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Cross-national analysis of attitudes towards fossil fuel subsidy removal

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In 2021, governments of 51 countries spent US$697 billion on subsidizing fossil fuels. Removing fossil fuel subsidies is crucial not only for reducing CO_2 emissions and making carbon pricing more effective, but also for making more valuable use of government funds. Currently, however, scientific evidence on the scale and scope of public attitudes towards fossil fuel subsidy-removal policies is lacking, yet it is instrumental for gauging political feasibility. Furthermore, previous studies tend to focus on carbon pricing in the developed world only. Here we present a comparative analysis of attitudes towards both carbon taxation and fossil fuel subsidy removal, focusing on five developing countries across four continents. It is found that (1) removing fossil fuel subsidies is not more undesirable than introducing carbon taxation and (2) the public has more-positive attitudes towards subsidy removal if optimal use of the saved fiscal revenues is specified.

To reach the CO_2-emission reduction targets of the Paris Agreement's Nationally Determined Contributions, a growing number of countries are considering implementing domestic carbon taxes. These would increase the price on fossil fuels (coal, natural gas, end-use electricity and petroleum) to decrease fossil fuel consumption (for example, Coalition of Finance Ministers). However, and repeatedly recognized during both the 26th UNFCCC Conference of the Parties (COP26) meeting in Glasgow and the recently finalized COP27 in Sharm el-Sheikh, many countries currently have policies that keep end-user prices artificially low through subsidies. This encourages increases in both production and consumption of fossil fuels and thus effectively counteracts the intended objective of carbon pricing. In addition, subsidies represent a burden on the governments' fiscal budgets through deficits and revenue losses. The Organisation for Economic Co-operation and Development (OECD) found that tax breaks and spending programmes (fossil fuel support) in the G20 countries, linked to both the production and use of coal, oil, gas and other petroleum products, had risen to US$190 billion in 2021, a level that is higher than in previous years (30% higher than in 2020)[1]. The OECD and International Energy Agency (IEA) have also estimated that governments in 51 countries provided US$697.2 billion in fossil fuel subsidies in 2021, doubling the amount from 2020[2], an amount that is three times the annual amount needed to eradicate global extreme poverty[3].

All these mentioned costs are, however, only the direct costs of the subsidies themselves. According to the International Monetary Fund (IMF), including also indirect costs (the contribution of fossil fuels to global warming, local air pollution and other externalities, and foregone consumption tax) would increase the figure for annual fossil fuel subsidies by around US$6 trillion, or 6.5% of global GDP[3,4]. They also find that 45% of the benefits from direct fossil fuel subsidies goes to the richest quintile, while only 7% goes to the poorest 20% of the population[5].

Removing subsidies on all fossil fuels simultaneously should be the natural first step to reduce CO_2 emissions[6] since removing subsidies only on some fossil fuels will risk increasing the consumption of another, still subsidized, fossil fuel (compare ref. [7]). Particularly in developing countries, increasing fiscal revenues originated from savings from removed fossil fuel subsidies can be used for welfare-enhancing projects (for example, investments in health care and education) and spurring economic growth[8] and eradicate the regressivity of the existing subsidies.

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These issues have started to be acknowledged also by world leaders, for example, in the Glasgow Climate Pact at the 2021 COP26, which calls for "accelerating efforts toward the phase-out of [...] inefficient fossil fuel subsidies, recognizing the need for support toward a just transition".[9] The concept of just transitions implies recognizing and attempting to counteract the profound societal impacts that a shift towards a low-carbon future implies, not the least in the form of job losses due to fossil fuel industry decline and uneven distribution of costs and benefits both within and between countries (for example, ref. [10]). Given that such a shift may have immediate negative consequences for individuals and groups, the political feasibility of removing fossil fuel subsidies in any country highly depends on the degree of public acceptability of such a policy[11,12].

