



Analysis

Climate concern and policy acceptance before and after COVID-19

Stefan Drews^{a,*}, Ivan Savin^{a,b}, Jeroen C.J.M. van den Bergh^{a,c,d}, Sergio Villamayor-Tomás^{a,e}^a Institute of Environmental Science and Technology, Universitat Autònoma de Barcelona, Spain^b Graduate School of Economics and Management, Ural Federal University, Yekaterinburg, Russian Federation^c ICREA, Barcelona, Spain^d School of Business and Economics & Institute for Environmental Studies, VU University Amsterdam, the Netherlands^e Institute of Geosciences, Department of Cartography, Federal University of Minas Gerais, Brazil

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ABSTRACT

It remains unclear how COVID-19 has affected public engagement with the climate crisis. According to the finite-pool-of-worry hypothesis, concern about climate change should have decreased after the pandemic, in turn reducing climate-policy acceptance. Here we test these and several other conjectures by using survey data from 1172 Spanish participants who responded before and after the first wave of COVID-19, allowing for both aggregate and within-person analyses. We find that on average climate concern has decreased, while acceptance of most climate policies has increased. At the individual-level, adverse health experiences are unrelated to these changes. The same holds for negative economic experiences, with the exception that unemployment is associated with reduced acceptance of some policies. Complementary to the finite-pool-of-worry test, we examine three additional pandemic-related issues. As we find, (1) higher climate concern and policy acceptance are associated with a belief that climate change contributed to the COVID-19 outbreak; (2) higher policy acceptance is associated with a positive opinion about how the government addressed the COVID-19 crisis; (3) citizens show favorable attitudes to a carbon tax with revenues used to compensate COVID-19-related expenditures. Overall, we conclude there is support for addressing the global climate crisis even during a global health crisis.

1. Introduction

There has been much speculation about whether the COVID-19 pandemic has affected support for mitigating climate change. Commentators have pointed at similarities, differences and other connections between these two global crises. While some argue that responses to COVID-19 can accelerate the implementation of ambitious climate policies and a transition to a low-carbon economy (Markard and Rosembloom, 2020; Engström et al., 2020), others are more skeptical (Gosens and Jotzo, 2020; Mukanjari and Sterner, 2020). Focusing on the attitudes of citizens, various theoretical and opinion articles suggest that the COVID-19 pandemic presents opportunities as well as challenges for public acceptance of climate policy (Howarth et al., 2020; Botzen et al., 2020; Reese et al., 2020; Bouman et al., 2020a).

The present study empirically examines how citizens' perceptions and attitudes regarding climate change and climate policies have been affected by the COVID-19 pandemic and associated measures, such as confinement and travel restrictions. For societies to be able to combat climate change, citizens need to accept the seriousness of the problem

and show sufficient concern about it. A logical consequence of such concern is that citizens express greater acceptance of climate policies aimed at emissions reduction (Bouman et al., 2020b). A main reason why virtually no country is on track to achieve the Paris climate targets is that they lack sufficiently strong climate policies. This can be partly explained by inadequate public support or even resistance against such policies (Carattini et al., 2018; Kyselá et al., 2019; Savin et al., 2020).

The COVID-19 crisis presents a unique natural experiment to test if a major threat to health and the economy affects how people feel about climate action and policy. There are reasons to expect both negative and positive effects. A detrimental effect of the pandemic may be based on the psychological argument that individuals have a so-called "finite pool of worry" (Weber, 2006). According to this idea, once a concern about one issue (e.g., the health or economic situation due to COVID-19) goes up, for another (e.g., climate change) it goes down, with potentially negative consequences for associated behaviors and policy preferences. Although the idea of a finite-pool-of-worry is frequently mentioned in research on climate change perceptions (e.g. Whitmarsh, 2011; Van Der Linden, 2017), to our knowledge it has actually not seen much empirical

* Corresponding author at: ICTA, Edifici Z, UAB Campus, 08193 Bellaterra, Spain.
E-mail address: stefan.drews@uab.cat (S. Drews).

testing, neither generally nor in the context of the recent COVID-19 pandemic. One recent study for the UK finds limited evidence for the finite-pool-of-worry hypothesis (Evensen et al., 2021). Drawing on survey data with the same respondents before and after COVID-19, the authors find little difference in the perceived severity of climate change and other beliefs, such as the anthropogenic nature of the climate crisis. Related research examines how perceptions of climate change can weaken in the advent of particular events, such as the global economic crisis of 2008 (Capstick et al., 2015).

The pandemic might, however, also create positive effects on climate concern and policy acceptance. One pathway could be that climate change is perceived as a contributing factor to the outbreak of COVID-19 or to the spread of infectious diseases more generally (Smith et al., 2014; van Wijk et al., 2020). A second possibility is that people's evaluations of how the COVID-19 crisis has been managed affects how they judge other public policies, such as those to address climate change. This is related to, but distinct from, previous research showing that if citizens consider the government to be untrustworthy or inefficient, they may show lower policy support (Hammar and Jagers, 2006; Savin et al., 2020; Kitt et al., 2021).

Three main survey-based approaches are available to examine changes in climate attitudes and perceptions. The first one is to collect data at one specific point in time on climate perceptions and variables that might have caused changes, such as perceptions of recent economic trends (Kachi et al., 2015; Bakaki and Bernauer, 2018). The second, repeated cross-sectional design, uses data from different samples and different points in time to assess changes or differences at the aggregate level (Scruggs and Benegal, 2012). The third and arguably best approach is to examine temporal changes for samples of the same individuals, known as longitudinal or panel studies, which allows assessing within-individual changes (Mildenberger and Leiserowitz, 2017; Jenkins-Smith et al., 2020).

The present COVID-19 situation presents an opportunity to contribute to this literature. This study examines how economic, health and other aspects of COVID-19 have affected perceptions and policy attitudes associated with climate change. While giving attention to aggregate-level results, the thrust of our study consists of analyzing individual-level changes of climate perceptions and attitudes. To this end we use the same sample of Spanish survey respondents ($n = 1172$) from before and after the start of the COVID-19 pandemic. This goes beyond the approach adopted by the earlier mentioned UK study (Evensen et al., 2021) by uncovering several underlying factors of potential changes over time. Our focus on Spain is relevant given that it belongs to the countries that have been most affected health-wise by the COVID-19 pandemic and economically by associated preventive measures (Section 3.2.2 provides more details about the Spanish context).

We have three research aims. First, the core of this paper is to detect changes in climate concern and policy acceptance, and how these are associated with experiences and perceptions regarding health-, economic-, climate- and policy-related aspects of COVID-19. Second, we assess whether changes in climate concern are associated with changes in policy acceptance. A distinctive feature of this study is that we account for within-person changes over time, which allows assessing how an external event such as COVID-19 affect attitudes and beliefs. To complement this analysis, our third aim is to analyze how features of climate policy – notably social and health co-benefits – matter in attenuating the potential negative effects of COVID-19 on policy acceptance. Specifically, we examine whether the acceptance of a carbon tax is strengthened when the tax not only addresses climate change but presumably also helps to tackle COVID-19. Addressing this third research aim means deriving insights about post-COVID-19 policy attitudes as we cannot assess changes over time, that is, we conduct a cross-sectional analysis.

2. Hypotheses

This study involves three main research aims. The first is to test the finite-pool-of-worry hypothesis (Weber, 2006), which suggests that the pandemic reduced climate concern and policy acceptance over time among individuals who are concerned about, or affected by, different aspects of the pandemic. As mentioned above, the finite-pool-of-worry hypothesis tells us that people can only pay attention to a limited number of concerns and new concerns can then crowd out existing ones (ibid). Thus, we predict that on the aggregate level both climate concern (Hypothesis 1a) and policy acceptance (Hypothesis 1b) will be lower after COVID-19. In addition, we expect that individuals with stronger negative economic- and/or health-related experiences and perceptions regarding COVID-19 are more likely to show a decrease in their climate concern (Hypothesis 2a) and policy acceptance over time (Hypothesis 2b).

An alternative proposition, complementary to the finite-pool-of-worry hypothesis, is that concern and acceptance may have increased over time for people who perceive that climate change has actually contributed to the outbreak of COVID-19. The impact of climate change on the spread of infectious diseases was already acknowledged by the IPCC (Smith et al., 2014). Research also shows that perceiving and communicating health consequences of climate change can increase public engagement (Akerlof et al., 2010; Myers et al., 2012; Amelung et al., 2019). Moreover, a multinational survey conducted in March 2020 found that a majority of the participants believed that climate change influences infectious diseases (van Wijk et al., 2020). This leads us to expect that individuals who perceive climate change to be a factor contributing to the outbreak of COVID-19 show an increase in climate concern (Hypothesis 3a) and policy acceptance (Hypothesis 3b). Another proposition is that there is not just a perceived link between perceptions of the two problems (COVID-19 and climate change) but also between their solutions. For example, research shows that increased support for a plastic charge is linked to increased support for other environmental policies – which has been termed ‘policy spillover’ (Thomas et al., 2019). In the present case, people who favorably assess the government's response to tackle the COVID-19 crisis may have increased their acceptance of climate policy (Hypothesis 4), regardless of their concern.

The second research aim is to examine whether changes in climate concern are related to changes in policy acceptance due to COVID-19. An implication of the finite-pool-of-worry hypothesis would be that lower climate concern translates into lower policy acceptance (Hypothesis 5). This is based on prior cross-sectional research demonstrating that climate concern is associated with climate policy acceptance (Bouman et al., 2020b). While it is plausible to assume that this relationship also holds in a dynamic setting, some authors have stressed the need for empirical testing of this assumption (Capstick et al., 2015; Mildenberger and Leiserowitz, 2017).

