

Public support for carbon taxes varies across countries and policy design must consider the national context

Corresponding Author: Dr Hamid Bulut

This file contains all editorial decision letters in order by version, followed by all author rebuttals in order by version.

Attachments originally included by the reviewers as part of their assessment can be found at the end of this file.

Version 0:

Decision Letter:

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Dear Dr Bulut,

First of all, please allow me to apologise for the delay in sending a decision on your manuscript titled "From Opposition to Opportunity: Enhancing Public Carbon Tax Acceptance Through Effective Policy Design". It has now been seen by 2 reviewers, whose comments are appended below. You will see that they find your work of some potential interest. However, they have raised quite substantial concerns that must be addressed. In light of these comments, we cannot accept the manuscript for publication, but would be interested in considering a revised version that fully addresses these serious concerns.

We hope you will find the reviewers' comments useful as you decide how to proceed. Should additional work allow you to

- address these criticisms (that is, either to incorporate the suggestions or provide a compelling argument why the point made by the reviewer is not valid or relevant to the editorial threshold as outlined below)

AND

- meet our editorial thresholds as outlined below,

then we would be happy to look at a revised manuscript.

In the following, we list our minimum requirements for publication.

****Present novel insights into public support for carbon taxes based on evidence presented in the context of clearly communicated study aims and a fully developed theoretical framework.**

****Provide a comprehensive review of recent literature, outline methodological details, and clarify your control variables and hypothesis, including what is being measured.**

****Expand your discussion to highlight the difference between countries in social and economic contexts and clarify actual examples of carbon taxes.**

If you choose to take up this option, please either highlight all changes in the manuscript text file, or provide a list of the changes to the manuscript with your responses to the reviewers.

<When resubmitting, please provide a point-by-point response to the reviewers' comments. Please submit your responses as a separate file, distinct from your cover letter where you can add responses to the Editors' comments that you do not want to be made available to the reviewers. Word files are preferred. We recommend that any figures, tables or graphs that are included in the response to reviewers are also included in the main article or Supplementary Information.

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Please do not hesitate to contact us if you have any questions or would like to discuss the required revisions further. Thank you for the opportunity to review your work.

Best regards,

Franziska M. Hoffart
External Editor
Communications Earth & Environment

Martina Grecequet, PhD
Senior Editor
Communications Earth & Environment

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REVIEWER COMMENTS:

Reviewer #1 (Remarks to the Author):

Dear authors,

Many thanks for this interesting article. The paper examines the acceptance of carbon taxes through effective policy design in four countries in the Global North and Global South. Around 4000 respondents were reached with a quantitative online experiment. By comparing very different countries, especially countries in the global South, the article makes an important contribution to understanding the acceptance of carbon taxes under very different conditions. I recommend acceptance of the paper with major revisions.

1. After a detailed introduction, there is no theoretical contextualization leading to the development of hypotheses. It remains unclear which theoretical background is used to approach the research question. Accordingly, terms such as acceptance, support and preference remain unclear or are used synonymously. Here I recommend a theoretical framework as well as definitions of the terms to clarify the research question and what is being measured.

2. In the hypothesis development, the differences between the countries are only briefly touched on by the fact that the

Global South is more strongly affected. However, no differences are assumed in the hypotheses themselves. In my opinion, the expected differences between the countries should be explained more clearly. Not only due to the impact of climate change, but also other context variables of the political and economic system as well as the cultural and social context. The differences should actually also be included in the hypotheses.

3. Lines 210 to 212 mention control variables that were also included in the analysis. These are only taken up again in line 381 with the statement that trust and concerns are much more important for the evaluation than the selected variables. In my opinion, the control variables should be included in the presentation and interpretation of the analyses for a correct understanding of the results. It would also be interesting to see to what extent trust and concerns differ between the countries. For example, is trust much higher in one country and therefore also general approval?

4. I have some difficulties with hypothesis 3 and the interpretation of the results. The (spontaneous) agreement is higher if the costs are not mentioned. However, it cannot be concluded from this that the costs should not be mentioned, because at some point it is always about the costs. Is it a question of communication/information? Or is it a question of policy design? What exactly is being measured? And what can be concluded from this? A theoretical framework would provide more clarity here.

Reviewer #2 (Remarks to the Author):

The authors use a survey approach to examine public support for carbon taxes in four different countries (UK, Germany, India, and China). Their main contribution is that they survey two developed countries, one mid-developed country, and one developing country. The survey adjusts the design features of the carbon tax policy, so the quantitative analysis can identify how different design features (e.g., the revenue recycling method used) affect support. Surprisingly, support for carbon taxes was higher in China and India than in Germany and the UK. The authors also find that there was heterogeneity between countries in regards to which design features were more effective at increasing public support. They are then able to leverage this heterogeneity to suggest country specific designs for the four countries that would maximize support.

