

## RESEARCH ARTICLE

# Does partisanship shape public support for suspending U.S. federal gas tax? A survey experiment

Azusa Uji<sup>1</sup>, Jaehyun Song<sup>2</sup>, Nives Dolšak<sup>3</sup>, Aseem Prakash<sup>4\*</sup>

**1** Graduate School of Law, Kyoto University, Kyoto, Japan, **2** Faculty of Informatics, Kansai University, Osaka, Japan, **3** School of Marine and Environmental Affairs, University of Washington, Washington, Seattle, United States of America, **4** Department of Political Science, University of Washington, Washington, Seattle, United States of America

\* [aseem@uw.edu](mailto:aseem@uw.edu)

## Abstract

In the wake of Russia's invasion of Ukraine in February 2022, the national average gasoline price in the U.S. rose sharply. In response, President Biden wanted Congress to temporarily suspend the 18.4 cents per gallon federal gasoline tax. However, critics pointed out that gas tax suspension could: (1) undermine U.S. climate policy goals by encouraging the use of gasoline cars, (2) threaten U.S. national security by providing additional oil revenue to the Russian government for expanding its military capabilities, and (3) undermine the economy by defunding federal highway infrastructure. To systematically test how these critiques influenced public support for gas tax suspension, we administered an online survey experiment in May 2022 to a representative sample of U.S. respondents (N = 1,705). We found that in spite of high inflation during the months when the survey was conducted, in the aggregate, national security and the economy frames *reduced* public support for the gas tax suspension while the climate frame had no such effect. Yet, at the disaggregated level we find important partisan differences. When we interact treatment frames with respondents' party identification, the national security and the economy frames reduced public support for the gas tax suspension among Republicans only, while the climate frame reduced public support among Democrats only.

## OPEN ACCESS

**Citation:** Uji A, Song J, Dolšak N, Prakash A (2023) Does partisanship shape public support for suspending U.S. federal gas tax? A survey experiment. PLOS Clim 2(6): e0000163. <https://doi.org/10.1371/journal.pclm.0000163>

**Editor:** Suborna Barua, Dhaka University, BANGLADESH

**Received:** August 16, 2022

**Accepted:** April 28, 2023

**Published:** June 7, 2023

**Copyright:** © 2023 Uji et al. This is an open access article distributed under the terms of the [Creative Commons Attribution License](https://creativecommons.org/licenses/by/4.0/), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

**Data Availability Statement:** Replication codes and data are available at Harvard Dataverse (<https://doi.org/10.7910/DVN/7V6VVR>).

**Funding:** The authors received no specific funding for this work.

**Competing interests:** The authors have declared that no competing interests exist.

## Introduction

In 2022, gas prices were rising across the world. In the U.S., the national average gasoline price touched \$5 per gallon, the highest in the last 40 years. An important contributor to the price increase was Russia's invasion of Ukraine in February 2022, which led to Western sanctions, thereby reducing Russian oil supplies to global markets. Rising gas prices came at a time when the U.S. was facing record inflation. On June 22, President Biden called Congress to suspend the 18.4 cents per gallon federal gasoline tax for three months [1]. Independent of federal action, several blue *and* red states, such as Michigan, Pennsylvania, Georgia, and California announced proposals to suspend or reduce state gas taxes. The move to cut fuel taxes was not limited to the U.S.: Austria, Netherlands, Belgium, Greece, Sweden, and Cyprus cut fuel taxes as well [2, 3].

The gas tax suspension debate speaks to the broader issue of carbon taxation because gas or fuel taxes have a climate dimension. The U.S. federal gas tax, originally introduced under the Revenue Act of 1932, funded public works in general and defense buildups during the war. Since 1956, the revenue of the gas tax has been credited to a new Highway Trust Fund and reserved for use on the Interstate System and other highway projects [4]. Scholars note that public support for carbon taxes might depend, in part, on how the revenue is used [5–9]. The expectation is that if revenues are spent in a way that directly or indirectly benefits the public, a carbon tax could become more politically feasible [10–12]. One way to use the revenue is to give it back to citizens in the form of tax breaks. This way the carbon tax becomes revenue-neutral, and the expectation is that the public does not view it as an attempt by the government to extract more resources from society but as an attempt to shape specific behaviors without increasing the overall tax burden. Some prominent Republicans (who favor “small” government) have indicated their support for a revenue-neutral federal carbon tax. Carbon taxes could also be revenue positive, with the new revenue either going to the general budget or dedicated to specific projects or activities such as energy subsidies for low-income households, public transit, health insurance, or public education [13].

We focus on public support, especially in terms of partisan identification, for “suspending” an existing tax as opposed to introducing a new carbon tax. Politicians tend to favor low taxes and sometimes even cut existing taxes for the middle and working classes. Yet, cutting existing taxes might also mean shelving some programs. For example, when former Kansas Governor Sam Brownback, a fiscal hawk and a devotee of supply-side economics, cut state income tax in 2012–2013, he had to slash the budgets of schools and other public services as well [14]. As parents saw school funding diminish and the quality of K-12 education suffer, there was popular support for restoring taxes! Indeed, in 2017, the Kansas legislature repealed many of the tax cuts. Thus, the political dynamics of cutting existing taxes that fund popular programs could be different from raising new taxes (even when they promise to fund popular programs in the future). The reason is that in the former case, program beneficiaries have greater incentives to mobilize to protect their funding; the loss of an existing benefit might lead to a more vigorous public reaction as opposed to the promise of a comparable gain in the future [15].

