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The role of rebates in public support for carbon taxes

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The Role of Rebates in Public Support for Carbon Taxes

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Abstract

Economists advocate carbon pricing as the primary tool to reduce greenhouse gas emissions. However, very few governments have adopted a carbon tax high enough to meet international emission targets. Political challenges may stem from a number of areas, including political mobilization by policy opponents, consumers' willingness to pay and the regressivity of many carbon pricing schemes, which might be addressed through rebates. We use a novel carbon tax calculator to provide residents in the US and Switzerland with personalized estimates of the financial costs and benefits associated with carbon pricing policies. Our results indicate that, absent political messaging, rebates increase public support for carbon taxes in both countries by building support among lower income groups. In the US, we find majority support in our sample for both low ($50/t$CO_2$) and high ($230/tCO_2) carbon taxes when rebates are included; in Switzerland public support is lower. However, policy is always politicized, and when respondents are exposed to political messages about carbon pricing the effects associated with rebates are dampened or eliminated.

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The global economy is not on track to curtail greenhouse gas emissions quickly enough to limit warming to 1.5° to 2°C as stipulated in the Paris Agreement[1]. Recent IPCC reports note that a variety of policy tools—including market and non-market interventions—will be necessary to reduce emissions in line with warming goals. Economists have long advocated for carbon pricing as the primary, and most efficient, tool to reduce emissions[2-3]. However, few governments have adopted an economy-wide carbon price, and fewer have adopted one sufficiently large to meet international emissions targets. The High-Level Commission on Carbon Prices estimates the prices in the range of $40-$80 per ton of Carbon Dioxide (US$40-80/$tCO_2$) are necessary today to reduce emissions in line with goals established by the Paris Agreement, when combined with other mitigation policies[4]. Nobel Laureate William Nordhaus estimates that a carbon tax of US$230/$tCO_2$ is needed today to keep temperature increases below 2.5°C[5]. Yet the IMF estimates that the global average carbon price is just US$2/$tCO_2$ and covers only 22 percent of global GHG emissions[6-7]. As a result, most carbon prices enacted to date have had limited effects on national emissions trajectories.[8-9]

Research has pointed to several political barriers to enacting carbon prices with high enough prices and broad enough coverage to drive meaningful reductions in carbon pollution. Over three decades, the economic losers from carbon pricing policies have systematically mobilized to oppose carbon pricing within policymaking debates while working to undermine public support for climate reforms generally.[9-13] Their efforts have been facilitated by the political logic of carbon pricing which makes policy costs transparent and direct (in terms of more expensive energy and transportation costs for consumers) while leaving more obscure policy benefits (in terms of a stable future climate).[14] As a result, well-funded policy opponents have successfully exaggerated policy costs while obscuring climate mitigation benefits. Perhaps as a result, opinion poll research finds there is considerable public skepticism of regarding the effectiveness of carbon pricing,[15-16] that public support for carbon pricing tapers off as the price rises,[17-19] that carbon pricing can generate voter opposition even when policy benefits outweigh individual policy costs,[20] and that the potential regressivity of carbon pricing in high-income countries may create challenges for developing political support coalitions.[21-23]

These political challenges have limited the enactment of carbon pricing. Voters have rejected carbon pricing initiatives on numerous occasions, including in Switzerland in 2000, 2015, and 2021, and Washington State in 2016 and 2018[24-25]. In other cases, new governments have quickly rolled back existing carbon prices, as in Australia in 2013 and the Canadian province of Ontario in 2018. The "Gilets Jaunes" protest movement in France brought international attention to working-class opposition to carbon taxes that disproportionately burden the poor.