The third research aim puts the previous two aims in a broader context. Past research shows that policy attitudes are affected by numerous other factors than climate concern, including policy design and framing (Drews and van den Bergh, 2016). Specifically, perceived economic and social co-benefits from climate action can increase policy support (Bain et al., 2012). For example, a carbon tax tends to be viewed more favorably by citizens when its revenues are recycled for specific purposes (Beiser-McGrath and Bernauer, 2019), such as to alleviate regressive distributional impacts of the policy, compared to a situation where the revenues are unspecified or used for the general governmental budget (Carattini et al., 2018; Maestre-Andrés et al., 2019, 2021). Based on this insight, we derive two expectations in the context of the pandemic. First, a carbon tax has been argued to support the recovery from COVID-19 by using the resulting revenues to stimulate the economy and compensate for extra COVID-19 expenditures (Burke et al., 2020; Galbraith and van den Bergh, 2020; Mintz-Woo et al., 2020). Hence, we expect that acceptance of a carbon tax that explicitly uses

revenues for addressing the COVID-19 crisis will be higher than for an unspecified use of the revenues (Hypothesis 6a). Second, we are interested in examining whether spending money to mitigate the consequences of COVID-19 pandemic represents an opportunity to raise acceptance of climate policy, particularly among people who have become less concerned about climate change (i.e., expectedly due to increased concerns about COVID-19). Thus, we expect that the positive difference between acceptance of a carbon tax with COVID-19 and unspecified revenues will be higher for people who have reduced their climate concern (Hypothesis 6b).

A summary of the research framework and hypotheses is provided in Fig. 1. As stressed in Section 1, our focus is on understanding the individual-level changes of climate concern and policy acceptance (Hypothesis 2–5, middle panel in Fig. 1). This focus is accompanied by tests of propositions related to the aggregate-level changes (Hypothesis 1a/b, upper panel), and cross-sectional differences of post-Covid-19 policy acceptance (Hypothesis 6a/b, lower panel).

3. Method

3.1. Data

For this study we draw on two online surveys from Spain, conducted by using a panel of the survey company “Netquest”. Both surveys were approved by the University’s ethics committee. The first one was run in July–August 2019. Sampling was done by using quotas on age, gender

and geographical distribution, making the survey sample representative of the general population on these characteristics (Table A1 shows a comparison of key survey characteristics with census data). The response rate was 59% with a sample size of 2004 participants over 18 years old and the average completion time was 15 min. This first survey serves as the pre-COVID-19 baseline. The second survey was not originally planned by the research team, but the unfolding COVID-19 crisis several months after the first survey presented an opportunity to study both individual-level as well as aggregate changes of perceptions and attitudes. The data were obtained in June 2020 with a two-step sampling procedure. We first invited individuals who already participated in the 2019 survey, resulting in 1172 respondents (58% response rate). The sample was then supplemented with new respondents to achieve a sample size of at least 2000, while assuring representativity on the same characteristics as for the first survey. Among the new participants the response rate was 82%.

Table A2 in the Appendix compares the overall samples in 2019 and 2020 with the subsample of respondents who participated in both surveys on a broad range of characteristics, including key socio-demographics, income and employment, experience with COVID-19 as well as climate concern and acceptance of carbon taxation. In particular, we run a Kolmogorov-Smirnov test (with the null hypothesis that the two samples are drawn from the same distribution) and a Wilcoxon rank sum test (equivalent to the Mann-Whitney test, with the null hypothesis that one distribution is not stochastically greater than the other). As one can see, the subsample of repeated survey participants is very similar to

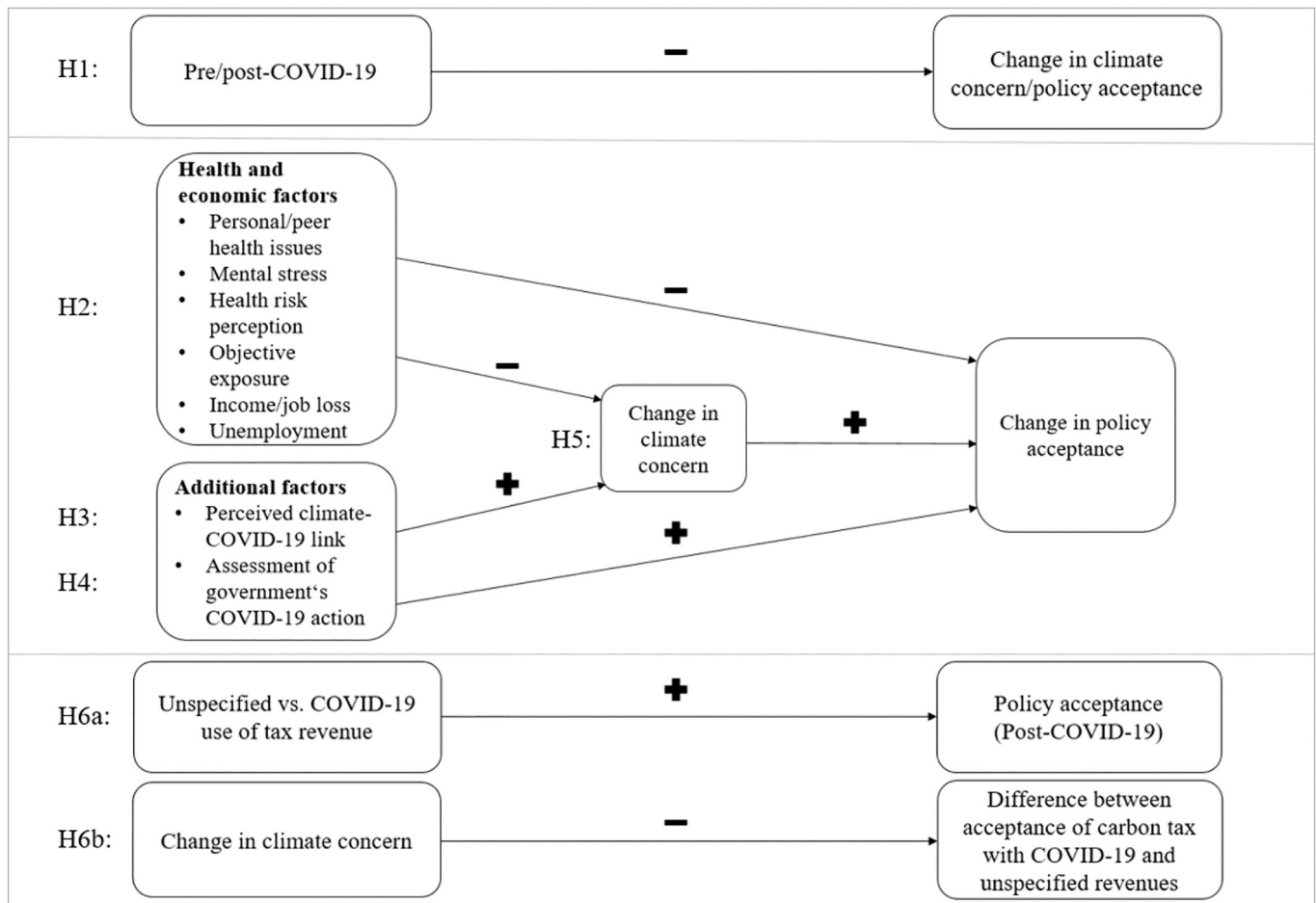


Fig. 1. Framework and hypotheses of this study.

Note: The focus lies on individual-level changes of climate concern and policy acceptance (Hypothesis 2–5, middle panel). This is accompanied by tests of hypotheses related to aggregate-level changes (Hypothesis 1a/b, upper panel), and cross-sectional differences of post-COVID-19 policy acceptance (Hypothesis 6a/b, lower panel).

the overall samples of the two surveys and differs significantly only with respect to gender (slightly fewer women in the subsample participating in both surveys) and age (higher average age of those who participated in both surveys). Since the differences are few and small, we can conclude that the subsample of 1172 respondents is fairly comparable to the representative full sample for Spain in 2019 and 2020. Given that our main interest is in examining within-person changes, our analysis henceforth focuses on this subsample of respondents.

3.2. Variables

3.2.1. Climate change concern and policy acceptance

The following survey items were present in both surveys and are used as the two main dependent variables to achieve the three research aims of this study. First, an item measured climate change concern by asking “How concerned are you about climate change?” (5-point Likert scale with response options: “Not at all”, “a little”, “quite a lot”, “much”, “very much”).

Second, policy acceptance is conceptualized and measured here as the acceptance of a carbon tax. Specifically, we measured acceptance for various types of the policy in order to understand the role of the tax revenues. The questions on carbon taxation were introduced by this sentence: “Under the Paris Agreement from 2015, each country, including Spain, must implement policies to reduce their CO₂ emissions, which contribute to climate change. One major proposal to achieve emissions reduction is by implementing a carbon tax on fossil fuels whose combustion is the main cause of CO₂ emissions”. The first question asked “How acceptable do you find a carbon tax?” (5-point Likert scale: “completely unacceptable”, “somewhat unacceptable”, “neither unacceptable nor acceptable”, “somewhat acceptable”, “completely acceptable”), without specifying any use of the tax revenues (labelled “unspecified” henceforth). In both surveys, respondents were then made aware of the fact that carbon taxes generate revenues. Three follow-up questions were “How acceptable do you find the carbon tax if its revenues were...” (all measured on the same 5-point Likert scale):

- (a) “used to compensate low-income households” (“PoorHH”),
- (b) “used to support the development of climate projects” (“Climate”),
- (c) “returned in equal amounts to all households as compensation” (“AllHH”).