The gas tax suspension debate speaks to the issue of how individuals assess the benefits of an existing tax on a carbon-intensive activity but whose revenues are earmarked for a specific use. At one extreme, one might expect that most individuals want their tax burden reduced (the “anti-tax citizen”). They might support shrinking the size of the government because citizens have better knowledge and motivation to use their monies appropriately as opposed to bureaucrats or politicians who are captured by lobbyists. However, others might take a more nuanced view of taxes (as in Kansas) and assess their tax burden in relation to the benefits taxes provide (the “nuanced citizen”). If the model of the “nuanced citizen” holds, the policy challenge is to effectively communicate the benefits taxes provide to citizens and their communities. These benefits might have the features of private goods such as subsidies to specific firms, local public goods such as economic development, or national-level public goods such as national security. It is less clear if respondents are willing to pay taxes to provide for a global public good, namely climate mitigation. Moreover, how individuals prioritize different benefits could depend, in part, on their ideological dispositions.

The proposed federal gas tax suspension was criticized on multiple grounds. Critics note that the suspension could impede the decarbonization of the transportation sector (climate), escalate the Ukrainian war by helping the Russian government to maintain its oil revenue (national security), and hurt the U.S. economy by reducing highway infrastructure spending (economy). These criticisms can translate into the benefits of maintaining the gas tax. It is less

clear if these benefits have comparable appeal for both liberals and conservatives or if their appeal reflects the broader partisan divide over climate policy [16–18].

In this paper, using an online survey experiment, we examine support for gas tax suspension among a representative sample of U.S. respondents ( $N = 1,705$ ). We administered this survey in May 2022, a period when the U.S. faced an unprecedented increase in gas prices and overall inflation. We randomly assigned respondents to reference/control and three treatment groups and presented them with different critiques (climate, national security, and economic) of gas tax suspension. Then, we asked respondents about their support for suspending the federal gas tax. We found that, in the aggregate, national security and economy frames *reduce* support for gas tax suspension (the “nuanced citizen” model) while the climate frame has no such effect. However, when we interact frames with respondents’ party identification, the national security and the economy frames reduced public support for the gas tax suspension among Republicans only, while the climate frame reduced public support among Democrats only.

If taxes are unpopular across the board, tax suspension should garner public support (the “nuanced citizen” model). Yet, we find that individuals with specific partisan identification are willing to forgo tax suspension if tax revenue is devoted to a specific cause (such as economic development) or serves a wider national policy objective (such as national security). Importantly, our findings suggest that highlighting a specific benefit of gas tax might not appeal across the political spectrum. This means that policymakers should link the gas tax with different benefits depending on the partisan orientation of their audience.

Our study has important implications for climate policy. First, public support for broad climate goals as reported in opinion polls [19, 20], may not translate into support for specific policy instruments (which probably motivate individuals to think more concretely in terms of benefits and costs). Second, the widening partisan divide does not necessarily impede climate policy progress. Policymakers could leverage the partisan divide by devising an audience-focused targeted communication strategy. That is, to gain Republicans’ support, climate policy instruments should be framed in terms of their economic payoffs or national security implications, as opposed to their climate goals.

## Hypotheses

The proposed federal gas tax suspension faced several criticisms. First, environmentalists feared that the suspension could impede the decarbonization of the transportation sector, the assumption being that lower gas prices discourage users from switching over to low-carbon transportation options [21]. Second, some saw the gas tax suspension (which potentially increases gasoline demand) as helping the Russian government to maintain its oil revenue, which it could use to continue or even escalate the Ukrainian war. Of course, this assumed high price elasticity of demand: that is, domestic price reduction increases oil demand, and hence allows Russia to maintain its revenue levels. Third, because gas taxes finance the construction and maintenance of federal highways, the proposed suspension could undermine the road infrastructure, thereby hurting local and regional economies. These criticisms can translate into the benefits of maintaining the gas tax. Amid high inflation, individuals are likely to support the gas tax suspension. However, they might reduce their support when they learn about the long-term benefits of the gas tax. Thus, we offer the following hypotheses:

H1: When respondents learn about the climate benefit of the gas tax, they are less supportive of the gas tax suspension, compared to the reference group.

H2: When respondents learn about the national security benefit of the gas tax, they become less supportive of the gas tax suspension, compared to the reference group.

H3: When respondents learn about the economic benefit of the gas tax, they become less supportive of the gas tax suspension, compared to the reference group.

However, individuals may vary in their assessment of different benefits. Scholars find political polarization over environmental issues, including climate change [16, 17, 22–24]. That is, liberals or Democrats are more likely to believe that global warming is real and anthropogenic, respect the broad scientific consensus on this subject, and support climate policies. Scholars have also explored factors driving this partisan divide. Some attribute it to the polarized media environment, both the traditional and social media [18, 22, 25, 26].

Scholars note that the partisan divide tends to be less pronounced on economic development as well as foreign policy issues [27]. Economic prosperity is important for all. Similarly, inter-state wars have tended to generate bipartisan support by emphasizing the shared peril and enhancing the sense of national identity [28, 29]. Yet, recent research suggests that even major crises or security threats may not generate bipartisan support [30]. In the context of our paper, we suggest that our treatment frames may resonate more with subgroups with specific ideological orientations. Thus, we offer the following hypotheses:

H4: The climate frame reduces public support for the gas tax suspension among Democrats only.

H5: The national security frame reduces public support for the gas tax suspension equally across Democrats, Independents, and Republicans.

H6: The economy frame reduces public support for the gas tax suspension equally across Democrats, Independents, and Republicans.

## Methods: A survey experiment

To systematically test whether different benefits influence US public support for gas tax suspension and whether partisanship generates support for specific frames only, we administered an online survey experiment to a representative sample of adult US respondents over the age of 18 ( $N = 1,705$ ). The Human Subjects Division of the University of Washington reviewed and approved the study (#STUDY 00015566), and we pre-registered our survey ([https://osf.io/3w94e/?view\\_only=67b432386b894902b12fe9ac90830063](https://osf.io/3w94e/?view_only=67b432386b894902b12fe9ac90830063)). We contracted with a survey firm, Cint, to administer the online survey between May 17–19, 2022. The survey was administered amidst the inflation and rising gas prices in the United States and abroad.