In response, focus has turned to policy designs that may increase public support for carbon pricing, including the use of equal lump-sum rebates, referred to as carbon dividends or rebates. These rebates hold the potential to create a short-term, salient economic benefit associated with policy enactment, helping to reshape the politics of carbon pricing; publics may

subsequently mobilize to defend the carbon price from opponents or even advocate for its expansion to maintain these benefits. Such rebates might also solve the problem of the public's seemingly low willingness-to-pay to address climate change. For example, Aldy et al. find that US residents are only willing to pay about $162 per year to reduce emissions in the electricity sector[26], while Kotchen et al. show that the average American is willing to pay $177 in higher energy bills per year[27]. A carbon price of just $10/tCO$_2$ would increase the median US household's direct and indirect costs by this magnitude, which might suggest that an effective carbon tax is a political non-starter.

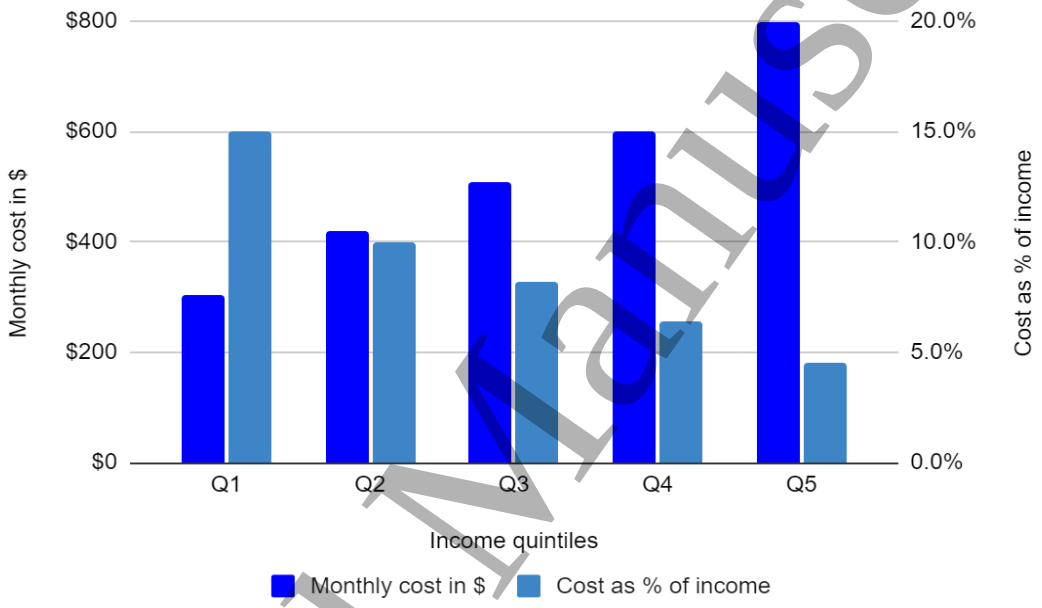
However, while this literature shows that most people are not *willing* to pay much to address climate change, most people will not *need* to pay much to address climate change. Carbon tax revenues do not disappear, and if they are returned to the public in lump-sum payments, most families, including the vast majority of low-income households, would receive a rebate payment that exceeds the increased costs they face[28-29]. In other words, when carbon tax revenues are returned as rebates, the willingness-to-pay of the median household could theoretically be $0. Klenert et al. suggest that if the benefits from carbon rebates "are clearly communicated to the public, they might outperform other mechanisms in terms of acceptability"[30]. If carbon taxes are unpopular due to their regressivity, then carbon rebates could be popular due their progressivity. Indeed, recent experimental studies show that carbon rebates can bolster public support for a carbon tax[31]. The potential popularity of carbon rebates has led thousands of economists, including dozens of Nobel prize-winners, to sign onto a public statement advocating for a carbon tax and rebate to reduce emissions[32].