In addition, the 2020 survey had one new item that offered an explicit COVID-19 option:

- (d) “used to pay for the extra public expenditures resulting from the COVID-19 crisis” (“COVID-19”).

Both climate concern and the policy acceptance variables are used to test aggregate-level hypotheses 1 and 6a. For testing individual-level hypotheses 2–4 and operationalize the change in climate concern and policy acceptance in our analysis, we employ the so-called “residualized change approach” (Castro-Schilo and Grimm, 2018). This involves using the post-COVID-19 values of climate concern or policy acceptance as dependent variables, and the associated pre-COVID-19 values as independent variables in regression analyses.

One additional question asked respondents to freely allocate revenue uses (“What percentage of the total carbon tax revenues (100%) would you prefer to allocate for each of the 4 proposed options? Please make sure that the total amount is equal to 100%.”). Since this question had only three revenue use options in the 2019 survey, perfect comparability is not possible. However, we use this question to complement our analysis of within-person changes involving the variables described before.

3.2.2. Explanatory and control variables

The 2020 survey included various questions to measure people’s experiences and perceptions related to health, economic, climate and policy aspects of COVID-19. One variable captures participants’ threat perception related to COVID-19. Two variables measure respondents’ past health problems due to COVID-19, either for themselves or their family and friends. Another variable measures people’s psychological stress due to the pandemic and associated confinement measures. Two survey items cover economic aspects, namely respondents’ perceived income loss during the pandemic, as well as their current employment situation. The latter variable was divided into whether a respondent was unemployed (which may have been the case even before COVID-19) or on a temporary workforce reduction program (Spanish “ERTE”) initiated due to COVID-19. One variable covers the perceived effect of climate change on the outbreak of COVID-19. Finally, we measure how people evaluate the government’s efforts to respond to the pandemic. Table 1 shows all these variables and their question wordings, coding, descriptive statistics and how they relate to the individual-level hypotheses 2–4 explained in Section 2.

In addition to the tests of hypotheses 2a/b related to the finite-pool-of-worry through the survey-based measures of experiences and perceptions, we examine the influence of objective experience of COVID-19. To this end, we use official data reported by the Spanish government on the number of reported new COVID-19 cases per day in every autonomous community. This data is then cumulated for the period until the launch of the survey (23rd of June), normalized by the number of inhabitants in each of the autonomous communities and linked to the survey respondents own reported location (see Fig. 2 visualizing the spread of COVID-19, and Fig. A1 in Appendix for further information). As noted before, our survey respondents were invited using quotas for autonomous communities. The combined data can be considered as a rough proxy of objective exposure to contagion for the survey respondents.

To test hypotheses 5 and 6b, one explanatory variable needs to be constructed, namely change in climate concern. This is done by calculating the absolute difference between the post- and pre-values of climate concern. Finally, our control variables are age, gender, education, household income, trust in politicians, and political orientation. Their descriptive statistics can be found in Table A1 in the Appendix.

4. Results

4.1. Understanding changes in climate concern and policy acceptance

We start with the analysis of changes in climate concern and policy acceptance. First, we briefly consider aggregate indicators derived from the data, and then look at the individual-level effects hypothesized above. Fig. 3 shows the pre- and post-COVID-19 averages of concern about climate change as well as acceptances of the four types of carbon taxes (Unspecified, PoorHH, Climate, AllHH). The figure and an accompanying pairwise Mann-Whitney test that explicitly compares responses from the same individuals for stochastic dominance demonstrate that climate concern has decreased ($M = 3.48$ vs. $M = 3.2$, $p < 0.001$, see Table A3). The corresponding effect size Cohen’s $d = 0.255$ falls into the category of small (0.2) to medium (0.5). However, it is worth noting that a similar percentage of people indicated that they are at least “somewhat concerned” about climate change: 79% in 2019 versus 77% in 2020. Fig. 4 shows that the average reduction of climate concern is mainly driven by the lower share of people who are “very much” concerned about climate change, suggesting that high concern has decreased. This finding supports our Hypothesis 1a. In contrast with the latter, policy acceptance has statistically significantly increased for three of the four types of carbon taxes, with one tax (unspecified revenues) having a small-to-moderate effect size ($d = 0.259$), while the others have d values below 0.2 (Table A3). Only a carbon tax with revenues going to all households is not viewed significantly differently

Table 1
Variables from the post-COVID-19 survey used to examine associations with changes in climate concern and policy acceptance.

Label of variable	Question wording	Coding of response options	Mean (standard deviation) or %	Related hypothesis
Perceived COVID-19 threat	How serious of a threat do you think COVID-19 is to you and your family?	1 = not at all, 2 = little, 3 = considerable, 4 = much, 5 = very much	3.38 (1.00)	H2a/b
Personal health issues	Have you had serious health issues due to COVID-19?	2 = yes, serious; 1 = yes, mild; 0 = no	0.68 (0.28)	H2a/b
Peer health issues	How many of your family members and friends have had serious health issues due to COVID-19 (excluding yourself)?	0–60	1.07 (2.66)	H2a/b
Psychological stress	To which extent have the COVID-19 pandemic and the confinement caused any psychological stress on you?	1 = none, 2 = little, 3 = quite some, 4 = much, 5 = very much	2.53 (1.12)	H2a/b
Household income loss	How did the COVID-19 crisis affect the net monthly income (including salary and/or rents) of your household?	1 = very negatively, 2 = negatively, 3 = no effect, 4 = positively, 5 = very positively	2.54 (0.75)	H2a/b
ERTE	What is your current job situation?	1 = Worker affected by a temporary suspension of employment (Spanish “ERTE”), 0 otherwise	7.33%	H2a/b
Unemployed	What is your current job situation?	1 = Unemployed, 0 otherwise	12.71%	H2a/b
Perceived effect of climate	To what extent do you agree with the following statement? “Climate change has contributed to the COVID-19 outbreak”	1 = Totally agree, 2 = partially agree, 3 = neutral, 4 = partially disagree, 5 = totally disagree	2.66 (1.26)	H3a/b
Assessment of government	Overall, how would you rate the performance of the government to deal with COVID-19?	1 = very negatively, 2 = negatively, 3 = neutral, 4 = positively, 5 = very positively	2.70 (1.28)	H4

after COVID-19. All this suggests that the relationship between COVID-19, climate change concern and policy acceptance is more complex than one would expect. We thus reject Hypothesis 1b.

To corroborate these and obtain additional insights, it is necessary to examine individual-level effects while controlling for socio-

demographic variables. Table 2 reports results from an ordered logistic regression using the residualized change approach mentioned in Section 3.2.1. It regresses the post-COVID-19 level of climate concern (column 2) and policy acceptance (columns 3–6) on pre-COVID-19 levels as well as on the explanatory and control variables mentioned in the Methods section. Note that three variables (peer health issues, household income, political orientation) together have many missing data ($n = 426$). To check the robustness of our results with the larger sample size, we exclude these variables from the analysis and report the results in Tables A5–A8 in the Appendix. Overall, the results are very similar across the two regression models.

Our results show that neither objective exposure to COVID-19, nor self-reported personal, peer health issues, or psychological stress due to COVID-19, is associated with changes in climate concern or policy acceptance (Table 2). While the sign of the coefficient of these variables is sometimes in the expected negative direction, they are not statistically significant. However, the perception that COVID-19 is a threat for respondents or their families is – against expectations – associated with increases in climate concern and acceptance of a carbon tax with unspecified use of revenues ($p < 0.01$). Furthermore, economic factors such as income and job loss do not show consistent effects either. However, it is noteworthy that unemployed people have reduced their acceptance of a carbon tax with climate revenues ($p < 0.05$). Overall, there is no or very little support for Hypotheses 2a and 2b.

With respect to the additional factors, we find a fairly consistent effect for people’s belief that climate change has contributed to the outbreak of COVID-19, increasing both climate concern ($p < 0.001$) and acceptance of almost all types of carbon taxes ($p < 0.05$). Thus, there is support for Hypotheses 3a and 3b. Moreover, people’s evaluation of the performance of the government in tackling the COVID-19 crisis is positively associated with increases in acceptance of a carbon tax with unspecified revenues. The latter gives partial support for our Hypothesis 4 (the statistical significance of these results is even more frequent in the full sample, as shown in Table A5 in the Appendix).

Despite general increases of policy acceptance and the decrease of climate concern, these aggregate findings do not rule out the possibility that individual-level reductions in climate concern have also reduced policy acceptance, which would be an implication of the finite-pool-of-worry hypothesis. To examine this, we conduct a regression analysis of change in climate-policy acceptance on change in climate concern, in two steps. The first involves change in climate concern (operationalized as the absolute difference between the post- and pre-values) as the only predictor next to pre-COVID-19 acceptance level. The second step involves controlling for other COVID-19-related variables and socio-demographic characteristics. Results are shown in Table 3. We do not find that decreases in climate concern are significantly associated with decreases in acceptance of a carbon tax, neither in the simple model nor the model with all variables. Hence, we reject Hypothesis 5.