Numerous scholars and policy experts have advocated putting a price on carbon as a highly cost-effective way to reduce GHG emissions[13,14]. Introducing such policies has, however, become a vexing problem for decision makers worldwide. The examples of Australia in 2015, France in 2018 and Ecuador in 2019 demonstrate how widespread the public's negative attitudes towards carbon taxes and removal of fossil fuel subsidies seem to be, and thus how difficult they are to implement. Several factors are known to determine policy attitudes, including perceptions of fairness, effectiveness, political trust and climate concern[15] (compare refs. [16–21].) Political feasibility of carbon-pricing implementation and subsidy removal requires that one measures and analyzes how public opposition can be minimized. Such analyses are indeed crucial for stakeholders, policymakers and academics involved in climate change and policymaking. The empirical analysis of political feasibility, balancing effectiveness and cost efficiency with public acceptability, is imperative, especially as policymakers tend to be reluctant to introduce policies if levels of public acceptability are low[22]. From a theoretical perspective, understanding why certain policies generate negative perceptions, and the extent to which a design of a policy measure affects mass policy attitudes, is of great interest since it speaks to theories of policy feedback and how policy design can create its own constituency of support (for example, refs. [23,24])

In light of this, a number of recent experimental survey studies have suggested policies that could make carbon pricing more readily acceptable to the public, for example, fee-and-dividend approaches[25] (feebates), earmarking of tax revenues for necessary investments[26] and even rhetorical shifts from 'tax' to 'fee'[27]. These studies have focused mostly on (1) carbon taxation and (2) the developed world. Far fewer studies are concerned with public attitudes towards climate policy in developing countries, and even fewer, if at all, with attitudes towards the removal of fossil fuel subsidies as a climate change mitigation strategy[15]. However, considering the literature focusing on both contextual drivers of climate policy attitudes (for example, ref. [21]) and cross-national patterns in carbon pricing (for example, ref. [28]), we do not expect that attitudes and attitude formation differ systematically between the Global North and Global South. We rather assume that both attitudes and policy are sensitive to a range of complex and country-specific factors.

By using a 1 × 7, pre-registered, factorial-design survey experiment (N = 6,636), we make the following contributions to the related literature. (1) We consider five developing countries (Ecuador, Egypt, India, Indonesia and Mexico) that currently subsidize both consumption and production of fossil fuels. We select these countries because they have some of the highest levels of subsidies on consumption of fossil fuels[29]. (2) We analyse public attitudes in these countries towards (a) the introduction of a carbon tax and (b) the removal of subsidies on both industrial and private consumption of fossil fuels. (3) We examine whether and how attitudes towards subsidy removal and carbon taxation may differ from each other. (4) We compare attitudes towards removal of subsidies on private consumption of fossil fuels with those towards removal of subsidies on fossil fuels for industrial use. (5) We study whether policies that reallocate money spent on fossil fuel subsidies to investments that increase social and economic welfare systems lead to more-positive attitudes towards subsidy removal (refs. [26,30,31]). At the outset, we report that optimal use of savings from subsidy removal has positive effects on public attitudes.

In our survey, the respondents were also asked about their social and economic characteristics, whether they own a fossil fuelled vehicle and their views regarding various climate change scenarios (Supplementary Information). In addition, we empirically analyse the effects of these variables on their policy attitudes.

We proceed from the well-established hypothesis that an important driver of policy attitudes is the balance of perceived personal costs and benefits of a proposed policy[32–35]. First, we hypothesize that acceptance of removing fossil fuel subsidies will be lower than the corresponding attitude to introducing a carbon tax, as the former indicates a more visible and direct loss of money for the consumer compared with the indirect workings of a tax.

H1: The public acceptance of removing subsidies on fossil fuels is lower than the public acceptance of introducing a CO_2 tax on fossil fuels.

Second, a range of studies (for example, refs. [36,37]) have demonstrated how individuals display more-positive attitudes towards policies directed towards industry rather than towards themselves, in much the same way as people in general tend to prefer less-stringent policies over more-coercive ones (for example, ref. [38]). This might be due to both general beliefs concerning how the proposed policy will have direct implications for personal welfare (personal outcome expectancies)[33] and distributional preferences driven by the attitude that industry rather than individuals should bear the main costs of climate change[39]. As such, we hypothesize that people dislike policies that imply direct personal costs more than policies aimed towards industry, even if these might indirectly affect consumer prices, and that public acceptance of removing fossil fuel subsidies for private consumption therefore is lower than for those for industrial use.

H2: The public acceptance of removing fossil fuel subsidies for private consumption is lower than the public acceptance of removing fossil fuel subsidies for industrial use.