This study contributes to the experimental literature on carbon rebates by both integrating calculations of carbon tax rates and rebate levels, and by embedding them in a more realistic political environment. Experiments to date provide respondents with estimates of how much the carbon price will cost the average household, but they do not provide respondents with personalized estimates of *their* carbon rebate. As a result, these papers find steadily declining support as the hypothetical carbon tax increases from $66-$165/tCO$_2$ in Switzerland[33], from $15-$75/tCO$_2$ in Canada[34], and from $10-$70/tCO$_2$ in Germany and the United States[35]. In this experiment, respondents receive larger rebates at higher tax rates. Most existing experiments also ask respondents to consider a carbon tax and rebate in an abstract setting. However, some recent studies suggest that popular support depends strongly on the political context. One experimental study finds that providing respondents with information about their actual rebates in Canada and Switzerland does not significantly increase support for existing carbon taxes in those countries[36]. This study fills that gap in the experimental literature by examining how rebates shape public support in both abstract as well as politicized contexts.

Testing Public Support for a Carbon Tax and Rebate

To examine if rebates can increase public support for a carbon tax, we conducted online surveys of 1,430 US residents and of 1,525 Swiss residents sampled on age (both countries), gender (both countries), and race (US) or language region (Switzerland). The survey was designed to study the impact of dividends on public support for both low ($50/tCO$_2$) and high ($230/tCO$_2$) carbon taxes, with and without rebates, and in the absence and presence

Figure 1: Distribution of Carbon Tax Burden in the United States



Note: This figure illustrates the monthly cost of a tax of $230/tCO$_2$ for a 3-person US household by income quintile when revenues are not rebated to the public. High income households would pay more dollars, but a smaller percent of their income. Author's calculations based on Fremstad and Paul 2019.

of political messaging. Our experiment provides respondents with personalized estimates of both their tax burden and—if applicable—their carbon dividend. By testing a high carbon price that is more in line with emission goals than currently existing and proposed tax levels, we acknowledge that current research on public acceptance of carbon taxation typically stems from scenarios that involve too low carbon prices to sufficiently reduce emissions. We also randomly expose half our respondents to political messaging around carbon taxes to assess how robust possible changes in public support are to politicization of policy debates. Details regarding survey implementation, experimental design, and key survey language by treatment groups are presented in the Methods, while the relevant survey questions are provided in Supplementary Information Section 1.

We study public support for carbon taxes in two distinct political contexts: the United States and Switzerland. In the United States, few jurisdictions have carbon taxes, and at the federal level a carbon tax has not been an object of serious debate. By contrast, the Swiss survey was conducted in the runup to a referendum vote on a new law to increase the current carbon tax—from its current level of \$104/tCO_2 to a maximum of \$229/tCO_2. Roughly two thirds of Switzerland's existing tax is rebated to the public—though this occurs through a discount to public health insurance premium and is not communicated transparently to the public[32]. The 2021 proposed reforms would have increased the yearly per capita rebate from \$87 to \$182; however, the reforms were narrowly rejected by 51.6% of voters in a referendum.