4.2. The role of co-benefits from climate policy for addressing the COVID-19 crisis

Next, we examine to what extent policy acceptance is affected by climate policy being presented as having a co-benefit in terms of responding to the COVID-19 crisis. For this purpose, we first consider acceptance of a carbon tax whose revenues are used to compensate the public expenditures resulting from COVID-19 and compare this policy with the four other revenue uses (Fig. A2 in Appendix). This analysis draws only from the post-COVID-19 survey data. Results show that using revenues for COVID-19 has a slightly higher public acceptance than when the revenues remain unspecified ($M = 3.39$ vs. $M = 3.31$, $p < 0.05$ in pairwise Mann-Whitney test, Cohen’s $d = 0.062$, see Table A4), or when the revenues are transferred to all households ($M = 3.23$, $p < 0.01$, $d = 0.129$). The former results lend support to Hypothesis 6a. An additional finding is that there is considerably more acceptance of a carbon tax that uses revenues to finance climate projects than of a

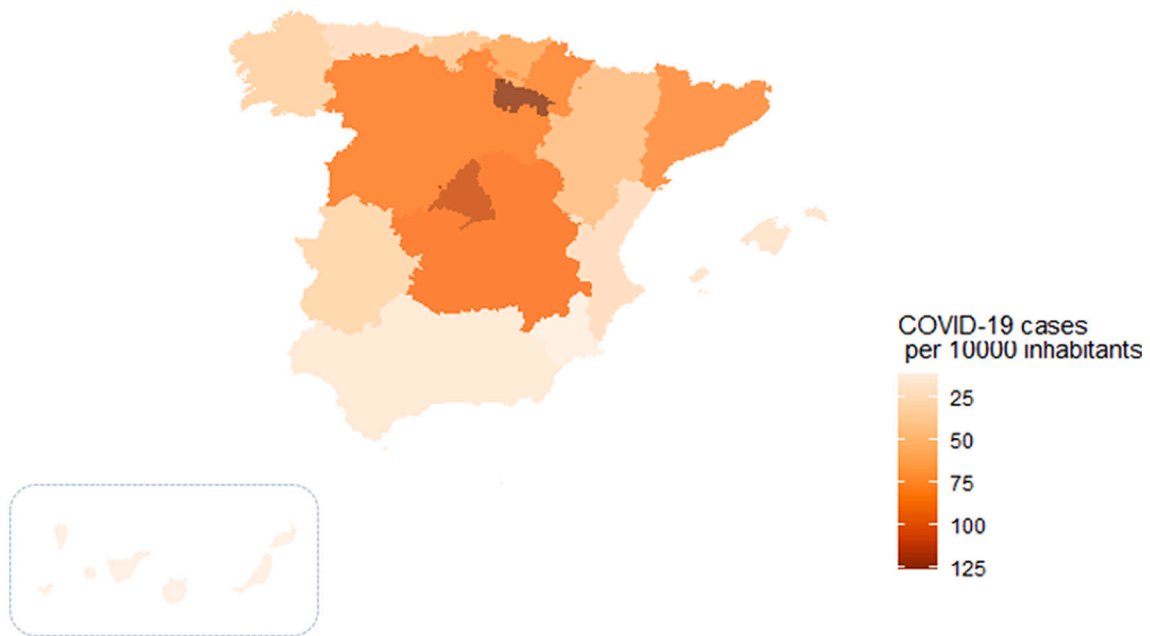


Fig. 2. Spread of COVID-19 cases per 10'000 inhabitants in Spain.

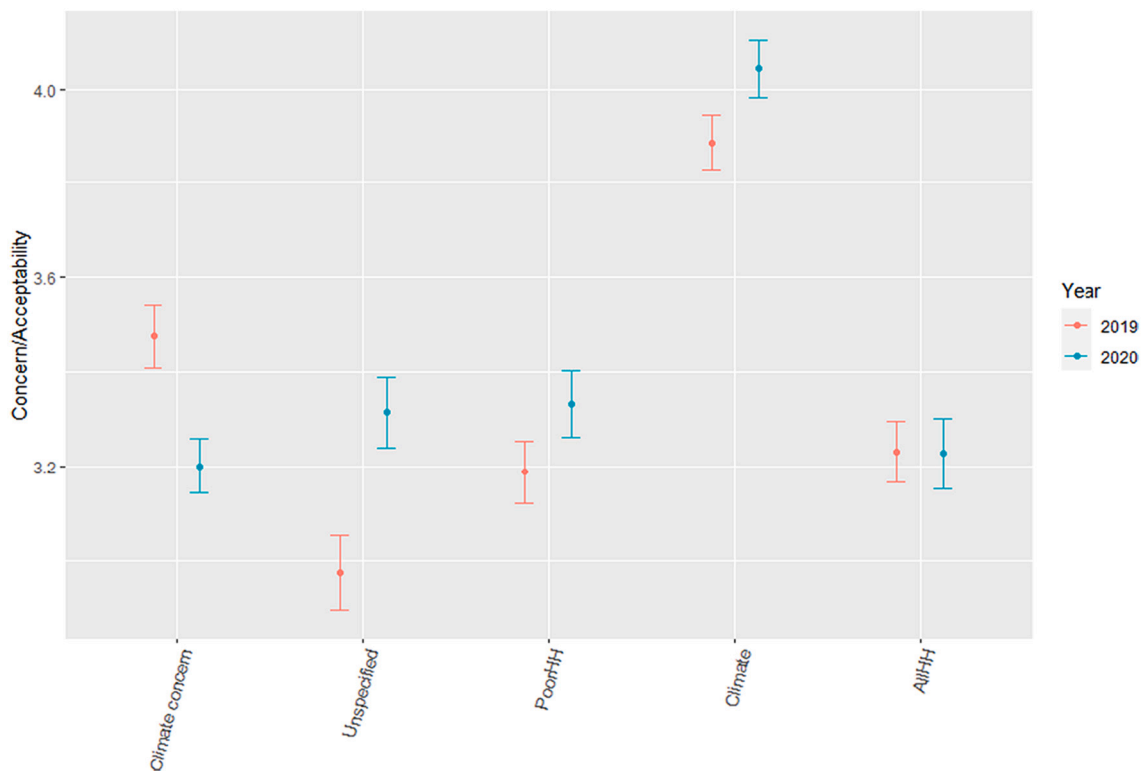


Fig. 3. Changes of climate concern and acceptance of carbon taxes before and after first COVID-19 wave. Note: Results include averages and error bars depicting +/- 2 s.e.

carbon tax that financially supports COVID-19 expenditures ($M = 4.04$, $p < 0.01$, $d = 0.552$). Moreover, expenditures related to COVID-19 have a similar acceptance as distributing them among poor households ($M = 3.33$). In other words, the carbon tax with COVID-19 revenue use performs relatively well compared to other uses of the carbon tax revenues.

In addition, respondents were asked how they would allocate tax revenues to different uses if they had complete freedom to decide about this. The results are summarized in Fig. 5. Before COVID-19, when the

choice was between only three options (PoorHH, AllHH, Climate), more than half of the sample preferred a combination of the three revenue uses, with a somewhat greater share of revenues allocated to climate projects than to the other two uses (Maestre-Andrés et al., 2021). Post-COVID-19, when given the additional option to allocate money to the COVID-19 revenue use, again over 50% of respondents prefer a roughly equal distribution among all available uses. Taken together, this shows that the COVID-19 revenue use is received as a valid alternative to other