Moreover, a growing body of research concludes that negative attitudes towards price-based climate policy tools can be alleviated through policy design, in particular revenue recycling, where a price increase is combined with a specified use of the available public funds[26,31] (but see ref. [30]). Although research is somewhat inconclusive concerning the attitudinal effects of different forms of revenue recycling (for example, fee-and-dividend solutions, increased investments in welfare systems (for example, education and health care) and using revenues for specific climate-related projects), we nevertheless expect that transparency in the use of generated public funds will trigger more-positive attitudes compared with non-specified use of public funds[19,40]. Such additional information aims to prevent people's perception that the subsidy removal is only an increased cost for the household.

H3: Compared with non-specified revenue use, the public acceptance of removing fossil fuel subsidies for private consumption is higher when revenue use is specified.

Public attitudes towards fossil fuel subsidy removal

To determine how different policy designs affect public policy support, as well as test our three hypotheses (H1, H2 and H3), we randomly assigned the respondents to one of a total of seven groups (Methods). On a 0–10 scale, the average support is 6.22 for removing industrial-use subsidies, 6.31 for removing subsidies on private consumption of fossil fuels and 6.33 for introducing a carbon tax. Apparently, the differences between these numbers are small. The statistical testing of the means (M) confirms this as well. When t testing the differences between the proposal of removing subsidies on private consumption (M = 6.31,

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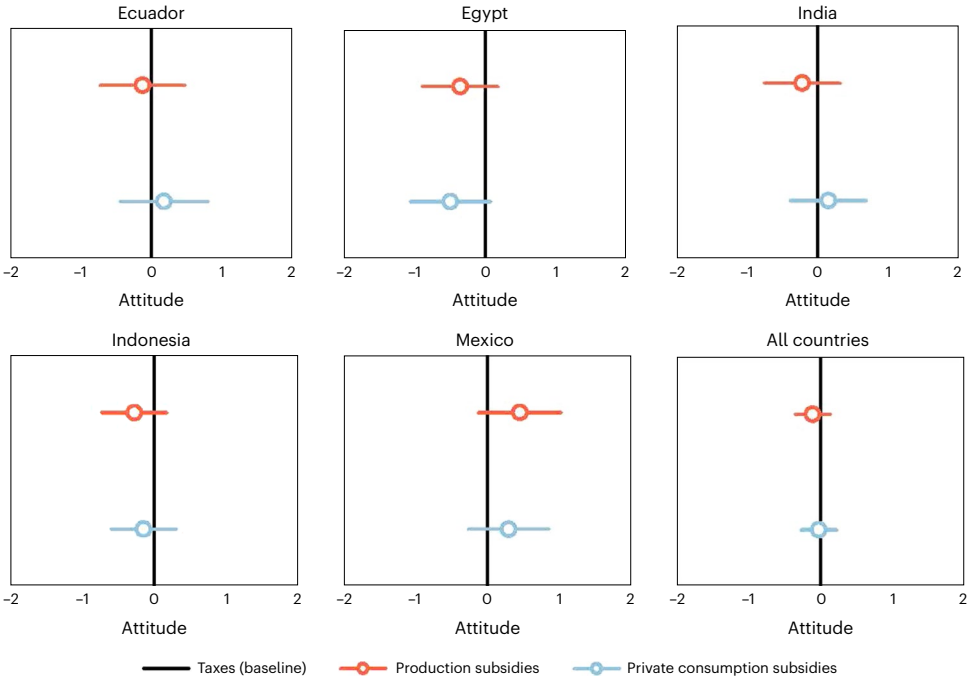

Fig. 1 | Attitudes towards a tax on CO_2 and removal of fossil fuel subsidies worldwide. Estimated average treatment effects. Points indicate the estimated effect; lines indicate 95% confidence intervals.

s.d. = 2.67) and the introduction of a carbon tax (M = 6.33, s.d. = 2.77), we find no statistically significant differences (t(1,893.16) = −0.1604, P = 0.4363). The first hypothesis is thus rejected. Nor do we find any differences between attitudes toward removing subsidies on industrial-use fossil fuels (M = 6.22, s.d. = 2.57) and subsidies on private consumption of fossil fuels (M = 6.31, s.d. = 2.67) (t(1,896.18) = 0.6985, P = 0.7575). Hence, we reject H2.