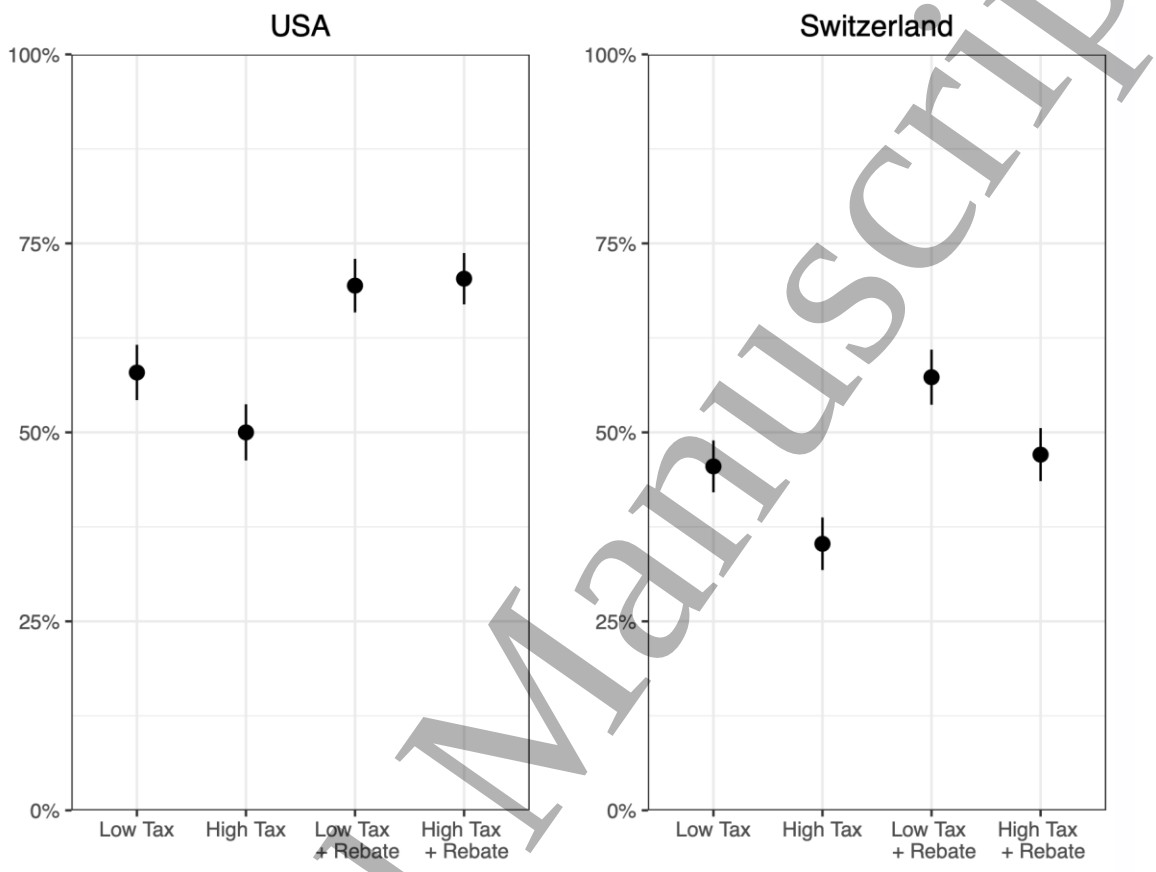
The present study integrates a carbon tax calculator into the survey to provide respondents with personalized estimates for their tax burden and rebate. The burden of a carbon tax is highly regressive, and a high tax would have a profound impact on household budgets. Figure 1 shows the tax burden of a US carbon tax of \$230/tCO_2 according to a model that combines Input-Output tables for the US economy and household expenditure data from the Consumer Expenditure Survey[25]. A tax at this level would increase prices across the economy, costing the median 3-person household \$507 a month. Higher income households pay more in dollar terms, but less as a percentage of income. We estimate the average household in the bottom quintile will pay \$302 a month in higher prices, equivalent to 15% of income, while the average household in the top quintile will pay \$799 per month, or 4.6% of income.

Carbon tax and rebate schemes have the potential to increase public support for carbon taxes, because they financially benefit the majority of households, especially low- and middle-income households. For example, a US carbon tax of \$230/tCO2 will fund a monthly rebate of \$186 per person. For a 3-person household this amounts to a rebate of \$559 per month at the high tax rate, more than the \$507 we estimate it would cost the household. In this scenario, the average household in the bottom three quintiles will have more money with a carbon tax-and-rebate than absent a carbon pricing policy. Our survey calculates respondents' monthly tax and rebate information based on their household's size and income quintile. The carbon calculator estimates for US and Swiss households are presented in Section 2 of Supplementary Information. Note, our analysis only accounts for the policies' effects on household finances, and abstracts from other economic, environmental, and health effects of reducing emissions.