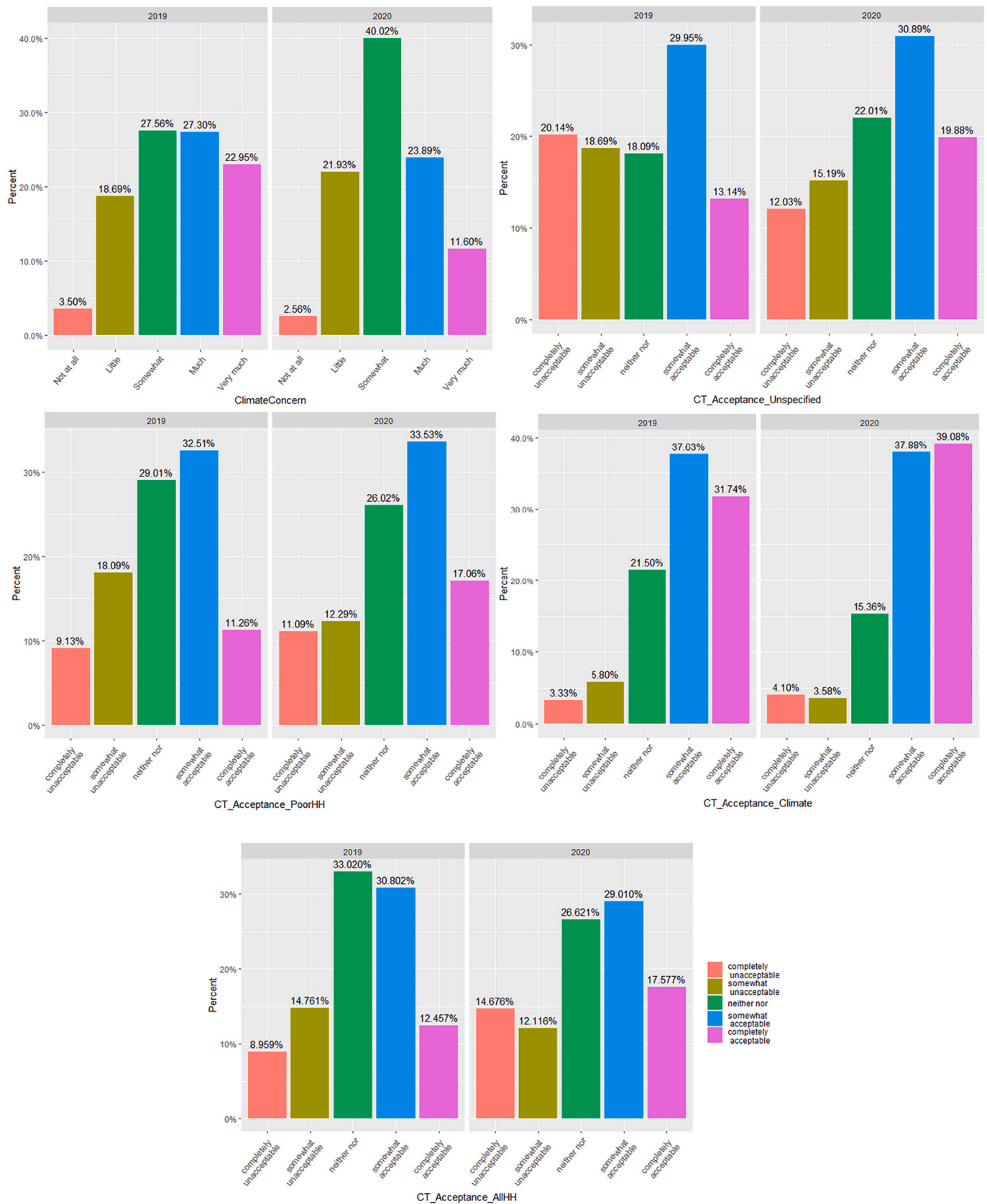


Fig. 4. Comparison of climate-change concern and acceptance of carbon tax under different use of revenues before (2019) and after COVID-19 (2020).

Table 2
The effect of COVID-19 on changes in climate concern and policy acceptance.

Independent variables	Post-COVID-19 climate concern	Post-COVID-19 carbon tax acceptance, by revenue use			
		Unspecified	Poor HH	Climate	All HH
Pre-COVID-19 concern or acceptance	3.69***	2.01***	2.04***	2.13***	1.81***
Objective COVID-19 exposure	1.00	1.00	1.00	1.00	1.00
Perceived COVID-19 threat	1.43***	1.26**	1.09	1.02	0.92
Personal health issues	1.26	0.96	0.99	0.72	1.23
Peer health issues	0.99	0.98	1.01	1.03	0.97
Psychological stress	1.02	0.90	0.97	1.07	1.00
Income loss	1.11	1.03	0.91	1.07	1.12
Unemployed	1.06	0.75	1.29	0.56*	0.88
ERTE	0.58	0.64	0.96	0.77	1.24
Perceived effect of climate	1.32***	1.21**	1.14*	1.19**	1.11
Assessment of government	1.09	1.23**	1.16	1.13	1.08
<i>Control variables</i>					
Age	1.00	1.00	1.01	1.01	0.99
Gender	0.90	0.88	1.17	1.11	1.10
Education	0.95	1.12	1.09	1.14*	0.91
Household income	0.96	1.12	0.97	0.90	0.96
Political orientation	0.91*	0.87***	0.82***	0.88**	0.97
Trust in politicians	1.07	1.38*	0.96	1.05	0.63***
Pseudo R2	0.49	0.40	0.29	0.27	0.18

Note: Ordered logistic regression. Results indicate odds ratios. *p < 0.05; **p < 0.01; ***p < 0.001; N = 746. Nagelkerke Pseudo R2 was used.

revenue uses.

As explained above, reduced climate concern is expected to lead to reduced policy acceptance at the individual-level. However, such an effect might be attenuated by a policy that accounts explicitly for COVID-19 concerns, such as the carbon tax with COVID-19 revenue use. To test this hypothesis (6b), we examine whether changes in climate concern are associated with the difference between acceptance of a COVID-19 carbon tax and the tax with unspecified revenues. Specifically, we test a regression equation of the following form:

$$Carbon\ tax\ support^{COVID} / Carbon\ tax\ support^{unspecified} = \alpha Change\ in\ climate\ concern + \beta X + \epsilon \tag{1}$$

Thus, we expect that the ratio of acceptances of a carbon tax on LHS of Eq. (1) will be higher for those people who have reduced their climate concern, i.e. coefficient α is expected to be negative and significant. Results indicate that while the coefficient of change in climate concern is negative, it is not statistically significant (Table 4).

As a last step, we seek to provide complementary insights about the role of the COVID-19 revenue use in comparison with the other carbon taxes. To this end, we run a set of regressions of the post-COVID-19 levels of tax acceptance, allowing us to understand how COVID-19 experiences and perceptions are linked to this policy option. Results in Table 5 show that higher COVID-19 threat perception is associated with acceptance of the carbon tax under the COVID-19 revenue use ($p < 0.001$), but has no significant effect on the acceptance of any other carbon taxes. There are three notable findings regarding economic effects: Unemployment and income loss – somewhat surprisingly – are associated with lower acceptance of the COVID-19 tax (both $p < 0.05$). Unemployment is also linked to lower acceptance of a carbon tax with climate revenues ($p < 0.01$). A positive assessment of the government’s effort to address the crisis is associated with higher acceptance of carbon taxes with unspecified and COVID-19 revenues ($p < 0.01$ and $p < 0.001$), while the perceived effect of COVID-19 on climate is linked to higher acceptance of all considered carbon tax revenue uses.

5. Discussion

5.1. Individual-level findings

The main objective of this paper was to examine how several individual-level factors are linked to changes in climate concern and policy acceptance. The first main insight is that we do not find clear evidence that reductions of climate concern are associated with various health and economic effects of COVID-19. Negative experiences of the

respondent or its family members and friends had no effect whatsoever on changes in climate concern and policy acceptance either.

That said, we also found that the perception of COVID-19 as a threat to oneself or one’s family is associated with higher climate concern as well as higher acceptance of a carbon tax with unspecified revenues. These findings contrast with the finite-pool-of-worry hypothesis. They suggest and confirm what has been found in another (unpublished) study by Sisco et al. (2020), namely that threat perception about one issue may spill over on another issue. The difference in effects of threat perception versus other COVID-19 health variables may be explained by the former variable being more forward-looking, and therefore connected with thoughts on policy solutions, whereas the latter examined past experiences.

Economic effects due to COVID-19 show little consistency. However, we found that unemployed people showed less acceptance of a carbon tax with climate revenues. This may be viewed at least as partial evidence for economic insecurity leading to less support for some climate policies, which in turn may be considered as indirect evidence for the finite-pool-of-worry. Overall, though, our findings are consistent with research using a similar within-person research design (Mildenberger and Leiserowitz, 2017), suggesting that the so-called economy-environment tradeoff for attitudes may have been overemphasized by other research relying on cross-sectional or aggregate-level analyses (e.g., Scruggs and Benegal, 2012). In other words, economic worries are not a major factor associated with reduced climate concern or policy acceptance. It is worth acknowledging, however, that here we focused on

personal economic situations and did not cover people's perceptions of the current and future *general* situation of the economy. For example, a study for Germany shows that a perceived deterioration of the general economic situation due to the COVID-19 crisis has a significantly negative effect on the acceptance of climate-oriented economic stimulus programs (Engler et al., 2021). This may be consistent with the fact that we found lower acceptance of the tax with COVID-19 revenue use among people who lost income and jobs.

Another insight is that changes in climate concern are unrelated to changes in policy acceptance. This finding contrasts the strong evidence from cross-sectional studies (e.g. Bouman et al., 2020b) and therefore explains why some authors have called for distinguishing static and dynamic relationships of climate perceptions (Capstick et al., 2015; Mildenerger and Leiserowitz, 2017). It could be, for example, that policy acceptance is not responsive to small reductions in climate concern taking place at the upper end, that is, when declining from very high to still high levels of concern. It may also have to do with our measurement of a more generalized climate concern, which according to the literature tends to have not as strong effects as more personal worry about, or perceived seriousness of, climate change (Van Der Linden, 2017).

A few comments on the two additional variables of interest are in order. A positive assessment of the government's effort to address the crisis is associated with higher acceptance of carbon taxes with unspecified revenues, but not for the other explicit revenue options (PoorHH, AllHH, Climate). This could explain the relatively high increase of acceptance of this type of carbon tax (revenue use) at the aggregate level. In other words, people may have observed that the government is doing a good job in tackling the health crisis and may then find it more acceptable to introduce a carbon tax even if the revenues are not clearly earmarked. This may be evidence for what has been termed a positive "policy spillover" (Thomas et al., 2019).

In line with our expectations was that the belief that "climate change has contributed to COVID-19" is significantly associated with higher climate concern and most cases of policy acceptance. This finding is consistent with other recent, cross-sectional evidence on people's subjective attribution of climate change to COVID-19 for countries, namely New Zealand (Thaker and Cook, 2021) and the US (Wong-Parodi and

Berlin Rubin, 2022). However, causality of the relationship might well be reverse, that is, people become more worried about climate change over time and attribute other kinds of problems to it. Further experimental research could try to substantiate these findings.