We randomly assigned respondents to four groups: a reference group and three treatment groups which focus on specific critiques of gas tax suspension (climate policy, national security, and economy). The climate policy frame highlights that lower gas prices reduce incentives for individuals to drive less, purchase hybrids or electric cars, or use public transportation—all of which undermine the U.S. climate policy goals. The national security frame suggests that lower gas prices increase the demand for gasoline, which generates oil revenue for Russia, which is a major oil exporter. This allows the Russian government to support its military which threatens U.S. security. While such interlinkages between national security and carbon tax tend to be understudied (exceptions include [31]), this perspective has gained importance in the aftermath of the Ukraine invasion because it has underlined the fact that energy dependence is a national security issue. The economy frame notes that tax suspension will reduce funding for interstate highways and bridges. This, in turn, will reduce employment in the construction industry which often directly affects local and regional economies. Furthermore, poorly maintained roads increase transportation costs and hurt consumers.

We recognize the challenges scholars face in designing survey experiments. Since the objective of the experiment is to introduce a new variable/argument in treatment groups (and test

the treatment against the reference category), some text from the reference category needs to be cut to maintain a comparable word count across frames. The challenge is to identify the text that does not provide new information about the issue and yet is coherent with the narrative presented in the reference group. This can be achieved by providing all groups with the same core information and introducing some repetitive information in the reference group. The treatment groups, on the other hand, do not get the repetitive information but the treatment text of approximately the same length. Our objective was to include repetitive information in the reference group which could be replaced by information about how gas tax suspension hurts climate change, national security, or the economy/road infrastructure. support for the suspension of the federal gas tax of 18.4 cents per gallon. While we carefully excluded repetitive information provided in the reference group from the treatment frames, this dropped information might induce a bias in estimating the treatment effect. Yet, if there is a bias, it makes our estimates of the treatment effects conservative because the information retained in the control/reference category might provide an additional reason for the control group respondents to oppose gas tax suspension.

In terms of administering the survey, we first presented a brief background of the gas tax suspension plan proposed by the Biden Administration, which is followed by the drawback of the suspension. Then, we asked respondents to indicate their support for tax suspension on a 1 (Strongly oppose) to 7 (Strongly support) scale. Also, we asked a series of standard demographic questions toward the end of the survey. Our survey design and the full text of our survey are available in Text D in [S1 Appendix](#). As Fig A in [S1 Appendix](#) shows, we use standardized biases (SBs) as balancing statistics. We calculated SBs for every pair of experimental groups. Absolute values of SBs are all lower than 20. This indicates that covariates are balanced by the treatment group.

While we administered the survey to 2,000 respondents, 295 (14.8%) selected the option, “Don’t want to answer” for at least one question. This reduced our sample size to 1,705. While recognizing the debate on the potential bias by excluding inattentive respondents, in the supplementary analysis, we limit our sample to attentive respondents ( $N = 1,221$ ). This leads us to drop 484 inattentive respondents, who were not able to provide correct answers to at least one of the two attention-check questions. Accordingly, we report results with both all respondents ( $N = 1,705$ ) and attentive respondents only ( $N = 1,221$ ).

To examine the impact of informational treatments on gas tax suspension (H1, H2, and H3), we constructed Model 1. Treatment<sub>1</sub>, Treatment<sub>2</sub>, and Treatment<sub>3</sub> respectively represent climate policy, national security, and the economic critiques of gas tax suspension. We also control for demographic variables: *Gender*, *Age*, *Income*, *Education*, *State* (where respondents reside), *Race*, *Religion*, and *Party Identification*. Model 2 includes interaction terms to see how party identification could influence respondents’ responses to treatment information (H4, H5, and H6). Since using a slider allows the respondent to express their support for the federal gas tax suspension on a continuous scale (bounded between 1 and 7), we employ the OLS estimator to estimate both models.

## Model 1

$$\hat{Y}_i = \alpha + \beta_1 \text{Climate Policy}_i + \beta_2 \text{National Security}_i + \beta_3 \text{Economy}_i + \beta_4 \text{Democrat}_i + \beta_5 \text{Republican}_i + \gamma' X_i$$

where  $X_i$  represents a vector of *Gender*, *Age*, *Education*, *Income*, *State*, *Race*, and *Religion*, and  $\gamma$  represents its coefficient.

## Model 2

$$\hat{Y}_i = \alpha + \beta_1 \text{Climate Policy}_i + \beta_2 \text{National Security}_i + \beta_3 \text{Economy}_i + \beta_4 \text{Democrat}_i + \beta_5 \text{Republican}_i \\ + \beta_6 \text{Climate Policy}_i \cdot \text{Democrat}_i + \beta_7 \text{Climate Policy}_i \cdot \text{Republican}_i \\ + \beta_8 \text{National Security}_i \cdot \text{Democrat}_i + \beta_9 \text{National Security}_i \cdot \text{Republican}_i \\ + \beta_{10} \text{Economy}_i \cdot \text{Democrat}_i + \beta_{11} \text{Economy}_i \cdot \text{Republican}_i + \gamma' X_i$$