Public support for a carbon tax and rebate in the absence of political messaging

In the absence of political messaging, a majority of respondents in our US sample expressed support for both high and low carbon taxes, with or without an associated rebate (Figure 2, left). Without a rebate, 58% of American respondents were willing to bear the costs associated with a \$50/tCO_2 carbon tax, and 50% were willing to bear the costs associated with a tax rate of \$230/tCO_2.

Figure 2. Support for a Carbon Tax by Treatment Condition

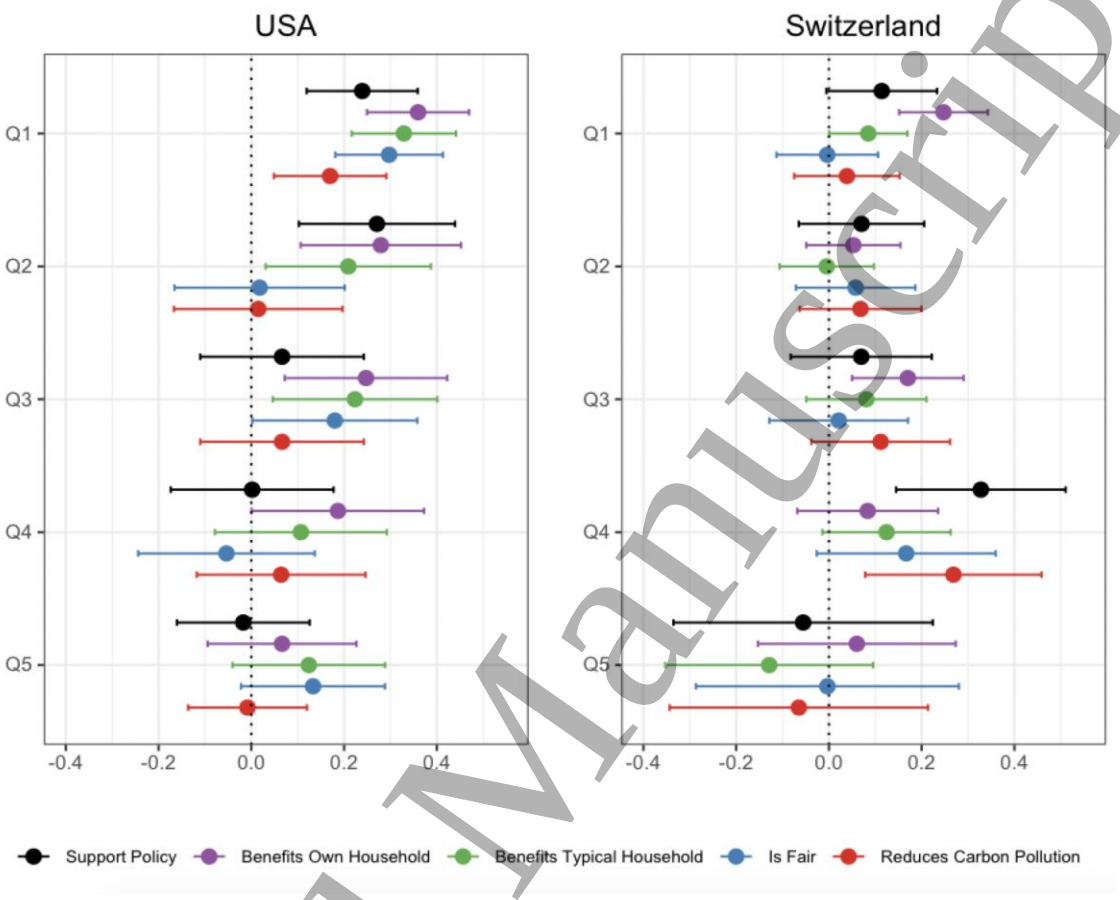


Note: Support for carbon tax for individuals who received personal estimates of their carbon tax burden at a low tax (cell BLN in Table M1; US n=183, Swiss n=212), high tax (cell BHN; US n=182, Swiss n=190), low tax with rebate (cell PLN; US n=170, Swiss n=185) and high tax with rebate (cell PHN; US n=182, Swiss n=204). Standard error bars show 95% confidence intervals of sample means.