Revenue recycling and fossil fuel subsidy removal

As a next step, we investigate whether people's attitudes towards the removal of subsidies on private consumption of fossil fuels are impacted when four alternative uses of fiscal revenues saved from such removals are part of the proposed policy. In addition to the proposal to remove subsidies on private consumption of fossil fuels, the respondents were randomly assigned five different alternatives for revenue use: investments to enhance welfare in society (for example, education and health care), income tax reductions, investments in climate adaptation measures, cash transfers to the poor and most-affected households and no information about revenue use.

When aggregating the groups where revenue use is specified (M = 6.49, s.d. = 2.59) and comparing them with the group with unspecified revenue use (M = 6.31, s.d. = 2.67), we find a significant difference (t(1,428.25) = 1.88, P = 0.03). In line with H3, public acceptance of removing subsidies for private consumption of fuels is higher when revenue use is specified, as compared with non-specified revenue use. Considering the treatment groups separately, we find that private-consumption subsidy removal reaches a higher level of acceptance if revenues are directed towards investments in welfare systems (M = 6.59, s.d. = 2.55) compared with a non-specified use (t(1,893.68) = 2.36, P = 0.01) or towards investments in climate adaptation (M = 6.62, a.d. = 2.65) compared with non-specified revenue use (t(1,887.99) = 2.57, P = 0.01). However, we do not find any statistically significant differences between a proposal to use fiscal revenues to reduce income taxes (M = 6.25, s.d. = 2.48) or to provide cash transfers to the poor and most-affected households (M = 6.49, s.d. = 2.66) and non-specified revenue use (M = 6.31, s.d. = 2.67): (t(1,884.34) = −0.50, P = 0.69) and (t(1,894) = 1.53, P = 0.06), respectively. Taken together, we cannot reject our third hypothesis. Attitudes towards removing subsidies can turn more positive when revenue use is specified. However, these results are also dependent on the type of revenue recycling proposed. Whereas investments overall drive more-positive attitudes, monetary compensation (either to all or to the most affected) does not.

Cross-national comparison of public attitudes

When we, more exploratorily, consider each of our countries (Ecuador, Egypt, India, Indonesia and Mexico) individually, we find that the attitudes towards fossil fuel subsidy removal are on the same level as attitudes towards the introduction of a carbon tax. In the comparison, Egypt constitutes an exception, with the least positive attitudes towards removal of fossil fuel subsidies for industrial use (M = 5.4) and private consumption (M = 5.3) compared with averages in the other countries of 6.2 for industrial use and 6.3 for private consumption (Fig. 1). Overall, from our results, we can conclude that the resistance towards (or acceptance of) the removal of fossil fuel subsidies is on par with the public opinion on introducing taxes on CO_2.

A commitment to use the tax money saved from removing existing subsidies in a way that benefits stakeholders will increase the level of public acceptance. At the country level, we find that the use of revenues for 'investment in climate adaptation' is the most popular alternative in both Mexico and Ecuador, while it is the least popular alternative in Egypt (Fig. 2). These results indicate that there are potentially important country-specific characteristics that should be considered by policymakers aiming to remove fossil fuel subsidies. In this explorative part of our study, we do not have any causal claims or hypotheses regarding mechanisms. However, factors such as cultural differences, tax levels and differences in welfare programmes could potentially explain country variation in support for various uses of revenues.

Discussion

Contrary to our expectations, when investigating public opinion on the removal of existing fossil fuel subsidies in five developing countries, we do not find the attitude towards removal of existing subsidies to