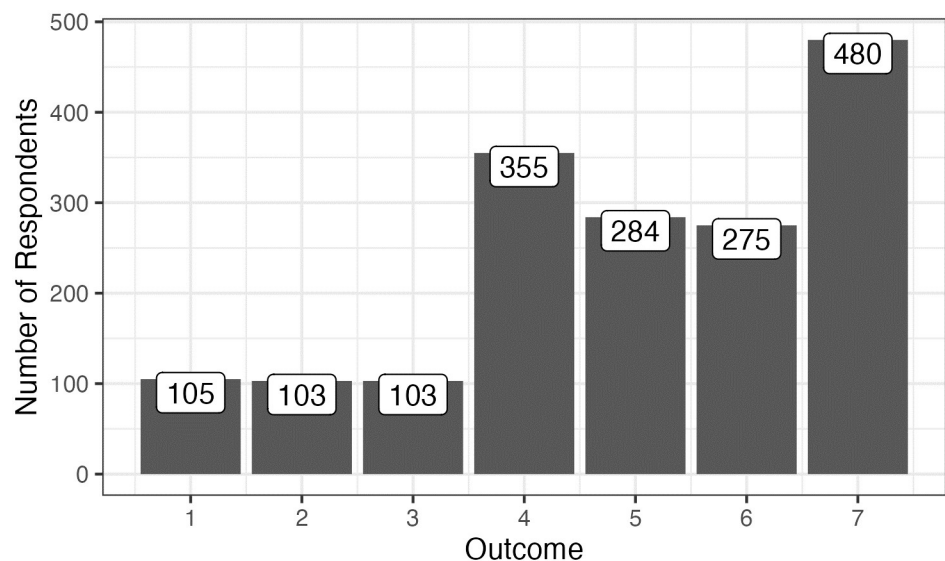
where  $X_i$  represents a vector of *Gender, Age, Education, Income, State, Race, and Religion*, and  $\gamma$  represents its coefficient.

## Results

In terms of the baseline public support, Fig 1 shows the distribution of the outcome variable. The mean value of the outcome variable is 5.22. Given that 7 represents “strongly support,” this suggests that US respondents, on average, are supportive of the gas tax suspension—which is not surprising given the high inflation and rise in energy costs.

Does exposure to a specific critique influence the support level at the aggregate level? The first and second columns in Table 1 respectively present the result of Model 1 with all respondents and attentive respondents only. Our main result of the treatment variables holds even when we exclude inattentive respondents. As robustness checks, we also ran models without covariates for full and only attentive respondents. For these results, see Table C in S1 Appendix. Focusing on Treatment Variables in Model 1 with the full sample, dots with lines in Fig 2 shows how each treatment frame changes public support for tax suspension in relation to the reference frame with 95% confidence intervals (Caterpillar plots for Model with attentive respondents are available in Fig B in S1 Appendix.).

Table 1 and Fig 2 show that while the effect of the climate frame is not statistically significant, both national security and the economy frames have statistically significant *negative* effects. That is, when people learn about the economic and national security benefits of the gas tax, they reduce support for its suspension, in relation to the reference frame (the “nuanced



**Fig 1. Distribution of the outcome variable.** Note: Each bar represents the number of respondents who expressed a certain level of support for tax suspension on a 1 (Strongly oppose) to 7 (Strongly support) scale.

<https://doi.org/10.1371/journal.pclm.0000163.g001>



Table 1. Regression table for Models 1 and 2 with all respondents and only attentive respondents.

	Model 1 All	Model 1 Attentive	Model 2 All	Model 2 Attentive
<b>Treatment Variables</b>				
Climate Policy (CP)	-0.248 (0.129)	-0.273 (0.157)	-0.079 (0.229)	-0.101 (0.274)
National Security (NS)	-0.435 (0.123) ***	-0.551 (0.152) ***	-0.836 (0.213) ***	-1.033 (0.261) ***
Economy (E)	-0.433 (0.124) ***	-0.599 (0.152) ***	-0.522 (0.214) ***	-0.598 (0.256) ***
<b>Demographic Variables</b>				
Gender (baseline: Non-binary)				
Male	0.789 (0.704)	1.210 (0.888)	0.785 (0.703)	1.154 (0.887)
Female	0.911 (0.705)	1.494 (0.889)	0.929 (0.704)	1.457 (0.888)
Age	0.000 (0.003)	-0.006 (0.004)	0.000 (0.003)	-0.006 (0.004)
Education	0.038 (0.045)	-0.006 (0.056)	0.039 (0.045)	0.001 (0.057)
Income	-0.095 (0.040) *	-0.138 (0.049) **	-0.093 (0.040) *	-0.137 (0.049) **
Party Identification (baseline: Republican)				
Democrat (D)	0.234 (0.112) *	0.187 (0.139)	0.105 (0.214)	0.076 (0.260)
Independent (I)	-0.063 (0.117)	-0.005 (0.144)	-0.224 (0.224)	-0.153 (0.273)
<b>Interaction Terms (Treatment × Party Identification)</b>				
CP × D			-0.406 (0.312)	-0.404 (0.378)
NS × D			0.692 (0.292) *	0.782 (0.357) *
E × D			0.137 (0.292)	0.019 (0.356)
CP × I			-0.005 (0.325)	0.006 (0.397)
NS × I			0.460 (0.310)	0.576 (0.385)
E × I			0.129 (0.323)	-0.003 (0.391)
Intercept	2.943 (1.500) *	5.729 (2.118) **	3.012 (1.500) *	5.729 (2.118) **
N	1,705	1,221	1,705	1,221
Adjusted R <sup>2</sup>	0.016	0.030	0.021	0.035

Note 1:

\*\*\* p &lt; 0.001;

\*\* p &lt; 0.01;

\* p &lt; 0.05

Note 2: Standard errors are in parentheses.