When respondents also received information about their household's rebate size, support increased significantly in both the high tax (difference-in-means (DIM) = 0.203, SE=0.050, p-value < 0.001) and low tax (DIM=0.115, SE=0.051, p-value=0.025) conditions. Interestingly, once a rebate is included, respondent support is nearly identical in both high and low tax conditions (DIM=0.009, SE=0.049, p-value=0.8518).

Support for carbon pricing in the Swiss sample is systematically lower across all four treatments (Figure 2, right), and only reached majority support in the low tax-and-rebate

Figure 3: The effect of rebates on policy support by income quintile



Note: This figure illustrates our estimates of the effect of a rebate on respondents' support for a carbon tax and belief about the policy by income quintile (cells BLN, BHN, BLR and BHR in Table M1). Standard error bars show 95% confidence intervals.

condition. Without information about the rebate, 45% of sample respondents supported a low carbon tax and 35% supported a high carbon tax. Again, rebates significantly increased support for both the low tax (DIM=0.118, SE=0.049, p-value=0.017) and high tax (DIM=0.118, SE=0.050, p-value=0.019) condition. Unlike in the United States, policy support in the presence of the rebate is still significantly lower in the high tax condition than in the low tax condition (DIM=-0.102, SE=0.051, p-value=0.044). The Swiss referendum adds external validity to our hypothetical survey experiment. In our survey, 47.1% of respondents support a high tax and rebate, very similar to the 48.4% who voted yes in the July 2021 referendum, which proposed a similar price per ton CO_2.

In Figure 3 we look at how including a rebate shapes public support across income quintiles. While rebates are distributed on an equal per capita basis, they protect the purchasing power of low- and middle-income households more than high-income households. In the US

case, we find that carbon rebates substantially increase support for a carbon tax for the bottom two quintiles (Q1 treatment effect=0.239, SE=0.61; Q2 treatment effect=0.360, SE=0.056). In Switzerland, we find modest increases in support amongst the bottom four quintiles, but few are significant. While affluent households still tend to support a carbon tax and rebate more than low-income households, rebating the revenues weakens the correlation between income and political support (See Figure A2).

For some income quintiles, we find a carbon rebate not only increases support for a carbon tax, but that it also bolsters beliefs that the policy benefits respondents' own household, benefits the typical household, is fair, and reduces carbon pollution. In the US case, statistically significant effects are concentrated in the bottom two income quintiles. In the Swiss case, the effects are weaker, but including a rebate does significantly increase the poorest respondents' belief that the policy benefits their own household.

Public support for a carbon tax in the presence of political messaging

Our baseline experiment finds a rebate can increase public support for a carbon tax. However, this raises the question of why very few countries have substantial carbon tax and rebate programs. One possibility is that the effect of a dividend is muted or eliminated when political parties and/or interest groups dispute the impact of carbon pricing policies. Indeed, support levels in Switzerland (where our survey was fielded during contentious political conversations around carbon rebate reform) were systematically lower than in the United States (where such conversations remain more hypothetical).

To explore the role of politics, and to better understand differences in support across the two countries, half of the survey respondents in each country received a political or interest group message about carbon taxes. These brief messages informed respondents about debates over the potential costs and benefits of a policy, in each case exposing respondents to the arguments from both proponents and opponents of this policy (See Methods for details). This allows us to estimate whether rebates still build public support in the presence of political messaging, which is ever-present in the real world.