5.2. Aggregate-level findings and synthesis

Our finding that aggregate climate concern has decreased can be viewed as evidence for the finite-pool-of-worry hypothesis, despite its rather small effect size. It also appears to contrast with results of a study for the UK which showed that climate beliefs are stable before and after COVID-19 and that, if anything, there is a "finite-pool-of-attention" (Evensen et al., 2021). The latter study analyzed Twitter data, finding that people have communicated less about climate change after COVID-19. This suggests that conceptualizations and operationalizations matter, which also becomes evident when considering our second main finding, namely that aggregate policy acceptance of carbon taxation with distinct revenue uses tends to increase over time.

It is evident that climate concern and policy acceptance are different concepts. Acceptance may increase for reasons unrelated to concern. One such reason is that policies may (be perceived to) have co-benefits. We showed that on average a carbon tax with a revenue explicitly framed to pay for COVID-19 expenditures is equally or slightly more accepted than other revenue uses except climate projects. In addition, results indicate that this revenue is more positively viewed by people who perceive COVID-19 as threat, but more negatively by people who have lost income. One interpretation of the latter is that respondents may have understood this revenue use not so much as an economic but a health response to COVID-19. The wording of the survey question was somewhat ambiguous in this respect. In any case, given that these results are cross-sectional, we can only speculate that any co-benefits have contributed to aggregate-level increases of policy acceptance.

It is difficult to answer why aggregate climate concern has somewhat decreased, although we do not find this decrease to be linked to the individual-level variables examined here. It is of course possible that changes are the result of influences unrelated with COVID-19. For example, data for the first survey in 2019 was collected at the end of July just a few days after a heat wave in Spain (see Fig. A1 in the Appendix).

Table 3

The effect of change in climate concern on change in policy acceptance.

Independent variables	Post-COVID-19 carbon tax acceptance, by revenue use							
	Unspecified		Poor HH		Climate		All HH	
	M1	M2	M1	M2	M1	M2	M1	M2
Pre-COVID-19 acceptance	2.12***	2.02***	2.21***	2.04***	2.25***	2.13***	1.84***	1.81***
Change in climate concern	1.06	1.04	0.97	1.08	0.98	1.00	1.01	0.99
Objective COVID-19 exposure		1.26		1.09		1.02		0.92
Perceived COVID-19 threat		0.95**		0.98		0.72		1.23
Personal health issues		0.98		1.01		1.03		0.97
Peer health issues		0.90		0.97		1.07		1.00
Psychological stress		1.03		0.91		1.07		1.12
Income loss		0.75		1.28		0.56		0.88
Unemployed		0.64		0.96		0.77*		1.24
ERTE		1.21		1.14		1.19		1.11
Perceived effect of climate		2.02**		2.04*		2.13**		1.81
Assessment of government		1.23**		1.16		1.13		1.08
<i>Control variables</i>								
Age		1.00		1.01		1.01		0.99
Gender		0.88		1.17		1.11		1.10
Education		1.12*		1.10		1.14*		0.91
Household income		1.12		0.97		0.90		0.96
Political orientation		0.87***		0.82***		0.88**		0.97
Trust in politicians		1.38*		0.96		1.05		0.63***
Pseudo R2	0.24	0.40	0.20	0.34	0.18	0.41	0.13	0.18

Note: Ordered logistic regression. Results indicate odds ratios. *p < 0.05; **p < 0.01; ***p < 0.001; N = 1172 in Model 1 (M1), N = 746 in Model 2 (M2). Nagelkerke's Pseudo R2 was used.

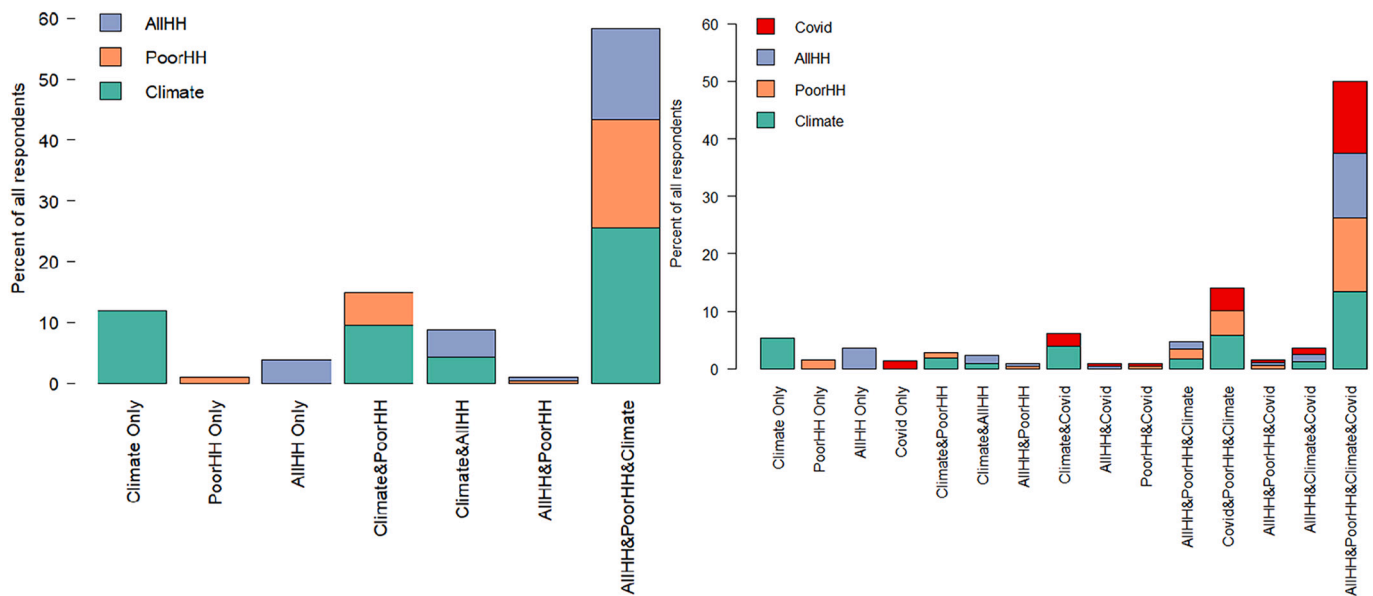


Fig. 5. Preferred allocation of revenues from a carbon tax. Respondents were asked to express the share (in %) of total revenues to be allocated to each revenue use. The left panel shows results for 2019, the right panel for 2020 with an additional COVID-19 option.

Research suggests that such experiences can (temporarily) increase climate change concern (Howe et al., 2019). This could mean that our baseline measure was rather high. The available data of respondents' locations does not allow for proper controls in this respect. In contrast, the overall increase of climate policy acceptance may be the result of increasing attention about climate change due to the UN climate talks in Spain in December 2019 or the Friday for Future movement. All this points to a more general consideration for the interpretation of our findings, namely the issue of timing. The post-COVID-19 data was collected after the end of the first wave. Results may differ with a larger number of people being affected health-wise and/or economically throughout subsequent waves, while the emergence of vaccinations may

have influenced especially the policy-related variables. Future research will have to answer these questions.

5.3. Limitations

Some limitations of our study are as follows. The first is that it can only draw on single items to measure changes of the key constructs. That is, single-item measures, such as for climate concern and policy acceptance, might be somewhat unreliable compared to composite indices

Table 4
Analysis of the additional acceptance of a carbon tax due to a COVID-19 revenue use.

	Additional carbon tax acceptance due to COVID-19 revenue	
(Intercept)	1.20***	1.77***
Change in climate concern	0.01	-0.06
Pre-COVID-19 acceptance		-0.14***
Objective COVID-19 exposure	0.00	
Perceived COVID-19 threat	0.03	
Personal health issues	0.10	
Peer health issues	0.00	
Psychological stress	-0.01	
Income loss	-0.03	
Unemployed	-0.03	
ERTE	0.13	
Perceived effect of climate	0.00	
Assessment of government	-0.00	
<i>Control variables</i>		
Age	0.00	
Gender	0.15*	
Education	-0.05	
Household income	-0.03	
Political orientation	0.01	
Trust in politicians	-0.09	
Adj. R2	-0.00	0.08

Note: Results indicate OLS regression coefficients. *p < 0.05; **p < 0.01; ***p < 0.001; N = 1172 in Model 1 (M1), N = 746 in Model 2 (M2).

Table 5
Acceptance of a carbon tax with revenue use for COVID-19, compared with other types of revenue use.

Independent variables	Carbon tax acceptance, by revenue use				
	COVID-19	Unspecified	Poor HH	Climate	All HH
Climate concern	1.01	1.94***	1.08	2.20***	0.90
Objective COVID-19 exposure	1.00	1.00	1.00	1.00*	1.00
Perceived COVID-19 threat	1.40***	1.11	1.07	0.91	0.91
Personal health issues	1.00	0.93	0.99	0.69	1.35
Peer health issues	1.00	1.00	1.02	1.04	0.97
Psychological stress	0.94	0.88	0.95	1.05	1.02
Income loss	0.82*	0.88	0.92	0.95	1.15
Unemployed	0.66*	0.70	1.29	0.50**	0.80
ERTE	0.86	0.94	0.90	0.97	1.20
Perceived effect of climate	1.13**	1.16**	1.15*	1.13*	1.14*
Assessment of government	1.34***	1.28**	1.14	1.12	1.06
<i>Control variables</i>					
Age	1.01	1.00	1.00	1.01	0.99
Gender	1.50**	0.93	1.21	1.19	1.25
Education	0.96	1.22***	1.03	1.13*	0.86**
Household income	0.96	1.08	0.91	0.93	0.92
Political orientation	0.92*	0.89**	0.80***	0.88**	0.96
Trust in politicians	0.97	1.67***	1.00	1.13	0.66***
Pseudo R2	0.14	0.16	0.16	0.26	0.07

Note: Ordered logistic regression. Coefficients indicate odds ratios. *p < 0.05; **p < 0.01; ***p < 0.001; N = 746. Nagelkerke's Pseudo R2 was used.