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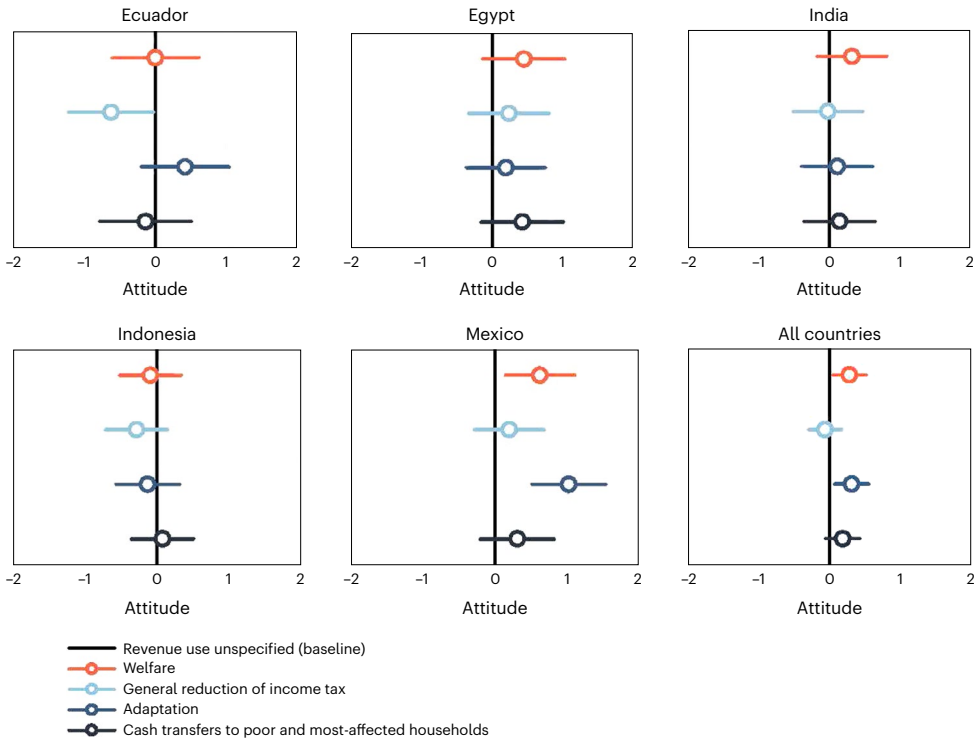

Fig. 2 | Support for different proposals of revenue use from the removal of fossil fuel subsidies by country. Estimated average treatment effects. Points indicate the estimated effect; lines indicate 95% confidence intervals.

be more negative than that towards the introduction of a carbon tax. Our study is unique in its focus on fossil fuel subsidies, and there are, currently, not many studies with which we can compare our findings. Therefore, there are reasons to be cautious and not draw any conclusions regarding the level of support for fossil fuel subsidy removal in these countries. Survey research is always sensitive to certain formulations and sampling strategies, and we know, from both previous studies and a range of real-world examples, that carbon pricing is indeed politically challenging and that rising fuel prices have spurred resistance in many countries across the world. However, one way of interpreting our results is that the public in fact considers a subsidy-removal policy as being equally acceptable (or not acceptable) as the introduction of a carbon tax. If this is the case, we should expect real-life suggestions for subsidy removal to be met with similar public opposition or acceptability as we have seen for other carbon-pricing measures. Furthermore, another finding from our study is that attitudes can be affected (in this case, increasing public acceptance) by combining a possible subsidy removal with a revenue-recycling policy. Yet again, we call for more studies to be able to more thoroughly evaluate and calibrate the size and strength of this effect. However, the results so far correspond with previous research on carbon pricing, consistently showing that revenue recycling increases support for such policies[25–27]. We also find that the respondents' concern for climate change appears to be a strong driver of policy attitudes, which has also been previously shown to be a strong predictor of climate policy support in the Global North[15], and finally that the impact of revenue recycling varies across the five countries (compare ref. [31]).

These findings may have important policy implications. First, our overall results concerning policy attitudes imply that removing subsidies on fossil fuels may not present much more of a political challenge than introducing carbon taxation. More important, by specifying alternatives for revenue recycling where public funds currently used for subsidies are instead directed towards other public investments, the level of acceptability may increase. However, the answer to the question of which specific investments are the most popular seems to be determined by national context. This further highlights the need for careful country-specific empirical investigations to determine preferred options for revenue recycling among the public, before making political decisions to remove or roll back existing fossil fuel subsidies.

The study has other limitations. Although conducted over several continents, the total number of countries is small, and there are probably important nuances to be grasped by extending the sample to other countries using representative samples. Furthermore, neither different levels of subsidy cuts nor any variation in how quickly the subsidies should be removed is specified by the study. From previous research, however, we can expect that such elements of policy design do affect policy attitudes. In addition, fuel prices are always fluctuating, and the survey was conducted before the notable rise in energy prices caused partly by the conflict in Ukraine. Furthermore, the current experimental design has no control group to benchmark the treatment groups against.

A venue for future research is to study the degree to which public acceptance of various policy instruments is affected by such price fluctuations. Furthermore, future research should test similar hypotheses where respondents are provided with more information on how certain policy instruments work. Misunderstanding, or lack of information, might be part of the explanation to the similar support for removing subsidies on fossil fuels and introducing a carbon tax. Developing a more innovative design, including a control group, may also be a future avenue to consider.