Figure 4: The effect of rebates on policy support with and without political messaging

Note: This figure illustrates our estimates the effect of a rebate on support for a carbon tax in the absence of political messaging (717 US respondents and 790 Swiss respondents in BLN, BHN, BLR and BHR in Table M1) and in the presence of political messaging (713 US respondents and 733 Swiss respondents in PLN, PHN, PLR and PHR in Table M1). The rebate's effect on the entire sample is shown in black, and its effect on voters of different political orientations are shown in blue (left), purple (center), red (right) and gray (other). In the US, Independents include all respondents who are not Democrats or Republicans. In Switzerland, we group major political parties into Left, Right, and Center, with all others placed in Other. Standard error bars show 95% confidence intervals of estimates.

In Figure 4, we see that in the absence of such messaging, the rebate increased support for people across the political spectrum in the US by similar magnitudes. In Switzerland, we find that without political messaging, the rebate increases support, but the increase is concentrated among those on the political right. However, the introduction of political messaging substantially reduces the rebate effect, rendering it statistically insignificant in most cases. In the presence of political messages in the United States, the effect of rebates remains suggestively positive but no longer significant; critically, this reduction in the rebate effect is driven by the elimination of a

positive effect among lower income quintiles, despite rebates materially benefiting these households (Supplementary Information Section 3, Figure 1). It is noteworthy, however, that a rebate still significantly increases support among independents—a key voting block. In Switzerland, when respondents are exposed to political messaging, the rebate effect is eliminated entirely. We also find that support for rebate policies are more sensitive to political messaging than policies without rebates (Supplementary Information Section 3, Figure 2).

Conclusion

Our study examines the role of rebates in building public support for carbon taxes. When respondents are provided with controlled and accurate information about the effects of a carbon price and rebate policy, rebates have a positive effect on public support. Thus, in the absence of political messaging, we find that the inclusion of a rebate substantially increases support for carbon taxes in both the US and Switzerland. When rebates are included, we find strong support for carbon taxes even at \$230/tCO_2, a rate that would substantially reduce emissions. In these experimental conditions, carbon rebates primarily increase support among low-income households that are net beneficiaries of the policy. At the same time, high income groups do not substantially reduce support for a carbon tax when revenues are rebated to the public, leading towards a convergence in levels of support across income quintiles. The fact that a large majority of American respondents support a high carbon tax when it is fully rebated to the public suggests that carbon pricing in the U.S. is politically possible in the right political environment.

However, our results also reveal that the effect of rebates depends crucially on politics. First, while rebates increase public support for carbon taxes in both countries under investigation in the absence of political messaging, we find substantially lower support levels in Switzerland. This difference may be explained by the fact that carbon taxation has been subject of a recent referendum. Second, we expose half of the respondents to simple political messages around carbon taxation by showing them arguments from proponents and opponents of these policies. In contrast to most previous survey approaches, this better simulates what occurs in real world elections and referendums. In both countries, the effect of rebates on respondents overall is no longer statistically significant in the presence of political messaging, suggesting that politics trumps personal economic interests. Thus, even if the financial benefits of carbon rebates are clearly communicated to respondents, public support is not increased when the issue is politicized.

A strength of our approach is that we use a novel carbon tax calculator that allows us to examine the effect of carbon rebates in both high and low tax scenarios, but a drawback is that testing multiple scenarios limits our sample size and statistical inference. Our experiment also remains a hypothetical scenario. In a real-world policy, it would be difficult to communicate accurate cost and benefit information to respondents, provided opponents' incentives to

exaggerate policy costs and downplay potential benefits. In this sense, our simple political messaging treatments may understate the nature of politicized messaging environments surrounding climate policies. Even so, our experimental results call into question the degree to which carbon rebates could increase public support for carbon taxes. In an idealized world where political parties pull together to implement carbon taxes in a depoliticized context, rebates may help them build public support for the policy, including for substantially higher carbon taxes than previously believed possible. However, in more realistic political contexts where carbon pricing is an object of significant political and policymaking conflict, political messaging seems to undermine rebate efficacy in increasing public support, even among households who are net beneficiaries from the policy. Future research must investigate whether or how rebates can be more effectively communicated to the public in such real-world settings, and what political messages could counteract these effects to build more robust support for necessary climate reforms.