The paper is very well-written and the results will be of interest to policy-makers and academics who study climate policies. The survey and the design of the distribution seem well thought out and appropriate. The quantitative analysis appears to be well-done and appropriate.

Comment 1:

The paper does not mention much about actual examples of these carbon tax policies that have actually been implemented. Canada has had a carbon tax with lump-sum transfers for a few years now, so would be very relevant to motivate this research:

Mildenberger et al. (2022) Limited impacts of carbon tax rebate programmes on public support for carbon pricing. *Nature Climate Change* 12, 141-259.

Wood (2022) Is Revenue Neutrality in carbon Taxation Possible in Practice? Lessons from the Canadian Experience. *Canadian Tax Journal* 70, 563-93

Winter et al. (2023) Carbon pricing costs for households and the progressivity of revenue recycling options in Canada. *Canadian Public Policy* 29, 13-45.

Comment 2:

A very recent paper was just published in *Nature Sustainability* that is directly related to this one and therefore should be discussed:

Woerner (2024) How to increase public support for carbon pricing with revenue recycling. *Nature Sustainability* 7, 1633-1641.

Comment 3:

The only limitation that I have to raise is that I would have liked to see "Reduction in other taxes" as one of the Levels considered in the "Use of the carbon tax revenue" dimension. However, I know that it is impossible to include it now. I recommend including a sentence indicating that this was excluded and a justification for why.

Overall a very interesting and well-done paper.

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Version 1:

Decision Letter:

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Dear Dr Bulut,

Your manuscript titled "From Opposition to Opportunity: Enhancing Support for Carbon Taxes Through Effective Policy Design" has now been seen by our reviewers, whose comments appear below. In light of their advice we are delighted to say that we are happy, in principle, to publish a suitably revised version in Communications Earth & Environment.

We therefore invite you to edit your manuscript to comply with our format requirements and to maximise the accessibility and therefore the impact of your work.

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We hope to hear from you within two weeks; please let us know if you need more time.

Best regards,

Franziska M. Hoffart, PhD
Editorial Board Member
Communications Earth & Environment

Martina Grecequet, PhD
Senior Editor,
Communications Earth & Environment
@CommsEarth

REVIEWERS' COMMENTS:

Reviewer #1 (Remarks to the Author):

Many thanks for the extensive changes and additions, which have according to my assessment increased the quality of the paper. I recommend for acceptance.

Reviewer #2 (Remarks to the Author):

My comments from my initial review have been addressed in a satisfactory manner.

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Response Letter to the Reviewers

Reviewer #1 (Remarks to the Author):

Dear authors,

Many thanks for this interesting article. The paper examines the acceptance of carbon taxes through effective policy design in four countries in the Global North and Global South. Around 4000 respondents were reached with a quantitative online experiment. By comparing very different countries, especially countries in the global South, the article makes an important contribution to understanding the acceptance of carbon taxes under very different conditions. I recommend acceptance of the paper with major revisions.

Author Response:

Thank you very much for your motivating words and helpful comments.

Reviewer Comment 1:

After a detailed introduction, there is no theoretical contextualization leading to the development of hypotheses. It remains unclear which theoretical background is used to approach the research question. Accordingly, terms such as acceptance, support and preference remain unclear or are used synonymously. Here I recommend a theoretical framework as well as definitions of the terms to clarify the research question and what is being measured.

Author Response:

We appreciate this valuable suggestion and have now revised the manuscript to include a clearer theoretical framework that guides the study. In the revised version, we explicitly outline the theoretical underpinnings of our research, drawing on theories of public opinion, perceptions of fairness, and models of economic compensation. We also provide precise definitions of acceptance, support and preference to ensure conceptual clarity and consistency throughout the paper. This discussion has been incorporated at the beginning of the hypothesis development section, where we now articulate how these theoretical perspectives shape our hypotheses. These revisions can be found on pages 4 and 5 of the manuscript and below:

“To better understand the conditions under which carbon taxation can gain public support, we draw on insights from environmental sociology, behavioural economics and public policy analysis. Central to our theoretical framework is policy feedback theory (Pierson, 1993), which highlights how public attitudes to taxation are shaped by both material experiences, such as household costs and the visibility of revenue uses, and interpretive effects, including perceived fairness and effectiveness.