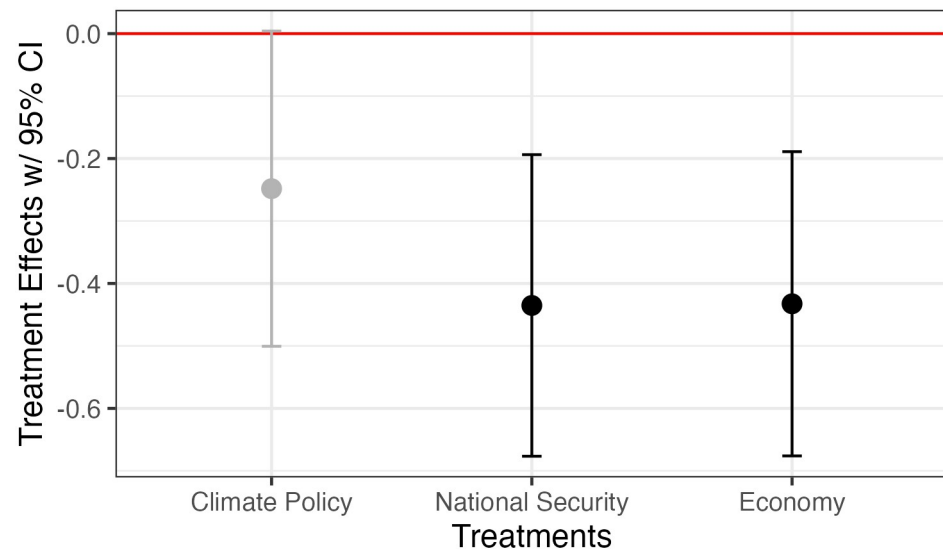
Note 3: The result of State, Race, and Religion are omitted. See replication files for the results.

<https://doi.org/10.1371/journal.pclm.0000163.t001>

citizen” model). However, the climate benefit of the gas tax does not affect the level of public support for the suspension (although the sign of the coefficient is in the expected direction). These results are consistent with a recent study assessing public support for the Thacker Pass lithium mine in Nevada, a mineral critical for renewable energy transition, which reduces U.S. dependence on China for this mineral. Uji et al (2023) find that public support for the mine increases when its benefits are framed in terms of national security but not in terms of climate policy [32].

Our results of the treatment frames are surprising given that inflation is straining household budgets and one might expect respondents to support gas tax suspension. Yet, respondents seem to take a nuanced view of taxes and appreciate the benefits that gas taxes provide. Consequently, they are less supportive of gas tax suspension (in relation to the reference frame). Hypotheses 2 and 3 are supported while Hypothesis 1 is not supported.

Does the gas tax suspension resonate differently across demographic groups? Contrary to previous literature, Democrats are more supportive of the suspension than Republicans (Model 1). Specifically, scholars find that Democrats are more supportive of the gas tax



**Fig 2. Treatment effects.** Note: Dots show how much each treatment frame changes public support for tax suspension in relation to the reference frame while lines represent 95% confidence intervals.

<https://doi.org/10.1371/journal.pclm.0000163.g002>

increase than Republicans [33, 34], and Tea Parties are the least supportive [35, 36]. Our findings differ probably because President Biden has framed high gas prices as a consequence of the Russian invasion, while Republicans want to pin high gas prices on President Biden's climate policies (such as drilling bans or denying permits to oil pipelines) which they claim has hurt fossil fuel supplies.

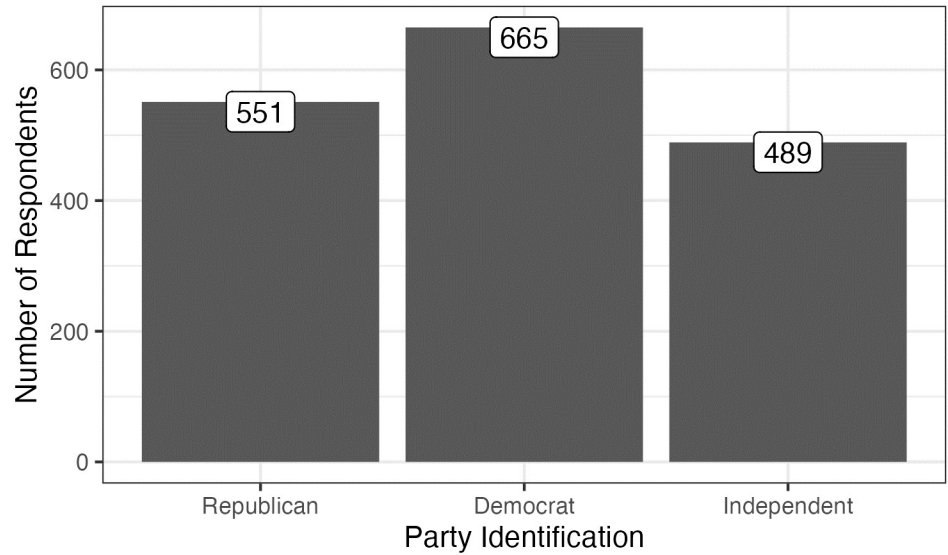
The results of other demographic variables are reported in Table 1. We find that low-income respondents are *more* supportive of the suspension. Because gas taxes are regressive, this finding is consistent with the literature [37, 38]. However, gender, age, and education are not statistically significant. We observe this demographic tendency consistently across Models 1 and 2.

Do different dimensions of gas tax suspension appeal uniformly across the ideological spectrum? To examine this subject, we turn to the interaction effects between treatment frames and party identification. Fig 3 shows that out of our sample 665, 489, and 551 respondents are Democrats, Independents, and Republicans, respectively. The third and fourth columns in Table 1 respectively show the result of Model 2 with all respondents and attentive respondents. Again, our main result holds even when we exclude inattentive respondents.

Might multicollinearity pose a problem for Model 2 with interaction terms? It is typical that variance inflation factor (VIF), which is used to detect the severity of multicollinearity, increases for models with interaction terms [39]. In fact, in Model 2, the generalized VIF (GVIF) is very large for treatment, party identification, and the interaction term between them. Because this reflects the high correlation of the interaction term with treatment and party identification, it does not pose a problem given the exogenous nature of our treatment variable. Considering the issue of inflation, to test multicollinearity for interaction models, scholars use GVIF for models excluding interaction terms (Model 1 in our case) or predictor GVIF developed for interaction models. We confirmed that both GVIF for Model 1 and predictor GVIF for Model 2 are smaller than 10, suggesting that there is no concern about the multicollinearity problem. Please see the replication data for detail.