Our study is one of rather few investigating attitudes towards climate policy instruments in the Global South. As these countries are parties of the Paris Agreement and thereby struggle to find ways to limit their emissions, there is an increasing need for knowledge on attitudes and attitude formation in contexts outside the Global North. Simultaneously, there is a need for studies targeting actors' (citizens, consumers, business and other stakeholders) acceptance of subsidy removals in specific contexts. This need is palpable in both the developing and developed countries as subsidies on fossil fuel consumption and production do exist also within the OECD member states and

since the formation of policy attitudes is probably driven by a range of complex country- and situation-specific factors.

Finally, since climate change concern is a factor that significantly affects policy attitudes, further public and media attention assigned to climate change may make subsidy removals more conceivable and open up promising avenues for developing countries to contribute to the global mitigation of climate change. At the same time, fossil fuel subsidy removal frees public funds for investing in social and economic development, which would be of great value and use in many developing countries.

Online content

Any methods, additional references, Nature Portfolio reporting summaries, source data, extended data, supplementary information, acknowledgements, peer review information; details of author contributions and competing interests; and statements of data and code availability are available at https://doi.org/10.1038/s41558-023-01597-5.

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Methods

We conducted an online survey experiment (carried out through YouGov) in five countries. Our sample is based on pooled groups from Ecuador, Egypt, Mexico, Indonesia and India, which all have substantial consumption- and production-based fossil fuel subsidies. We had slightly more than 1,000 respondents in Ecuador and slightly more than 1,400 in each of the other countries, all of whom were asked about their support/acceptance of climate policy introduction. We use a 1 × 7 factorial survey experiment where respondents participating in the study were randomly exposed to different kinds of policy measures (treatments), which they were asked to evaluate (hypotheses pre-registered at OSF Registries[41]). (1) One group gave their opinion about the proposal of introducing a carbon tax in their country (as a point of reference for us to compare with the other proposals). (2) One group gave their opinion about the proposal of removing the current industrial subsides to fossil fuels in their country. (3) One group gave their opinion about the proposal of removing the current private-consumption subsides to fossil fuels in their country. Four different groups gave their opinion about the proposal of removing the current consumption subsides on fossil fuels in their country plus any of the following additional policies: (4) use the surplus funding for general welfare purposes (for example, improved health or education), (5) use the surplus funding to compensate for a general reduction of the income tax, (6) use the surplus funding for climate change adaptation projects (for example, flooding prevention) and (7) use the surplus funding for cash transfer to the poor most-affected households to keep their welfare levels unchanged.

Following previous research demonstrating how factors at the individual level affect policy attitudes, the study includes both beliefs (climate concern) and standard socioeconomic items (age, sex, income, education and urban/rural place of residence).

Sample and respondents

The samples are based on quota criteria. That is, the probability for each individual who could theoretically be included is not determined in advance but is based on their demographic background information, such as gender, age and region, from population statistics/census from each country.

Respondents participating in the study were randomly exposed to different kinds of policy measures (treatments). They did not know the treatment group to which they had been assigned. Subsequent to the question on policy support, they were asked to state their evaluative response to the specific policy. The respondents also answered survey questions regarding their gender, age, educational background, household income level, area of residence and climate concern.

Data collection

Data were collected by YouGov. YouGov uses their proprietary panels and proprietary sampling technology. YouGov begins by framing quotas on the basis of the census of the named populations. This frame is the basis on which the sampling software controls the flow of members into each survey. The sampling system will randomly select from each panel and allocate to surveys according to the quotas set. Panellists receive an invitation email containing a survey link. When they access the link, the router checks against quotas on all live surveys and allocates them to a survey they qualify for.

Statistical analysis

All the samples from the different countries were pooled when testing H1, H2 and H3. With 1,400 respondents in four countries and 1,000 respondents in one country, the total sample contained 6,600 respondents. These were then divided into seven groups (1,000 respondents in each group). To test H1, H2 and H3, we used independent-sample one-sided t tests and ordinary least-squares regression models with robust standard errors (results reported in Supplementary Information). We used the standard $P < .05$ criterion for determining whether there are differences between the groups. Hypotheses H1, H2 and H3 were supported if the null was rejected, and the estimates are statistically significant and have the expected signs and directions for both these tests. To test H3, group 3 was compared with an aggregated group based on group 4, group 5, group 6 and group 7. For the exploratory part where we investigated the role of individual factors for policy support, we used ordinary least-squares models.

