvious typos and misspellings charitably—score based on the most likely intended meaning.

Scoring Rubric

1 – No / poor understanding. The participant does not seem to understand the video, or displays mistakes or misunderstandings.

Score 1 when the response:

- Does not mention cost, cost-effectiveness, or any comparison of pollution policies.
- Gives a label-like answer with only generic terms and no explanation of any relationship (e.g., “pollution,” “cost effective,” “taxes,” “fossil fuels,” “energy”).
- Explicitly states the wrong conclusion — that the pollution standard is more cost-effective or better than taxes/cap-and-trade.
- Is off-topic, sarcastic, political commentary, or a non-answer.

Examples:

- ‘‘Pollution’’
- ‘‘Fossil fuels’’
- ‘‘Cost effective’’

- ‘‘Reducing pollution’’
- ‘‘Pollution taxes’’
- ‘‘Taxing companies for the amount of pollution they produce.’’ [describes only one policy, no comparison or cost-effectiveness link]
- ‘‘The video is garbage.’’
- ‘‘Another way for the government to be over involved and make money.’’
- ‘‘Standards are the most cost effective way to reduce pollution.’’ [explicitly wrong conclusion]

2 – Partial understanding. The participant shows some understanding of the video's content—connects cost-effectiveness to pollution reduction, or describes/compares multiple pollution policies—but does not clearly state that taxes or cap-and-trade are more cost-effective than standards.
Score 2 when the response:

- Describes the concept of cost-effectiveness in the pollution reduction context but does not specify which policy is more cost-effective (e.g., "the most cost-effective way to reduce pollution" without saying what that way is).
- Describes HOW the pollution tax works (e.g., "low-cost plants reduce pollution, high-cost plants pay the tax") without explicitly comparing this to the standard or stating that the approach is more cost-effective overall. Describing the mechanism of a single policy alone is NOT sufficient for score 3.
- Gives a generally correct but vague description (e.g., "it's about the cost-effectiveness of different policies in controlling pollution").

Examples:

- ‘‘The cost effectiveness of different pollution-reducing strategies.’’
- ‘‘Comparing the cost effectiveness of standards, taxes, and cap-and-trade.’’
- ‘‘The most cost effective way to reduce pollution.’’ [does not state which method is most cost-effective]
- ‘‘The video is about the difference between pollution standards and a tax on pollution.’’ [compares policies but no conclusion about which is better]
- ‘‘How taxes versus standards affect pollution control.’’ [compares but no conclusion]

- ‘‘Some plants will reduce pollution because it’s cheaper, others will pay the tax.’’ [describes tax mechanism only, no comparison to standard]
- ‘‘Cost-effective ways to reduce pollution from plants.’’ [mentions cost-effectiveness but vague]
- ‘‘The video was about different strategies for reducing power plant pollution and their effects.’’ [describes multiple strategies, no conclusion]

3 – Clear understanding of the key economic principle. The participant conveys the idea that market-based instruments (pollution taxes and/or cap-and-trade) are more cost-effective than pollution standards for reducing pollution. Synonyms and paraphrases count.
To qualify for score 3, the response must convey BOTH of these elements:

1. Understands the concept of cost-effectiveness (allowing pollution reduction to happen where it is cheapest or leading to different allocations across high-cost and low-cost plants), AND
2. States or clearly implies that taxes/cap-and-trade are more cost-effective than standards, OR equivalently that standards are less cost-effective than market-based approaches (“taxes are more cost-effective than standards,” “cap-and-trade is cheaper than a standard,” “standards are not cost-effective”).

Score based on whether the participant can articulate the principle, regardless of whether they agree with it. A response like “The video claims taxes are more cost-effective than standards, but I think that’s wrong” should still receive score 3.
Examples:

- ‘‘Pollution taxes are more cost-effective than standards because taxes lead pollution reduction to happen where reduction is cheapest.’’
- ‘‘Charging firms for pollution is more cost-effective than standards.’’
- ‘‘The video shows why pollution tax is more cost effective than setting standards.’’
- ‘‘It explains why cap and trade and pollution tax strategies are able to reduce emissions more cost-effectively than standard emissions limits.’’
- ‘‘Standards are not the best way - taxing pollution is more cost effective.’’
- ‘‘Taxing pollution is more cost effective because plants that can cheaply reduce pollution will do so, while expensive plants pay the tax instead.’’

- "Charging companies for pollution is the most cost-effective way to reduce pollution." [implies tax is superior to alternatives]
- "The video covered various ways to attempt to limit pollution, the most effective being cap and trade or tax on pollution." [ranks cap-and-trade/tax as best]
- "Cost effectiveness is better than setting standards on power plants." [implies market mechanisms beat standards]
- "It's about cost effectiveness. Taxes are better than standards."
- "The video says setting standards is NOT the best cost-effective way to reduce pollution." [implies standards are inferior]

Score 99 — Blank

The response field is empty or contains only whitespace.

Output Format

Return only the score (1, 2, 3, or 99) next to the column of responses.