The results of Model 2 in Table 1 show that interaction terms except for one between national security and Democrats do not have statistically significant effects. However, we

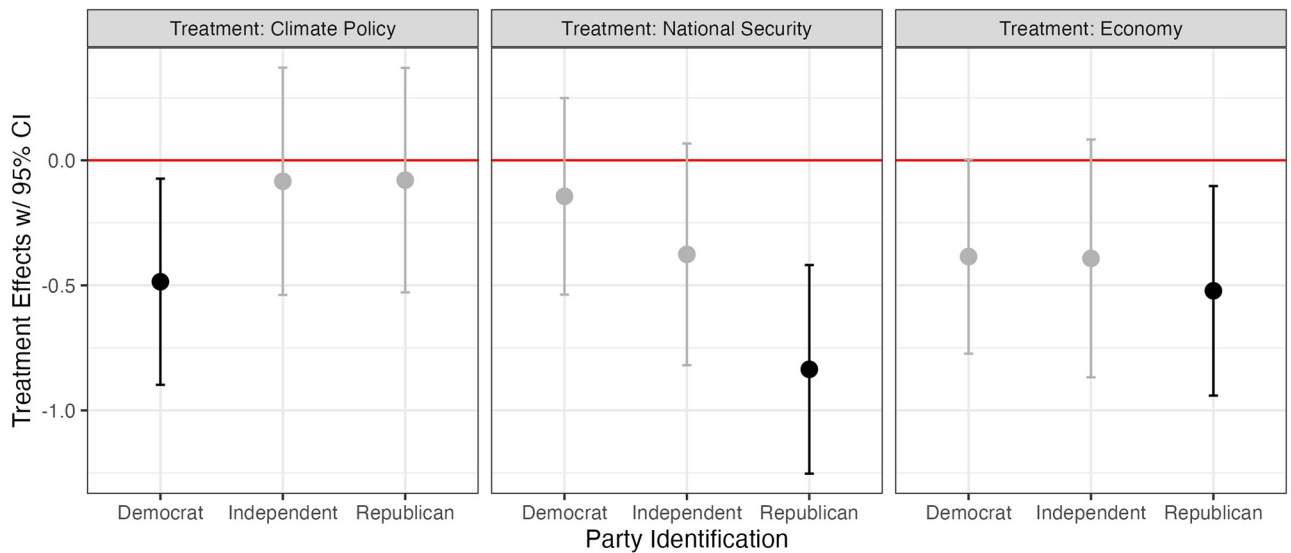




**Fig 3. Distribution of respondents by party identification.** Note: Each bar indicates the number of Republicans, Democrats, and Independents out of our sample (N = 1,705).

<https://doi.org/10.1371/journal.pclm.0000163.g003>

cannot correctly evaluate the treatment effects conditional on the party identification only with the regression table [40]. As the size and significance level of treatment effects vary by the value of party identification, we need to see marginal effects: treatment effects when party identification takes a certain value. Fig 4 thus plots the marginal effects of each treatment when respondents' party identification is Democrat, Independent, or Republican. Dots with lines in each panel show how the treatment frames change public support for tax suspension in relation to the reference frame with 95% confidence intervals by party identification.



**Fig 4. Interaction effects between treatment and party identification.** Note: Dots show how much each treatment frame changes public support for tax suspension in relation to the reference frame by respondents' party identification while lines represent 95% confidence intervals.

<https://doi.org/10.1371/journal.pclm.0000163.g004>

While the climate frame did not have a statistically significant effect in Model 1, the pane on the left in Fig 4 shows that it becomes statistically significant among Democrats. Meanwhile, the effect of climate frame is not statistically significant among Independents or Republicans. This provides additional evidence about polarization over climate policy. All three panes in Fig 4 also show that none of our treatment frames have statistically significant effects among Independents. Panes in the middle and on the right in Fig 4 show that national security and the economy frames have statistically significant negative effects among Republicans only. That is, the effects reported for Model 1 are largely driven by Republicans. The finding on the absence of bipartisanship over national security is consistent with the recent finding that security threats do not always induce bipartisan consensus.

The lack of significance of the economy frame among Democrats is inconsistent with a recent study [41] that finds that Democrats who endorsed the Green New Deal (which framed climate policy in terms of its economic and social implications) received about a 2% higher vote share in the 2020 Congressional elections in relation to Democrats who did not. Overall, these results support Hypothesis 4 but not Hypotheses 5 and 6.

## Conclusion

Record high inflation and international insecurity motivated the US federal government to propose the suspension of the federal gas tax. Yet, the gas tax does create benefits, and its suspension, ironically, could impose the reduction of these benefits. In the context of the carbon tax, previous studies suggest revenue recycling in specific ways could enhance public support for the tax. Drawing on this discussion, we asked two questions. Which benefits appeal to the U.S. public to maintain the gas tax (the “nuanced citizen” model)? Given the widening partisan divide over environmental issues in the US, could partisanship influence the public’s responses to each benefit? We administered an online survey experiment to a representative sample of U.S. respondents. We found that, in the aggregate, national security and the economy frames reduced public support for the gas tax suspension while the climate frame had no such effect. However, with interaction effects, the national security and the economy frames reduced public support for the gas tax suspension among Republicans only and the climate frame reduced public support among Democrats only.

The federal gas tax recycles the revenue in a specific way: it funds federal road infrastructure. In an automobile-dependent economy such as the U.S., this probably is politically appealing, especially for the Republicans, as our results show. Moreover, construction jobs often support the local economy, which again is politically appealing. However, support for the national security frame was surprising. Arguably, national security is a national public good and individuals might be tempted to free ride. Yet, it seems that individuals (specifically, Republicans) continue to care about national security, and arguably, the Russian invasion has again shone the spotlight on national security issues. This subject needs to be investigated further especially when the U.S. is not actively involved in a global military crisis.