(Kyselá et al., 2019). For example, prior research on within-person changes of climate beliefs and attitudes has shown that survey response errors, such as paying insufficient attention to questions, are related to variability in responses (Jenkins-Smith et al., 2020). While we examined effects of survey completion time and did not find any significant relation with the magnitude of change in climate concern or policy support (results are available upon request), the existence of other such effects cannot entirely be ruled out. Second, to test the finite-pool-of-worry hypothesis more comprehensively, it would have been ideal to not only measure changes in climate concern, but also changes in non-climate concerns. This was of course not possible, given that our baseline survey was not designed with such a research question in mind. Third, although our focus here was on carbon taxes with a broad set of social and climate revenue uses, carbon pricing is generally one of the more contested climate policies (Rhodes et al., 2017). Future research could investigate changes in other, less polarizing, types of climate policies.

6. Conclusions

This study examined how COVID-19 has affected concern about climate change and acceptance of climate policy in Spain. Using data for the same survey participants before and after COVID-19, we find that the pandemic has somewhat reduced aggregate-level concern about climate change. In contrast, public acceptance of a carbon tax with different revenue uses has slightly increased over time. At the individual level, however, we do not find reductions in climate concern to be related to health or economic effects of COVID-19. This means limited evidence for a finite-pool-of-worry, at least when measured through experience-based proxies. It rather appears that the perception of one threat (climate change) spills over onto another threat (COVID-19). Similarly,

we find that citizens' positive assessment of the government's action to address COVID-19 is associated with higher acceptance of some climate policies. In the concrete case of a carbon tax, our study suggests that policy makers can consider allocating at least some of the tax revenues for COVID-19 purposes, as citizens view this option favorably, next to other conventional revenue uses. The results of our case study for Spain – a country that was hit relatively hard by the pandemic – offers an optimistic conclusion for policy: even in times of a global health crisis, public support for addressing the global climate crisis remains fairly stable.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgements

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Appendix A

Table A1

Comparison of sample (N = 1172) with census data.

Variables	Description	Mean (SD) or %	Spanish population
Gender	Dummy: female	47.44%	50.99%
Age	18 to 88 years old	49.30 (14.10)	43.59
Monthly household income	1 (less than 1000€) to 5 (More than 4000€)	2.64 (1.14) translating into a value between ± €2600	2385 euros per month
Education	1 (Less than 5 years of school) to 8 (University)	5.05 (1.30); 89.92% of the sample have medium professional or higher studies	63.8% have a medium professional or higher studies [*]
Political orientation	1 (left-wing) to 10 (right-wing)	4.54 (2.44)	4.6 (2.0) [*]

Notes: Sampling was done by using quotas on age, gender and geographical distribution, making the survey sample representative of the general population on these characteristics. The rest of variables are compared with census data from the Spanish National Institute of Statistics (www.ine.es) unless another source is indicated.

^{*} Source: Centro de Investigaciones Sociológicas (CIS), Barómetro de Julio 2020.

Table A2

Results of the Kolmogorov-Smirnov (K-S) and Wilcoxon rank sum tests for differences in samples.

Variable	Mean of repeated 1172 respondents in 2019	Mean of all 2004 respondents in 2019	p-value (K-S test)	p-value (Wilcoxon test)	Cohen's d (effect size)	Mean of repeated 1172 respondents in 2020	Mean of all 2200 respondents in 2020	p-value (K-S test)	p-value (Wilcoxon test)	Cohen's d (effect size)
Gender (female=1)	1.47	1.51	0.280	0.047	0.073	1.47	1.51	0.288	0.049	0.071
Age	48.45	45.15	<0.001	<0.001	0.223	49.30	45.50	<0.001	<0.001	0.258
Region	8.30	8.32	0.999	0.950	0.006	8.27	8.29	0.999	0.990	0.003
Education	5.09	5.02	0.408	0.089	0.060	5.05	5.02	0.977	0.411	0.029
Climate concern	3.48	3.51	0.992	0.376	0.032	3.20	3.20	0.999	0.845	0.004
Acceptance of carbon tax (unspecified use)	2.97	3.00	0.999	0.647	0.018	3.31	3.34	0.983	0.648	0.019
Personal health issues COVID-19	-	-	-	-	-	2.93	2.92	0.999	0.348	0.033
Employment status	-	-	-	-	-	2.53	2.44	0.228	0.346	0.047
Household income	4.48	4.44	0.986	0.377	0.028	2.64	2.58	0.967	0.210	0.050
Political orientation	4.49	4.47	0.999	0.792	0.006	4.54	4.44	0.917	0.278	0.041
Trust in politicians	1.62	1.64	0.999	0.548	0.025	1.71	1.70	0.999	0.822	0.011

Note: cases where the differences are found to be significantly different are marked with grey shading.

Table A3

Comparing results for climate concern and policy acceptance before (2019) and after COVID-19 (2020).

Type of sample	2019	2020	Pairwise Mann-Whitney test's p value	Cohen's d (effect size)
Climate concern	3.475 (3.409–3.542)	3.201 (3.143–3.259)	<0.0001	0.255
Carbon tax acceptance (Unspecified revenue use)	2.973 (2.894–3.051)	3.314 (3.239–3.389)	<0.0001	0.259
Carbon tax acceptance (PoorHH)	3.187 (3.121–3.253)	3.332 (3.261–3.403)	<0.0001	0.123
Carbon tax acceptance (Climate)	3.887 (3.826–3.946)	4.043 (3.983–4.103)	<0.0001	0.152
Carbon tax acceptance (AllHH)	3.230 (3.164–3.296)	3.227 (3.152–3.302)	0.971	0.003

Note: Error bars with ± 2 s.e. are reported in parentheses. P-values below 0.05 indicate significant differences between data samples between data samples.

Table A4

Comparing carbon tax acceptance under different revenue uses in 2020.

Type of non-COVID revenue use	Mean acceptance of revenue use	Mean of COVID-19 revenue	Mann-Whitney test's p value	Cohen's d (effect size)
Unspecified revenue use	3.314 (3.239–3.389)	3.393 (3.318–3.469)	0.0427	0.062
PoorHH	3.332 (3.261–3.403)	3.393 (3.318–3.469)	0.054	0.049
Climate	4.043 (3.983–4.103)	3.393 (3.318–3.469)	<0.0001	0.552
AllHH	3.227 (3.152–3.302)	3.393 (3.318–3.469)	0.0001	0.129

Note: Error bars with ± 2 s.e. are reported in parentheses. P-values below 0.05 indicate significant differences between data samples.

Table A5
The effect of COVID-19 on changes in climate concern and policy acceptance (variables with many missing data excluded).

Independent variables	Post-COVID-19 climate concern	Post-COVID-19 carbon tax acceptance, by revenue use			
		Unspecified	Poor HH	Climate	All HH
Pre-COVID-19 concern/acceptance	3.77***	1.85***	2.07	2.03***	1.81***
Objective COVID-19 exposure	1.00	1.00*	1.00	1.00	1.00
Perceived COVID-19 threat	1.47***	1.18**	1.14*	1.12	0.97
Personal health issues	1.26	1.03	0.97	0.76	0.94
Psychological stress	0.98	0.86*	0.96	0.99	1.09
Income loss	1.12	0.99	0.96	1.18*	1.12
Unemployed	1.06	0.88	1.29	0.63**	0.98
ERTE	0.73	0.77	1.14	0.68	1.27
Perceived effect of climate	1.32***	1.24***	1.11*	1.14**	1.06
Assessment of government	1.21***	1.46***	1.36***	1.23***	1.05
<i>Control variables</i>					
Age	1.01	1.00	1.00	1.00	1.00
Gender	1.04	0.84	1.12	0.91	1.13
Education	0.91*	1.02	1.01	1.05	0.90*
Trust in politicians	1.00	1.25*	0.96	1.15	0.73**
Pseudo R2	0.49	0.34	0.24	0.21	0.16

Note: Ordered logistic regression. Coefficients indicate odds ratios. *p < 0.05; **p < 0.01; ***p < 0.001; N = 1155.

Table A6
The effect of change in climate concern on change in policy acceptance (variables with many missing data excluded).

Independent variables	Post-COVID-19 carbon tax acceptance, by revenue use			
	Unspecified	Poor HH	Climate	All HH
Pre-COVID-19 acceptance	1.85***	2.06***	2.02***	1.81***
Change in climate concern	1.03	0.99	0.97	1.01
Objective COVID-19 exposure	1.00*	1.00	1.00	1.00
Perceived COVID-19 threat	1.18**	1.14*	1.12	0.97
Personal health issues	1.02	0.97	0.76	0.93
Psychological stress	0.86**	0.96	0.99	1.09
Income loss	0.99	0.96	1.18*	1.12
Unemployed	0.88	1.29	0.63**	0.98
ERTE	0.77	1.14	0.68	1.26
Perceived effect of climate	1.24***	1.11*	1.14**	1.06
Assessment of government	1.46***	1.36***	1.23***	1.05
<i>Control variables</i>				
Age	1.00	1.00	1.00	1.00
Gender	0.84	1.12	0.91	1.13
Education	1.03	1.01	1.05	0.90*
Trust in politicians	1.25*	0.96	1.15	0.73***
Pseudo R2	0.34	0.24	0.21	0.16

Note: Ordered logistic regression. Coefficients indicate odds ratios. *p < 0.05; **p < 0.01; ***p < 0.001; N = 1155.

