Climate Policy

ISSN: 1469-3062 (Print) 1752-7457 (Online) Journal homepage: www.tandfonline.com/journals/tcpo20

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To cite this article: Wouter Poortinga (30 Jul 2025): The role of policy appraisals and second-order beliefs in public support for climate policies in the UK, Climate Policy, DOI: 10.1080/14693062.2025.2539977

To link to this article: https://doi.org/10.1080/14693062.2025.2539977

CLIMATE POLICY
https://doi.org/10.1080/14693062.2025.2539977

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The role of policy appraisals and second-order beliefs in public support for climate policies in the UK

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ABSTRACT

Ambitious climate policies designed to reduce carbon emissions through behaviour change require public consent for their successful implementation, which is dependent on their design and the way they are appraised. The current study, involving a large UK-based sample ($n = 2002$), brings together research on policy attributes, policy-specific appraisals, and second-order beliefs to examine how they can help explain support for different types of climate policies. The results show that restrictive 'push' measures are supported far less than non-coercive 'pull' measures; financial measures are less popular than regulatory measures; and measures aimed at changing dietary behaviours are supported less than those aimed at energy and travel behaviours. It further finds that perceived effectiveness, perceived fairness and perceived levels of public policy support ('second-order beliefs') follow similar patterns and can explain support for the different climate policies. The study shows that both policy-specific appraisals and second-order beliefs mediate differences in support for the different types of climate policies. Furthermore, while support for the different climate policies is systematically underestimated by 18% and opposition systematically overestimated by 16% on average, the magnitude of pluralistic ignorance is smaller for push measures than for pull measures. The smaller perception gap for the less popular restrictive measures may limit the effectiveness of informational norm interventions in increasing public acceptance of these policies.

Key policy insights

- Public support for climate policies varies systematically by policy type and behavioural domain, with restrictive 'push' policies and those targeting diets receiving the least support.
- Perceived fairness, effectiveness, and popularity of climate policies significantly mediate these differences, helping to explain why certain policies are more widely supported.
- Public support for climate policies is systematically underestimated (and opposition overestimated), but the perception gap is smaller for unpopular policies, potentially limiting the effectiveness of norm-based informational interventions for those policies.
- Communicating actual levels of public support may help promote already popular policies, but additional strategies are needed to increase acceptability of less supported measures.
- Policy design should account for perceived fairness and tailor framing strategies accordingly, especially in sensitive domains such as diet, to improve public acceptance and avoid backlash.

ARTICLE HISTORY
Received 24 October 2024
Accepted 22 July 2025

KEYWORDS
Policy support; policy instruments; public opinion; policy appraisal; second-order beliefs

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Supplemental data for this article can be accessed online at https://doi.org/10.1080/14693062.2025.2539977.

1. Introduction

1.1. Background

The challenge of climate change necessitates transformative policies that can lead to a substantial and rapid reduction of carbon emissions (Patterson, 2023). The feasibility of such policies is intricately tied to public support, without which they are unlikely to be implemented (Verfuerth et al., 2023). While concern about climate change has increased substantially over the past decade (Demski et al., 2022; Poortinga et al., 2018),[1] climate policies often encounter significant resistance. In several countries, efforts to introduce climate-related measures, such as a fuel tax in France, a gas boiler ban in Germany, and Low Traffic Neighbourhoods in the UK, have triggered a strong public backlash (Grossman, 2019; Pitel, 2023; Powell, 2025). Even non-existent measures, such as a 'meat tax', have provoked outrage on social media, reflecting sensitivities surrounding personal freedoms and food choices (Michielsen & van der Horst, 2022). These examples illustrate how backlashes, even from vocal minorities, can lead to policy abandonment and create negative feedback loops that make future climate action more difficult (Lockwood, 2022).

This study aims to investigate public support for different types of climate policies and explore what perceptions may explain differences between them. It is based on the premise that, to better understand public support for climate policies, research needs to consider both the attributes of the policies and the way they are appraised by the public. The study builds upon several strands of literature, discussed in Sections 1.2 (public support for climate policies), 1.3 (perceived fairness and effectiveness), and 1.4 (second-order beliefs), before outlining the aims of this study in Section 1.5. Section 2 then presents the methodology, Section 3 reports the key results, and Section 4 discusses the implications of the research including the study's strength and limitations and overall conclusion.