Consistent with the literature on public opinions, we found a partisan divide: support for policy issues varies by party identification. Although the partisan divide is often regarded as an impediment to climate policy progress, our survey experimental approach suggests that it may not necessarily be the case. Policymakers can link climate policies with different issues depending on the partisan orientation of their audience. This political communication strategy is increasingly feasible as the boundaries between environmental, economic, and security issues become blurred. For example, countries compete for green industrial policies to gain comparative advantages, including the recent Inflation Reduction Act and the EU’s Green Industrial Plan. Countries also seek to strengthen global supply chains and encourage reshoring for EV

batteries or semiconductors, which are essential for green technologies as well as for national security. Future studies should test how these issue linkages could affect public opinion in the context of other environmental policy instruments.

We note the limitations of our study. Gas tax suspension is popular: it scores 5.22 on the 1–7 scale where 7 represents strong support. Yet, even in the context of an inflationary environment, we find that the level of support reduces when respondents are told of national security and economic payoffs of taxes. In terms of the generalizability of our findings, it will be instructive to revisit the issue when inflation levels are lower, or at least conform more closely to the historical experience of respondents. Second, the proposed gas tax suspension was a temporary measure, which did not receive Congressional approval. Moreover, savings for consumers (18.4 cents per gallon) were probably small compared to carbon taxes proposed (or in operation) across countries. Thus, future work should assess public support for tax suspension, especially when taxes have a more substantial effect on household budgets. Third, as we noted, the political dynamics of introducing a new tax and repealing or suspending an existing tax might differ. Thus, our findings should be applied carefully to debates about carbon tax introduction. Finally, partisanship could be assessed in a more granular fashion [35, 36]: for example, MAGA Republicans might hold policy views that are different from mainstream Republicans. Future work could take a more nuanced view of partisanship to assess if extreme factions among conservatives or liberals are driving results.

## Supporting information

**S1 Appendix. “Does partisanship shape public support for suspending U.S. federal gas tax? A survey experiment”.**

(DOCX)

## Acknowledgments

We thank Lawrence Hamilton and one anonymous reviewer for their constructive comments.

## Author Contributions

**Conceptualization:** Azusa Uji, Nives Dolšak, Aseem Prakash.

**Data curation:** Jaehyun Song.

**Investigation:** Azusa Uji, Jaehyun Song, Aseem Prakash.

**Methodology:** Azusa Uji, Jaehyun Song, Nives Dolšak, Aseem Prakash.

**Project administration:** Azusa Uji, Nives Dolšak, Aseem Prakash.

**Software:** Azusa Uji, Jaehyun Song.

**Supervision:** Nives Dolšak, Aseem Prakash.

**Validation:** Nives Dolšak, Aseem Prakash.

**Visualization:** Jaehyun Song.

**Writing – original draft:** Azusa Uji, Nives Dolšak, Aseem Prakash.

**Writing – review & editing:** Azusa Uji, Nives Dolšak, Aseem Prakash.

## References

1. Kanno-Youngs Z, DePillis L. Biden Pushes Congress for Three-Month Gas Tax Holiday. *The New York Times*, June 22, 2022. <https://www.nytimes.com/2022/06/22/us/politics/biden-gas-tax-holiday.html>
2. Chan K, Parra, A. Amid protests, Europe limited in curbing high energy prices. *AP News*, March 24, 2022. <https://apnews.com/article/russia-ukraine-business-europe-lifestyle-prices-34cad398126d3eb43336ae54fe6e8ce6>
3. McGuirk R. Australia aims to ease inflation pressures ahead of election. *AP News*, March 29, 2022. <https://apnews.com/article/business-elections-australia-general-elections-prices-3c2a2b99e4e920521f6b42474e906487>
4. U.S. Department of Transportation. Highway History. <https://www.fhwa.dot.gov/infrastructure/gastax.cfm>
5. Carattini S, Carvalho M, Fankhauser S. Overcoming public resistance to carbon taxes. *Wiley Interdisciplinary Reviews: Climate Change*. 2018; 9(5), e531. <https://doi.org/10.1002/wcc.531> PMID: 31031823
6. Klenert D, Mattauch L, Combet E, Edenhofer O, Hepburn C, Rafaty R, et al. Making carbon pricing work for citizens. *Nature Climate Change*. 2018; 8(8), 669–677.
7. Dolšák N, Adolph C, Prakash A. Policy design and public support for carbon tax: evidence from a 2018 US national online survey experiment. *Public Administration*. 2020; 98(4), 905–921.
8. Beiser-McGrath LF, Bernauer T, Song J, Uji A. Understanding public support for domestic contributions to global collective goods. *Climatic Change*. 2021; 166(3), 1–20.
9. Jagers SC, Lachapelle E, Martinsson J, Matti S. Bridging the ideological gap? How fairness perceptions mediate the effect of revenue recycling on public support for carbon taxes in the United States, Canada and Germany. *Review of Policy Research*. 2021; 38(5), 529–554.
10. Douenne T, Fabre A. French attitudes on climate change, carbon taxation and other climate policies. *Ecological Economics*. 2020; 169, 106496.
11. Nowlin MC, Gupta K, Ripberger JT. Revenue use and public support for a carbon tax. *Environmental Research Letters*. 2020; 15(8), 084032.
12. Fairbrother M. When will people pay to pollute? Environmental taxes, political trust and experimental evidence from Britain. *British Journal of Political Science*. 2017; 49(2), 661–682.
13. Gevrek ZE, Uyduranoglu A. Public preferences for carbon tax attributes. *Ecological Economics*. 2015; 118, 186–197.
14. Mazerov M. Kansas Provides Compelling Evidence of Failure of "Supply-Side" Tax Cuts. Center on Budget and Policy Priorities. January 22, 2018. <https://www.cbpp.org/research/state-budget-and-tax/kansas-provides-compelling-evidence-of-failure-of-supply-side-tax>
15. Kahneman D, Tversky A. Prospect theory: An analysis of decisions under risk. *Econometrica*. 1979; 47, 278.
16. McCright AM, Dunlap RE. The politicization of climate change and polarization in the American public's views of global warming, 2001–2010. *Sociological Quarterly*. 2011; 52(2):155–94. <https://doi.org/10.1111/j.1533-8525.2011.01198.x>
17. Hamilton LC, Hartter J, Lemcke-Stampone M, Moore DW, Safford TG. Tracking public beliefs about anthropogenic climate change. *PLOS One* 2015; 10(9): e0138208. <https://doi.org/10.1371/journal.pone.0138208> PMID: 26422694
18. Carmichael JT, Brulle RJ, Huxster JK. The great divide: Understanding the role of media and other drivers of the partisan divide in public concern over climate change in the USA, 2001–2014. *Climatic Change*. 2017; 141:599–612. <https://doi.org/10.1007/s10584-017-1908-1>
19. Pew Research Center. Climate Change Remains Top Global Threat Across 19-Country Survey. August, 2022.
20. Kennedy B, Tyson A, Funk C. Americans Divided Over Direction of Biden's Climate Change Policies. Pew Research Center. July 14, 2022. [https://www.pewresearch.org/science/2022/07/14/americans-divided-over-direction-of-bidens-climate-change-policies/?utm\\_source=AdaptiveMailer&utm\\_medium=email&utm\\_campaign=22-07-14%20Climate%20and%20environmental%20views%20GEN%20DISTRIBUTION&org=982&lvl=100&ite=10238&lea=2157494&ctr=0&par=1&trk=a0D3j000011IRwsEAG](https://www.pewresearch.org/science/2022/07/14/americans-divided-over-direction-of-bidens-climate-change-policies/?utm_source=AdaptiveMailer&utm_medium=email&utm_campaign=22-07-14%20Climate%20and%20environmental%20views%20GEN%20DISTRIBUTION&org=982&lvl=100&ite=10238&lea=2157494&ctr=0&par=1&trk=a0D3j000011IRwsEAG)
21. Dlouhy JA, Wingrove J. Biden embraces oil as Ukraine war overwhelms his climate agenda. *Japan Times*, April 2022. <https://www.japantimes.co.jp/news/2022/04/01/world/ukraine-war-climate-agenda/>
22. Guber DL. A cooling climate for change? Party polarization and the politics of global warming. *American Behavioral Scientist*. 2013; 57, 93–115.
23. Dunlap RE, McCright AM. A Widening Gap: Republican and Democratic Views on Climate Change. *Environment*. 2008; 50(5):26–35.