Previous research on environmental taxation (Baranzini & Carattini, 2017; Beiser-McGrath & Bernauer, 2019; Carattini et al., 2017) suggests that people are more likely to support carbon taxes if they believe the revenues will be used fairly and effectively. Complementing this,

fairness theory provides further nuance by emphasising that public evaluations of policy interventions are not driven solely by economic self-interest, but also on considerations by distributive and procedural justice, which play a crucial role in shaping public attitudes towards taxation (Frondel et al., 2022; Klenert et al., 2018; Sommer et al., 2022).

Furthermore, studies in behavioural economics highlight loss aversion as a factor influencing support for tax policies (Bashir et al., 2021; Kahneman & Tversky, 2015). Transparency in cost communication can lead to negative reactions due to increased loss salience, whereas revenue recycling through lump-sum transfers can alleviate these concerns by providing visible, tangible benefits (Woerner et al., 2024).

In the literature on public responses to environmental taxation, the nuances between support, acceptance, and preference are often used interchangeably, leading to ambiguity in the interpretation of research findings (for a more detailed discussion, see (Ott et al., 2021)). In what follows, we explicitly define the terms central to our study and justify their relevance to our research context.

Following (Dreyer et al., 2015) conceptual distinctions, we distinguish between acceptance and support for carbon taxation. According to their framework, acceptance represents relatively passive attitudes, primarily characterised by individuals' expressed willingness to accept a policy (e.g., expressing approval of a carbon tax in surveys). In contrast, and in line with the definition of support as an active evaluative response to policy proposals, we treat the outcome of our factorial survey experiment as an indicator of public support for different carbon tax policy designs.

Preference refers specifically to individuals' evaluations and relative judgments of alternative policy scenarios, typically assessed through factorial survey experiments or vignette studies (Auspurg & Hinz, 2015). Preference thus captures the extent to which individuals consistently prefer particular policy attributes or combinations of them, indicating their relative desirability compared to alternative options.

Given our primary research objective of examining individual citizens' attitudes towards carbon taxation in different national contexts, we focus specifically on support and preference for carbon taxation.”

Additionally, we have revised the manuscript title to: *From Opposition to Opportunity: Enhancing Support for Carbon Taxes Through Effective Policy Design*. This change reflects our efforts to use consistent and precise terminology, in particular 'support' rather than 'acceptance', to align with the conceptual distinctions introduced in this theoretical framework and to reflect a more precise differentiation of terms.

In response to the helpful suggestion for greater conceptual clarity, we have also clarified how public support was operationalised in the study. To improve transparency and precision, the manuscript now clearly states on page 13:

“The level of support for carbon taxation was measured by asking respondents to indicate their level of support or opposition to specific carbon tax policy proposals on a scale ranging from –5 (completely oppose) to +5 (completely support).”

By making this operationalisation explicit, we aim to more clearly bridge the theoretical and empirical components of the study. This addition helps ensure that readers understand exactly how the concept of support is measured, thereby strengthening the internal coherence of our conceptual framework and addressing concerns about clarity of measurement.

Reviewer Comment 2:

In the hypothesis development, the differences between the countries are only briefly touched on by the fact that the Global South is more strongly affected. However, no differences are assumed in the hypotheses themselves. In my opinion, the expected differences between the countries should be explained more clearly. Not only due to the impact of climate change, but also other context variables of the political and economic system as well as the cultural and social context. The differences should actually also be included in the hypotheses.

Response:

Thank you for this helpful suggestion. In response, we have explicitly elaborated on how political, economic and cultural factors can lead to divergent support for carbon taxation across countries. Rather than only emphasising that the Global South faces more severe climate impacts, we now discuss how centralised versus decentralised governance structures, welfare capacity and prevailing cultural norms (e.g. collectivism versus individualism) might drive differences in policy acceptance. This has allowed us to more concretely illustrate why certain contexts may foster greater tolerance for new fiscal measures, while others are met with heightened scepticism or distributional concerns. We are grateful for your suggestions, which have helped us to strengthen the theoretical underpinnings and clarify why and how we expect country-level differences in support for carbon taxes to matter. The following revisions can be found on pages 10 and 11 of the manuscript and below:

Public support for carbon taxes does not depend solely on people's perceptions of climate change or environmental urgency. Broader political, economic and cultural contexts also influence how carbon taxes are received and whether they gain sufficient support to be enacted (Bergquist et al., 2022b; Carattini et al., 2018; Harring & Jagers, 2013; Harring et al., 2019).