Ethics

This study has been reviewed and approved by the legal division of Luleå University. In addition, the survey company (YouGov) has all the required permits and obtained informed consent from all participants.

Reporting summary

Further information on research design is available in the Nature Portfolio Reporting Summary linked to this article.

Data availability

Data for replication are available via the Harvard Dataverse [41]: https://doi.org/10.7910/DVN/0SU8CJ

Code availability

The code for the statistical analysis is available via the Harvard Dataverse[41]: https://doi.org/10.7910/DVN/0SU8CJ

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41. Harring, N., Jönsson, E. Matti, S., Mundaca, G. & Jagers, S. C. Replication data for: cross-national analysis of attitudes towards fossil fuel subsidy removal (OSF Registries, 2022, and Harvard Dataverse, 2023); https://doi.org/10.17605/OSF.IO/89CWY; https://doi.org/10.7910/DVN/0SU8CJ

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Author contributions

S.C.J. initiated the study. N.H., E.J., S.M., G.M. and S.C.J. conceptualized the paper and designed the survey experiments and contributed to the interpretation of the results. E.J. performed the analyses and implemented the data presentation and visualization with contribution from N.H., S.M., G.M. and S.C.J. G.M. provided statistics on fossil fuel consumption, production and subsidies. Finally, N.H., E.J., S.M., G.M. and S.C.J. wrote the main manuscript.

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Competing interests

The authors declare no competing interests.

Additional information

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☒	☐	For Bayesian analysis, information on the choice of priors and Markov chain Monte Carlo settings
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Our web collection on statistics for biologists contains articles on many of the points above.

Software and code

Policy information about availability of computer code

Data collection	No software was used for data collection.
Data analysis	Stata version 16.

For manuscripts utilizing custom algorithms or software that are central to the research but not yet described in published literature, software must be made available to editors and reviewers. We strongly encourage code deposition in a community repository (e.g. GitHub). See the Nature Research guidelines for submitting code & software for further information.

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Behavioural & social sciences study design

All studies must disclose on these points even when the disclosure is negative.

Study description	The study uses a experimental 1x7 factorial design where quantitative survey data were used.
Research sample	The sample consists of 1009 respondents from Ecuador, 1407 respondents from Egypt, 1416 respondents from India, 1402 respondents from Indonesia and 1402 respondents from Mexico. The sample is representative with respect to gender and age.
Sampling strategy	Data were collected by YouGov. YouGov used their proprietary panels and proprietary sampling technology. A power calculation (G*Power, Faul et al., 2007) based on effect size Cohen's d = 0.15 suggests a group sample size of 699 to ensure sufficient power (two-tailed, α = .05, β-1 = .80). We have group sample sizes of minimum 1 000 respondents.
Data collection	Data were collected through an online survey where the respondents were randomly assigned to the seven different experiment groups.
Timing	Ecuador: June 30th – July 14th 2021. Egypt: June 29th – July 9th 2021. Indonesia: June 29th – July 9th 2021. India: June 29th – July 10th 2021. Mexico: June 29th – July 10th 2021.
Data exclusions	No respondents were excluded except in the explorative regression models, where respondents with missing values on covariates were excluded.
Non-participation	No participants dropped out/declined participation.
Randomization	Respondents were randomly assigned to the seven experiment groups.

Reporting for specific materials, systems and methods

We require information from authors about some types of materials, experimental systems and methods used in many studies. Here, indicate whether each material, system or method listed is relevant to your study. If you are not sure if a list item applies to your research, read the appropriate section before selecting a response.

Materials & experimental systems

n/a	Involved in the study
☒	☐ Antibodies
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☒	☐ Palaeontology and archaeology
☒	☐ Animals and other organisms
☐	☒ Human research participants
☒	☐ Clinical data
☒	☐ Dual use research of concern

Methods

n/a	Involved in the study
☒	☐ ChIP-seq
☒	☐ Flow cytometry
☒	☐ MRI-based neuroimaging

Human research participants

Policy information about studies involving human research participants

Population characteristics	See above.
Recruitment	Participants were internet users and given a minor economic incentive to participate via YouGov
Ethics oversight	Approved by the Legal Division of Luleå University of Technology

Note that full information on the approval of the study protocol must also be provided in the manuscript.