Table A7
OLS regression of the additional acceptance of a carbon tax due to a COVID-19 revenue use (variables with many missing data excluded).

	Additional carbon tax acceptance due to COVID-19 revenue
(Intercept)	1.53***
Change in climate concern	-0.13
Pre-COVID-19 acceptance	-0.07***
Objective COVID-19 exposure	0.00
Perceived COVID-19 threat	0.05*
Personal health issues	0.00
Psychological stress	0.02
Income loss	0.01
Unemployed	-0.07
ERTE	0.10
Perceived effect of climate	-0.02
Assessment of government	-0.04
<i>Control variables</i>	
Age	0.00
Gender	0.12*

(continued on next page)

Table A7 (continued)

	Additional carbon tax acceptance due to COVID-19 revenue
Education	-0.03
Trust in politicians	-0.02
Adj. R2	0.07

Note: *p < 0.05; **p < 0.01; ***p < 0.001; N = 1155.

Table A8

Acceptance of carbon tax with COVID-19 revenue use compared to other types of carbon taxation (variables with many missing data excluded).

Independent variables	Carbon tax acceptance, by revenue use				
	COVID-19	Unspecified	Poor HH	Climate	All HH
Climate concern	1.03	1.96***	1.12	2.20***	0.93
Objective COVID-19 exposure	1.00	1.00**	1.00	1.00	1.00
Perceived COVID-19 threat	1.34***	1.01	1.09	0.98	0.96
Personal health issues	0.88	1.03	0.97	0.70	1.01
Psychological stress	0.96	0.84**	0.98	0.98	1.13*
Income loss	0.91	0.90	0.96	1.09	1.18*
Unemployed	0.82	0.89	1.39	0.61**	0.93
ERTE	0.94	0.94	1.20	0.85	1.30
Perceived effect of climate	1.16***	1.24***	1.12*	1.08	1.07
Assessment of government	1.38***	1.46***	1.43***	1.22***	1.06
<i>Control variables</i>					
Age	1.00	1.00	1.00	1.00	0.99
Gender	1.30*	0.89	1.18	0.96	1.27*
Education	0.94	1.10*	0.95	1.07	0.85***
Trust in politicians	1.08	1.50***	1.02	1.25*	0.75**
Pseudo R2	0.11	0.30	0.10	0.22	0.06

Note: Ordered logistic regression. Coefficients indicate odds ratios. *p < 0.05; **p < 0.01; ***p < 0.001; N = 1155. Nagelkerke Pseudo R2 was used.

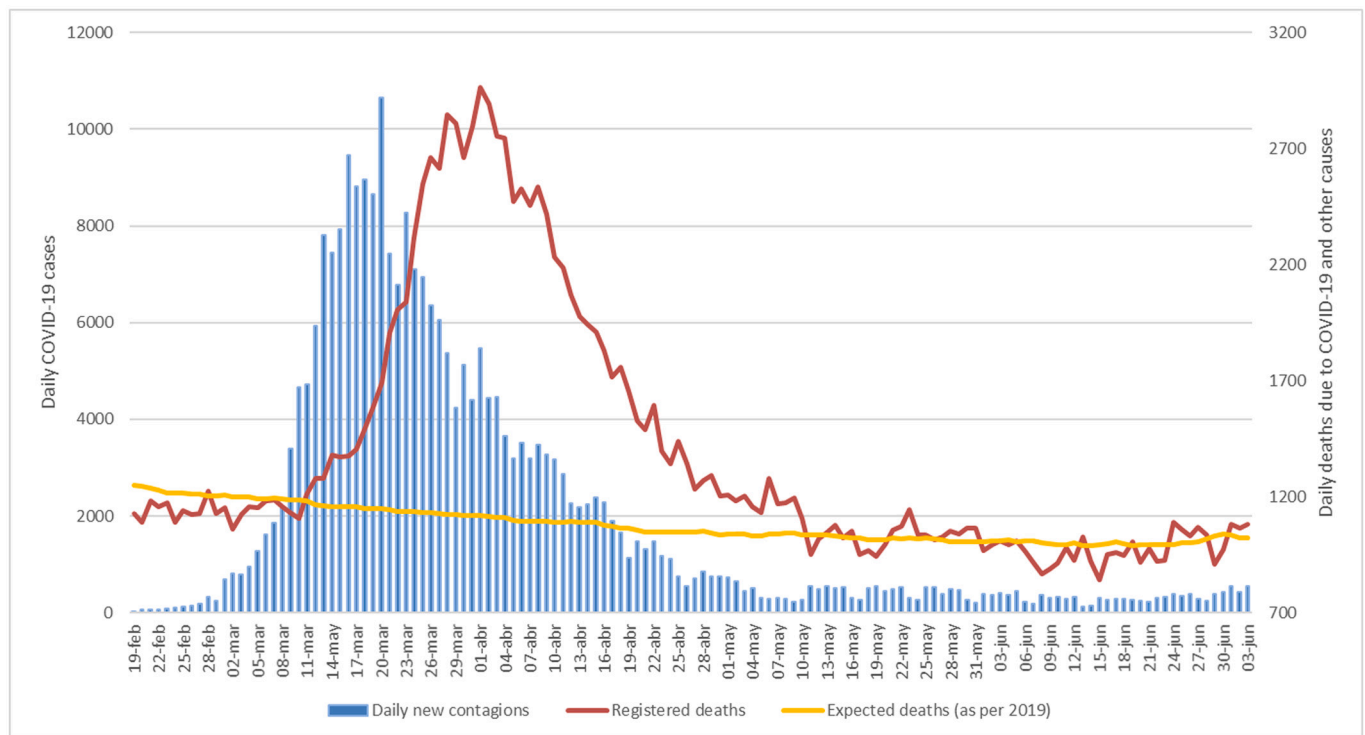


Fig. A1. Evolution of contagion and death cases in Spain (Confinement: 14 March - 21 June; survey: 23 June - 3 July).

Source: Spanish National Epidemiology Center <https://cneovid.isciii.es/covid19/#documentaci%C3%B3n-y-datos> (contagion cases), and Europa Press, www.epdata.es (death cases)

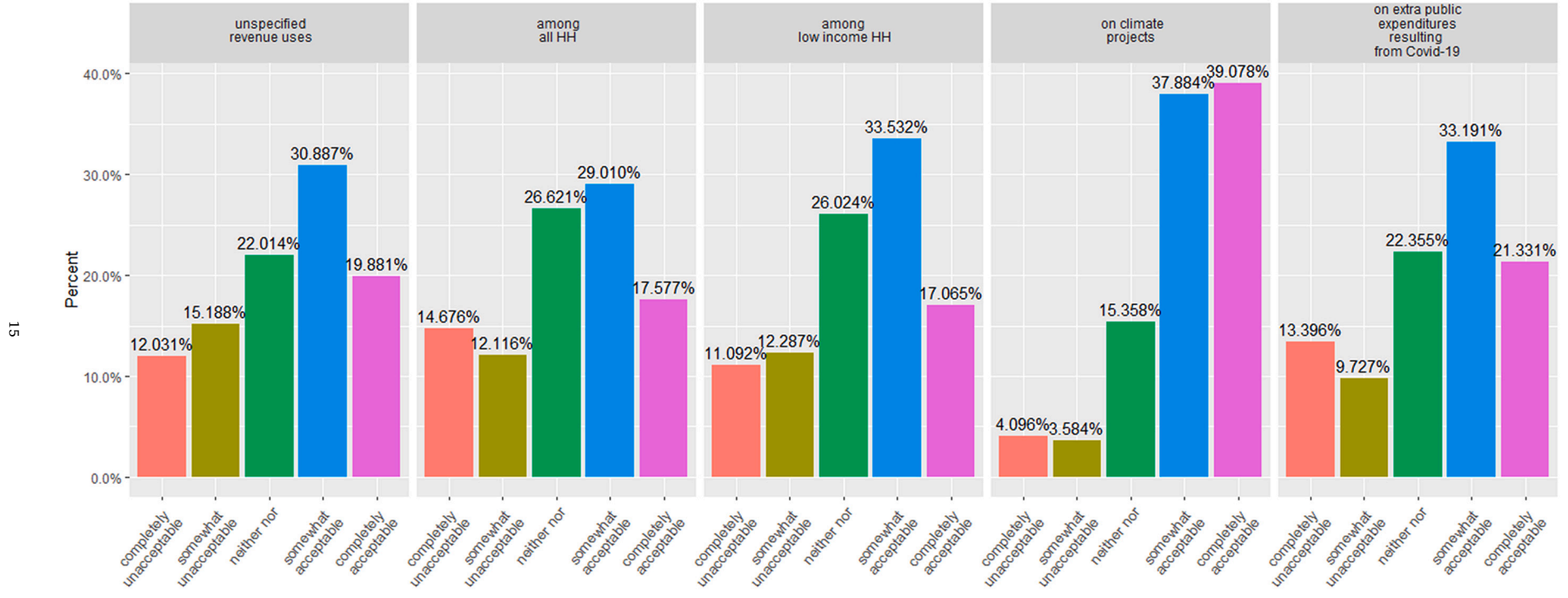


Fig. A2. Comparison of carbon tax acceptance under different revenue uses after COVID-19.

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