To begin with, governance structures and the degree of centralisation can have a significant impact on policy implementation. In highly centralised systems, such as China's, decision-making processes often involve fewer veto points, allowing carbon taxes to be enacted with relatively little public dissent (Harring et al., 2019). In contrast, in more decentralised systems, such as the United States, divergent political ideologies and more complex political processes can dampen the momentum for new or higher carbon taxes. Meanwhile, in robust democracies (e.g. Germany), policy proposals tend to be subject to heightened scrutiny, leading to intense public debate on issues such as fairness, accountability and transparency (Jagers et al., 2020).

Economic conditions also alter how citizens weigh up a carbon tax. In wealthier countries with established welfare systems, carbon taxes may be more tolerable if surplus revenues are redistributed in ways that reduce the burden on low-income households or fund social

programmes (Klenert et al., 2018). In contrast, developing countries such as India have pressing needs for poverty alleviation and infrastructure development alongside climate change mitigation (Mohammadzadeh Valencia et al., 2024). Here, policies that directly link carbon tax revenues to economic development or social support may prove more politically acceptable (Woerner et al., 2024).

Finally, cultural norms and social attitudes help shape preferences for different revenue recycling mechanisms. Citizens in more individualistic societies often prefer lump-sum dividends or other direct rebates, while collectivist cultures may find taxes that fund shared community services or public goods more appealing (Ehrlich & Yin, 2022). Taken together, these factors underscore why different countries achieve different levels of public support for carbon taxation: each nation's unique mix of political constraints, economic priorities and cultural values intersect with how individuals perceive cost transparency, fairness and policy effectiveness in practice (Jagers et al., 2021; Maestre-Andrés et al., 2019).

We greatly appreciate the suggestion to incorporate country-specific differences into the hypotheses. As our study follows a pre-registered analysis plan, we are currently constrained from making post hoc adjustments, but we fully recognise the value of this perspective for future research. This plan, which includes predefined hypotheses, variable definitions, statistical models and country-level controls, was pre-registered to increase the transparency and reproducibility of the study and to minimise bias associated with exploratory data analysis (Chambers, 2019; Nosek et al., 2018). Pre-registration is increasingly considered the gold standard in empirical research to guard against questionable research practices, such as selective reporting or p-hacking. In line with our commitment to maintaining transparency and reproducibility, we adhered closely to our pre-registered analysis plan, which unfortunately limits the scope for introducing new hypotheses after data collection (van 't Veer & Giner-Sorolla, 2016). In light of these considerations, we opted to remain within the bounds of our pre-registered study design, while recognising that exploring country-specific hypotheses would be a valuable direction for future research.

Even outside the constraints of preregistration, the statistical testing of country-specific hypotheses would present challenges due to sample size limitations. We appreciate the opportunity to highlight this limitation more clearly in the manuscript. Our sample includes only four countries, which limits the degrees of freedom and statistical power for multi-level modelling of country-level moderators. Including country-specific hypotheses would require a broader cross-country design to ensure robustness and generalisability (Bryan & Jenkins, 2016; T. Snijders & Bosker, 1999).

As a consequence, we now discuss these limitations more explicitly in the manuscript and highlight them as important directions for future research (p.25). By extending the theoretical discussion, we hope to provide a more nuanced understanding of how national context may influence the dynamics underlying the original hypotheses. We hope that these additions demonstrate our efforts to incorporate your valuable feedback by clarifying the theoretical relevance of country-level differences, even when formal hypothesis testing was not feasible within the constraints of the research design.

Reviewer Comment 3:

Lines 210 to 212 mention control variables that were also included in the analysis. These are only taken up again in line 381 with the statement that trust and concerns are much more important for the evaluation than the selected variables. In my opinion, the control variables should be included in the presentation and interpretation of the analyses for a correct understanding of the results. It would also be interesting to see to what extent trust and concerns differ between the countries. For example, is trust much higher in one country and therefore also general approval?

Author Response:

We greatly appreciate your constructive feedback and have addressed your concerns regarding the presentation of control variables (1) and their role in our model (2), the presentation of cross-country differences in trust in government and environmental concerns and support for carbon taxation (3), and the statistical testing of this causal relationship (4):

First, we have added the following new section “Measures” regarding the control variables on pages 29-32 of the revised manuscript, which explicitly explains the variables included, such as trust in government, climate change concerns, socioeconomic status, fossil fuel vehicle ownership, heating fuel type, attitudes towards distributive justice, and environmental attitudes, and discusses their relationship with the outcome variable, support for carbon taxation:

“Measures

To ensure robust and reliable estimates of public support for carbon taxation, we adjust for baseline characteristics that have been shown to influence climate-related attitudes and policy preferences (see Supplementary Table 6 for full model specifications). These variables were selected based on the existing literature and take into account socio-demographic, economic and attitudinal factors that may influence respondents' evaluations of carbon tax designs. The full wording of the measures used can be found in the supplementary questionnaire.