24. Tesler M. Elite domination of public doubts about climate change (not evolution). *Political Communication*. 2018; 35(2), 306–326.
25. Merkley E, Stecula D. Party cues in the news: Democratic elites, Republican backlash, and the dynamics of climate skepticism. *British Journal of Political Science*. 2021; 51(4), 1439–1456. <https://doi.org/10.1017/S0007123420000113>
26. Carmichael JT, Brulle RJ. Elite cues, media coverage, and public concern: an integrated path analysis of public opinion on climate change, 2001–2013. *Environmental Politics*. 2017; 26, 232–252.
27. Kertzer JD, Brooks DJ, Brooks SG. Do Partisan Types Stop at the Water's Edge?. *The Journal of Politics*. 2021; 83(4), 1764–1782.
28. Brody RA. *Assessing the President: The Media, Elite Opinion, and Public Support*. Stanford University Press; 1991.
29. Mueller JE. *War, Presidents, and Public Opinion*. Wiley; 1973.
30. Myrick R. Do external threats unite or divide? Security crises, rivalries, and polarization in American foreign policy. *International Organization*. 2021; 75(4), 921–958.
31. Busby JW. Who cares about the weather?: Climate change and US national security. *Security Studies*. 2008; 17(3), 468–504.
32. Uji A, Song J, Dolšak N, Prakash A. Pursuing decarbonization along with national security: Assessing public support for the Thacker Pass lithium mine. *PLOS ONE*. 2023; 18(1), e0280720. <https://doi.org/10.1371/journal.pone.0280720> PMID: 36693043
33. Agrawal AW, Nixon H. What do Americans think about federal tax options to support public transit, highways, and local streets and roads? Results from year four of a national survey. *Mineta Transportation Institute Report 12–07, i-96*; 2013.
34. Duncan D, Nadella V, Giroux S, Bowers A, Graham JD. The road mileage user-fee: Level, intensity, and predictors of public support. *Transport Policy*. 2017; 53(C), 70–78.
35. Fogg LM, Hamilton LC, Bell ES. *Transportation and taxes: What New Hampshire residents think about maintaining highways and bridges*. Durham, NH: Carsey School of Public Policy; 2017. <https://dx.doi.org/10.34051/p/2020.307>
36. Fogg LM, Hamilton LC, Bell ES. Views of the highway: infrastructure reality, perceptions, and politics. *Sage Open*. 2020; 10(4): 2158244020963609.
37. Rotaris L, Danielis R. The willingness to pay for a carbon tax in Italy. *Transportation Research Part D: Transport and Environment*. 2019; 67, 659–673.
38. Kenny J. Environmentalism undercover: The environmental dimension of public support for domestic water charges. *Electoral Studies*. 2019; 62, 102088.
39. Francoeur RB. Could Sequential Residual Centering Resolve Low Sensitivity in Moderated Regression? Simulations and Cancer Symptom Clusters. *Open Journal of Statistics*. 2013; 3 (6A): 24–44.
40. Brambor T, William RC, Matt G. Understanding Interaction Models: Improving Empirical Analyses. *Political Analysis*. 2006; 14(1): 63–82.
41. Carmack M, Dolšak N, Prakash A. Electoral appeal of climate policies: The Green New Deal and the 2020 U.S. House of Representatives elections. *PLOS Climate*. 2022; 1(6): e0000043