Methods

We conducted online surveys of 1,430 US residents and of 1,525 Swiss residents, 18 years and older. The US survey was conducted from February 24th to March 9th, 2021, quota sampled on age, gender, and race using a sample provided by the polling company Lucid Theorem. The Swiss survey was fielded from June 4th to June 17th, 2021, quota sampled on age, gender, and language region using a sample provided by Qualtrics. The survey was provided in German and French but not Italian, which is the official language in the canton of Ticino as well as some municipalities in Graubünden. Nevertheless, the survey covers respondents from all Swiss cantons. In terms of gender and age, our samples closely match the actual US and Swiss populations, although our sample skews a bit poorer than the actual population.

The Swiss survey was conducted in the context of the national referendum on the new CO_2 law which took place on June 13, 2021. This law, which included an increase of the existing CO_2 levy as well as the introduction of a tax on flight tickets was supported by all major parties except the right-wing Swiss People's Party, but it was rejected at the ballot by 51.6% of Swiss citizens. The campaign preceding the vote focused on the financial cost of the policy. For example, one of the main claims of the opponents was “car driving only for the rich.”

Respondents of both surveys were randomly subjected to 1 of 8 treatments. Table M1 summarizes our experimental conditions, and their 2x2x2 structure. These policy conditions include a low tax ($50/t$CO_2$) and no rebate information (BLN), a low tax and rebate (BLR), a high tax ($230/t$CO_2$) without rebate (BHN), a high tax and rebate (BHR), a low tax with political messaging (PLN), a low tax and rebate with political messaging (PLR), a high tax with political messaging (PHN), and a high tax and rebate with political messaging (PHR).

Table M1: Experimental Conditions

	Baseline experiment		**P**olitical messaging	
	Low tax	**H**igh tax	**L**ow tax	**H**igh tax
No rebate	**BLN**	**BHN**	**PLN**	**PHN**
Rebate	**BLR**	**BHR**	**PLR**	**PHR**

Across all conditions, respondents received a basic statement about the policy being considered:

> "To address climate change, we must reduce the amount of carbon pollution released into the atmosphere. One way to do this is to make carbon pollution more expensive by taxing each unit of pollution that gets released. Based on what you've told us about your household's income and size, we estimate that this tax will increase your household's monthly expenses by [COST]."

First, every respondent was randomized into a low or high tax rate condition. The cost field in this vignette was customized for every respondent based on information we collected about their household size and income.

Second, every respondent was randomized into a tax or tax-and-rebate condition. Half of respondents received a rebate. Respondents in the rebate condition received this additional vignette:

> "Carbon tax revenues will then be given back to Americans/Swiss residents in equal monthly rebate checks. People who produce less carbon than average will make money from the policy. Based on what you've told us about your household's income and size, we estimate that your household will receive a monthly rebate for [REBATE].

As with the cost field, the rebate amount was also tailored to a respondent's household size and tax rate condition.

Third, every respondent was randomized into a baseline or condition with political messaging. Half of respondents received messaging on carbon taxation from political groups favoring or opposing the policy:

> "Many [PRO GROUP] say this is a vital policy to fight climate change, create millions of clean-energy jobs, and save billions of dollars on climate-related natural disasters like wildfires and hurricanes. By contrast, many [ANTI GROUP]

say this is a poorly designed policy to increase energy costs by billions of dollars and hurt the economy, without significantly reducing carbon pollution."

For half of respondents in this condition, PRO GROUP was set to "environmentalists" and ANTI GROUP to "business groups". For the other half of respondents, these groups were associated with parties. In the US, PRO GROUP was set to "Democrats", and ANTI GROUP was set to "Republicans". In Switzerland, PRO GROUP was set to "environmental groups", and ANTI GROUP was set to "economic associations".

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