Trust in Government

Trust in government institutions is an important determinant of public support for climate policies, as individuals with higher institutional trust are more likely to perceive carbon taxes as fair and effective (Bergquist et al., 2022a; Carattini et al., 2017). We measured trust in government using a 7-point Likert scale.

Environmental Concern

Environmental concern has been widely identified as a key driver of public attitudes towards carbon taxation (Bergquist et al., 2022b; Harring et al., 2023). Individuals who perceive climate change as a serious threat are more likely to support carbon pricing mechanisms (Beiser-McGrath & Bernauer, 2019). We measured environmental concern using a 7-point Likert scale, which assesses respondents' perceived severity of climate change and their willingness to support policy interventions.

Social Justice Attitudes

The Basic Social Justice Orientation Scale assesses individuals' preferences for four basic distributive justice principles: equality, need, merit and entitlement (Hülle et al., 2018). These principles reflect order-related justice attitudes, as they define the norms that guide allocation and distribution decisions in society. The scale provides a structured framework for understanding how individuals prioritise these dimensions in different policy contexts, including environmental and fiscal policy (Hülle et al., 2018). In the context of this study, the scale helps to capture how underlying perceptions of fairness shape public support for carbon taxation and revenue recycling mechanisms. The scale was administered using a five-point Likert scale (1 = strongly disagree to 5 = strongly agree), with higher scores indicating stronger support for a particular distributive justice principle. The full list of items used in the survey can be found in the supplementary materials.

Gender

Gender differences in environmental attitudes are well documented, with women consistently showing stronger pro-environmental preferences than men (McCright & Xiao, 2014). Gender was included as a categorical variable.

Age

Age is a known determinant of environmental attitudes, with younger people generally expressing greater concern about climate change (Poortinga et al., 2023). Younger respondents may also be more receptive to policy interventions due to their longer expected exposure to climate risks (Lichtin et al., 2023). We included age as a categorical variable.

Education

Higher levels of education are positively correlated with pro-environmental attitudes and behaviours (Suárez-Perales et al., 2021). Education is consistently associated with awareness of climate science and acceptance of market-based environmental policies (Bergquist et al., 2022b; Harring et al., 2023). We measured education as an ordinal variable, distinguishing between different levels of formal education.

Income

Previous research shows that household income is associated with greater support for environmental taxes (Fronzel et al., 2022). We included income as a categorical variable based on self-reported household income.

Household Size and Dwelling Type

Previous research has shown that household size and dwelling type influence energy consumption (Gifford & Comeau, 2011). Larger households tend to have higher energy consumption, which may influence support for carbon taxation (Harring et al., 2023). We adjusted for these pre-treatment characteristics by including categorical variables for household size and dwelling type.

Fossil-Fueled Vehicle Ownership and Heating Fuel Type

Ownership of a fossil-fuelled vehicle is an important determinant of attitudes towards carbon taxation, as individuals dependent on petrol or diesel cars may perceive higher personal costs associated with carbon taxation (Carley et al., 2019). Research suggests that car-dependent individuals are more likely to oppose carbon pricing due to concerns about fuel affordability and transport alternatives (Harring et al., 2023; Sommer et al., 2022). We have included a variable that distinguishes between respondents who own at least one fossil-fuelled car (coded as 1) and those who do not (coded as 0).

Similarly, heating fuel type has been shown to influence public perceptions of carbon pricing, as households that use fossil fuels for heating (e.g. natural gas, coal or oil) face greater direct cost impacts from carbon taxes (Harring et al., 2023; Maestre-Andrés et al., 2019). Prior research has found that individuals who are more dependent on fossil fuels for heating tend to be less supportive of carbon pricing policies unless mitigation measures (such as subsidies for clean energy transitions) are provided (Baranzini et al., 2017; Sommer et al., 2022). To adjust for this effect, we asked respondents about the type of fuel they use for heating.

Although random assignment in survey experiments ensures statistical equivalence between treatment groups, including pre-treatment characteristics in the analysis can improve the precision of estimated treatment effects. By explaining some of the variance in the outcome variable, covariates such as age, education or socio-economic status reduce residual error. This in turn leads to more efficient estimates with smaller standard errors and narrower confidence intervals, improving statistical power without requiring a larger sample size. In this context, pre-treatment covariates are not used to correct for bias, but to increase the efficiency and clarity of causal inference (Gelman et al., 2021; Imbens & Rubin, 2015)."

Second, to provide a more straightforward interpretation of these effects, it is important to distinguish the influence of control variables from the causal effect of our experimental treatments. In our experimental design, we clearly define causal estimates to capture the direct effect of policy design on support for carbon taxation. Although random assignment theoretically balances all confounding factors across treatment groups, it does not eliminate residual variability due to measurement error, unanticipated imbalances, or natural variation in individual characteristics. The inclusion of control variables addresses these issues by reducing residual variance, leading to more precise estimates and increased statistical power (Gelman et al., 2021; Imbens & Rubin, 2015). In addition, we have now adopted more explicit causal language throughout the manuscript to distinguish the experimentally varied focal variables from those used as part of the adjustment set, thus further clarifying our causal claims. Specifically, we now refer to the previously termed "control variables" as the "adjustment set", following the recommendations of, for example, Gelman et al. who argue against the ambiguous and often misleading use of the term "control variables" because it can imply active manipulation or causal significance even when such variables are merely analytically adjusted for. Instead, they advocate explicitly naming variables as part of an "adjustment set" to communicate their analytical role in statistically controlling for confounding influences, thereby increasing transparency and precision in discussions of causal inference (Gelman et al., 2021).

To improve our conceptual and methodological clarity, and to separate the variables that identify causal effects from those that simply reduce residual variance, we have added a dedicated section entitled

Statistical Analysis, which details our mixed-effects modelling strategy and explains how it estimates treatment effects while incorporating the adjustment set for greater precision. The new section can be found on pages 27,28 and below:

Statistical Analysis

The primary analysis employed a mixed-effects linear regression model to estimate the impact of various policy attributes on support for carbon taxes. This approach was chosen to account for the hierarchical structure of our data, as each participant provided multiple vignette responses. The model is specified as:

$$\text{Support}_{ij} = \beta_0 + \beta_1(\text{Tax Level}_{ij}) + \beta_2(\text{Revenue Use}_{ij}) + \beta_3(\text{Costs}_{ij}) + \beta_4(\text{Effectiveness}_{ij}) + \beta_5(\text{International Cooperation}_{ij}) + \gamma^T \text{Covariates}_j + u_j + e_{ij}$$

where i indexes the vignette-level observations and j indexes the participants. In this specification, β_0 represents the fixed intercept, β_1 through β_5 denote the fixed effects coefficients for the policy attributes, and γ represents the fixed effects coefficients associated with the participant-level covariates. The term u_j is a random intercept for participant j , assumed to be normally distributed as $u_j \sim N(0, \sigma^2_{\text{participant}})$ to account for unobserved heterogeneity across individuals, while e_{ij} captures the residual error and is distributed as $e_{ij} \sim N(0, \sigma^2_{\text{error}})$.

The inclusion of a random intercept is essential to account for within-participant correlation arising from repeated measures, thereby improving the precision and inference of our model. Although our experimental design randomly assigns policy attributes to vignettes, meaning that causal estimators are theoretically identifiable, the addition of control variables and random effects increases statistical power by reducing residual variance (Imbens & Rubin, 2015; T. Snijders & Bosker, 1999). This increases the robustness of our causal inferences regarding the direct impact of policy design on carbon tax support.

While we welcome the opportunity to clarify our analytical approach, including the rationale for our adjustment sets, the transparency of our statistical model, and the specification of our causal estimates as focal predictors in relation to control variables, we believe it is important to distinguish this from the post hoc introduction of new hypotheses. In this context, we would like to reiterate that our study is based on a pre-registered analysis plan. In line with our commitment to the pre-registered analysis plan, we have refrained from introducing unregistered hypotheses post hoc, in line with best practice for open science (Nosek et al., 2018). Deviating from this plan post hoc could expose us to criticism, as the inclusion of unregistered hypotheses may introduce bias and compromise the integrity of the pre-registration (van 't Veer & Giner-Sorolla, 2016).

In addition, while exploring correlational hypotheses is certainly valuable, integrating them within an experimental study can present methodological challenges that we sought to avoid. This is because experimental designs inherently assume controlled manipulations (treatments) for causal inference, which are methodologically inconsistent with correlational analyses, which lack such control and thus do not meet the same stringent assumptions (Shadish et al., 2002). As such, mixing causal and correlational hypotheses could confound interpretations and compromise the validity of experimental findings. For

example, the observation of high levels of trust and political support in a country without experimental manipulation does not necessarily imply causality, as numerous uncontrolled confounding factors may be involved.

Therefore, although we are not able to formally introduce the additional hypotheses at this stage, we very much value the insight and have incorporated a discussion of these important considerations into the manuscript (see pages 19, 27-32). The specific regression coefficients, including those related to trust and environmental concerns, are reported in detail in the supplementary tables, and we have added a note in the methods section of the manuscript that explicitly refers to these details (see page 27).

Third, regarding the presentation of cross-country differences in trust in government, environmental concern and support for carbon taxation, we agree that this is a valuable addition. While the relationship between trust, concern and support for environmental policies is already well established and justifies their inclusion as an adjustment set in our models, these factors also provide the reader with meaningful insights into cross-country variation. For example, citizens who trust their government to manage resources transparently are more likely to support environmental taxes (Fairbrother, 2019; Fairbrother et al., 2019; Harring & Jagers, 2013), and individuals with high environmental concern are more likely to see climate policy as necessary and urgent (Drews & van den Bergh, 2016; Poortinga et al., 2019). Accordingly, we have revised the manuscript (p. 19) to include a discussion of how cross-country differences in trust and environmental concern may help explain variation in average levels of policy support. Please see the added passage below:

“Beyond these structural factors, two well-documented attitudinal drivers, trust in government and environmental concern, also offer a potential explanation for cross-country variation. Extensive research shows that citizens who believe their government manages resources transparently and effectively are more inclined to endorse environmental policies, including carbon taxes (Fairbrother, 2019; Fairbrother et al., 2019; Harring & Jagers, 2013). Likewise, individuals with heightened environmental concern consistently display stronger support for climate-mitigation instruments, viewing climate change as an urgent problem demanding policy intervention (Drews & van den Bergh, 2016; Poortinga et al., 2019). The baseline support is comparatively higher in China and India, where trust in government and environmental concern are substantially above the levels observed in the UK and Germany (see Supplementary Table 6).”

In addition, we now report country-level means for trust in government, environmental concern, and support for carbon taxation in Supplementary Table 6 (please see below):

Supplementary Table 6: Country means of trust in government, environmental concern, and support for carbon taxation

Country	Trust in Government	Environmental Concern	Support for Carbon Taxation
Germany	2.84	4.70	5.02

Country	Trust in Government	Environmental Concern	Support for Carbon Taxation
The UK	3.04	4.84	5.77
India	5.77	5.78	8.25
China	5.71	5.38	7.79

Fourth, while we were pleased to add the requested table and accompanying discussion, we cannot conduct formal statistical tests of a causal relationship between cross-country variation in trust/concern and support for carbon taxation. Even if the stringent assumptions for causal inference were hypothetically met, the analysis of such relationships with only four country-level observations would face important limitations in terms of statistical power and generalisability (Bryan & Jenkins, 2016; T. A. B. Snijders & Bosker, 2012).

The introduction of additional post-hoc correlational tests, which are absent from our pre-registered design, would also dilute the main contribution of the study, which is to identify the causal impact of specific policy design features on support for carbon taxes. By adhering to our pre-registered hypotheses, we maintain the clarity, rigour and credibility of the reported results.

Thank you very much for your valuable feedback. We hope that the revisions made, together with the explanation provided, clearly address your concerns and clarify our methodological approach.

Reviewer Comment 4:

I have some difficulties with hypothesis 3 and the interpretation of the results. The (spontaneous) agreement is higher if the costs are not mentioned. However, it cannot be concluded from this that the costs should not be mentioned, because at some point it is always about the costs. Is it a question of communication/information? Or is it a question of policy design? What exactly is being measured? And what can be concluded from this? A theoretical framework would provide more clarity here.

Author Response:

Thank you for raising your concerns regarding Hypothesis 3 and its interpretation. We absolutely agree that further clarification is needed to distinguish between the effects of cost communication and the overall policy implication. In response, we have revised the manuscript to better clarify our theoretical framework and the implications of our findings. On pages 21 and 22, we now emphasise the distinction between the immediate psychological reactions triggered by cost transparency and the broader implications for policy communication and design:

“Our findings suggest that omitting explicit cost information can temporarily increase public support, likely due to cognitive biases such as loss aversion, as theorised in prospect theory (Kahneman & Tversky, 2015). However, this does not advocate withholding essential cost

information in policy practice. Rather, it highlights the need to strategically frame costs within broader narratives that emphasise collective benefits and fairness considerations. Similarly, Woerner et al. (2024) found that the salience of immediate monetary compensation mechanisms, such as upfront climate premiums, can effectively counteract cost-related resistance and increase public support, suggesting the importance of communication strategies in policy design.

Furthermore, there is also suggestive evidence of a gradual increase in support once taxes are in place. For example, Murray and Rivers (2015) document that acceptance of British Columbia's carbon tax increased three years after its implementation, and Carattini et al. (2018) find similar improvements in other areas of environmental taxation, attributing these changes to experiential learning."

Reviewer #2 (Remarks to the Author):

The authors use a survey approach to examine public support for carbon taxes in four different countries (UK, Germany, India, and China). Their main contribution is that they survey two developed countries, one mid-developed country, and one developing country. The survey adjusts the design features of the carbon tax policy, so the quantitative analysis can identify how different design features (e.g., the revenue recycling method used) affect support. Surprisingly, support for carbon taxes was higher in China and India than in Germany and the UK. The authors also find that there was heterogeneity between countries in regards to which design features were more effective at increasing public support. They are then able to leverage this heterogeneity to suggest country specific designs for the four countries that would maximize support.

The paper is very well-written and the results will be of interest to policy-makers and academics who study climate policies. The survey and the design of the distribution seem well thought out and appropriate. The quantitative analysis appears to be well-done and appropriate.

Author Response:

Thank you very much for your encouraging words and helpful comments.

Reviewer Comment 1:

The paper does not mention much about actual examples of these carbon tax policies that have actually be implemented. Canada has had a carbon tax with lump-sum transfers for a few years now, so would be very relevant to motivate this research:

Mildenberger et al. (2022) Limited impacts of carbon tax rebate programmes on public support for carbon pricing. Nature Climate Change 12, 141-259.

Wood (2022) Is Revenue Neutrality in carbon Taxation Possible in Practice? Lessons from the Canadian Experience. Canadian Tax Journal 70, 563-93

Winter et al. (2023) Carbon pricing costs for households and the progressivity of revenue recycling options in Canada. Canadian Public Policy 29, 13-45.

Author Response:

Thank you very much for this helpful suggestion. We have now included discussions of real-world carbon tax implementations, with specific reference to the Canadian experience, in both the Introduction and Discussion sections. The revised manuscript now includes references to and discussions of Mildenberger et al. (2022), Wood (2022) and Winter et al. (2023) to contextualise our findings within existing policy implementations. These additions can be found in the Introduction on page 7 and in the Discussion section on page 21.

Reviewer Comment 2:

A very recent paper was just published in Nature Sustainability that is directly related to this one and therefore should be discussed: Woerner (2024) How to increase public support for carbon pricing with revenue recycling. Nature Sustainability 7, 1633-1641.

Author Response:

Thank you for bringing this important study to our attention; the study is indeed relevant to our study but was not published at the time of our submission to the journal, which is why we were not able to discuss it in the manuscript. We have now included a discussion of Woerner et al. (2024) in the revised manuscript. We have included this reference on pages 5, 8 and 20 and integrated its findings into the Introduction, Hypothesis Development and Discussion sections to provide additional context and comparison with our findings.

Reviewer Comment 3:

The only limitation that I have to raise is that I would have liked to see "Reduction in other taxes" as one of the Levels considered in the "Use of the carbon tax revenue" dimension. However, I know that it is impossible to include it now. I recommend including a sentence indicating that this was excluded and a justification for why.

Author Response:

Thank you for this valuable suggestion. We have now included a paragraph in the manuscript clarifying why "Reduction in other taxes" was not considered as a revenue recycling option. Specifically, we added the following paragraph:

"Another revenue recycling scheme often discussed in the literature, reducing other taxes, was not included as an option due to differences in tax systems across countries, which would make a consistent assessment difficult. Furthermore, previous research suggests that the aforementioned compensation measures are comparatively more effective in increasing public support for carbon taxation (Beiser-McGrath & Bernauer, 2019; Carattini et al., 2017; Haring et al., 2023). Nevertheless, further research is needed to examine the extent to which these findings apply in contexts not studied so far."

The revised text can be found on page 8 line 185 of the manuscript.

Overall a very interesting and well-done paper.

Response: Thank you very much for your supportive comments and constructive feedback.

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Response Letter to the Reviewers

We would like to thank the reviewers for their time spent reviewing our manuscript. We appreciate their comments and are pleased that our revisions met their expectations and did not raise any new concerns requiring further revision.

As there were no specific issues to address, we have not made changes to the manuscript. However, in line with the editorial instructions, we have adjusted the title and abstract, and added a short summary of the results at the end of the introduction.

We remain grateful for the constructive and encouraging feedback.

Sincerely,

Hamid Bulut

Robin Samuel