1.2. Public support for climate policies

Environmentally relevant behaviour can be shaped by different policy tools, often distinguished by their level of coerciveness. A common distinction is between 'push' and 'pull' measures (Ejelöv & Nilsson, 2020; Steg et al., 2006): push policies aim to discourage undesirable behaviours through costs or restrictions (Drews & van den Bergh, 2016; Poortinga & Drews, 2023), while pull measures promote desired behaviours through incentives or other forms of support (Drews & van den Bergh, 2016; Poortinga & Drews, 2023). The literature shows that restrictive push policies are less popular than non-coercive pull measures (Ejelöv & Nilsson, 2020; Steg et al., 2006). An alternative classification categorises policies into regulatory, economic, and informational instruments (Vedung, 1998), with regulatory instruments using laws and standards; economic instruments applying financial incentives or disincentives; and informational instruments providing relevant information to increase knowledge or awareness to change behaviour.

Empirical research shows considerable variation in support across different policy types, supporting the need for more fine-grained distinctions: financial instruments are generally viewed less favourably than non-financial measures (Kirchgässner & Schneider, 2003); and financial disincentives are supported less than financial incentives (Levi, 2021; Poortinga & Drews, 2023; Rhodes et al., 2017). Bretter and Schulz (2024) found that, although there is majority support for all policy types in the UK, more stringent regulatory and market-based instruments are less popular than information-based and voluntary measures. Similarly, Poortinga et al. (2022) reported lower support for restrictive regulatory measures, than for financial disincentives and financial support, and particularly non-coercive information-based policies.

While existing research provides a clear overall picture of which climate policies are liked or disliked, several limitations restrict more nuanced analyses. First, most studies focus primarily on financial instruments, particularly carbon taxes (Drews et al., 2022; Fairbrother et al., 2019; Hardisty et al., 2019; Levi, 2021; Maestre-Andrés et al., 2019). Where comparisons are made, they typically involve only a small set

[1] In the UK, the proportion of people who were very or extremely worried about climate change increased from 25% in 2016 (Poortinga et al., 2018) to 46% in 2022 (Demski et al., 2022).

of climate policies and are not systematic (Poortinga et al., 2023; Sparkman et al., 2022). Second, existing research tends to compare broad policy categories rather than specific attributes (Geiger & Swim, 2016), making it difficult to systematically assess how distinct features shape public support. Third, many studies present climate policies in abstract terms (Marquart-Pyatt et al., 2019; Poortinga et al., 2022), focus on a single behavioural domain (Steg et al., 2006; Swim & Geiger, 2021), or examine a range of measures across sectors, often combined into composite indices (Bretter & Schulz, 2024; Ejelöv et al., 2022). Yet, public support for climate policy is likely to vary across behavioural domains (Kukowski et al., 2023; Poortinga et al., 2023). For example, people appear more resistant to policies targeting travel and dietary behaviours than to those aimed at household energy use (Cherry et al., 2024). However, such domain-specific differences have not been explored systematically before, and could reveal patterns in public support that are relevant for policymakers (Poortinga et al., 2023).

1.3. Perceived fairness and effectiveness of climate policies

Support for climate policies depends not only on specific policy attributes but also on how individuals appraise them. A recent meta-analysis identified perceived fairness and effectiveness as some of the strongest predictors of public support for climate taxes and regulations (Bergquist et al., 2022).

Perceived fairness has distributive and procedural components, referring to how costs and rewards of a policy are shared across different groups, and to the process of decision making, in particular whether it is transparent and takes into account views of everyone affected (Greenberg, 1986). There is strong evidence showing that both components, as well as general fairness perceptions, play a critical role in climate policy support (Bergquist et al., 2022; Ejelöv & Nilsson, 2020; Maestre-Andrés et al., 2019). For example, Dreyer and Walker (2013) found that general fairness perceptions strongly predict public support for a carbon tax in Australia (Dreyer & Walker, 2013); Poortinga et al. (2023) identified fairness perceptions as one of the most reliable predictors of support for different net-zero policies in the UK; and Clayton (2018) reported similar findings for various environmental measures in the US (Clayton, 2018). Schmöcker et al. (2012) and Kim et al. (2013) found that both distributive and procedural fairness significantly shape public acceptability of coercive measures, such as road pricing and environmental taxation in the UK, Japan, and the US (Kim et al., 2013; Schmöcker et al., 2012). In Germany, Huttarsch and Matthies (2024) showed that general fairness perceptions mediate the effects of perceived distributive and procedural fairness (Huttarsch & Matthies, 2024).

In a similar way, perceived effectiveness strongly influences policy support: people who view climate policies as more effective in achieving their intended goals are also more likely to support them (Baranzini & Carattini, 2017; Huttarsch & Matthies, 2024; Swim & Geiger, 2021). For example, Swim and Geiger (2021) found that that anticipated environmental benefits are among the strongest predictors of climate policy support in the US; Huttarsch and Matthies (2024) found that perceived effectiveness independently predicts carbon pricing support, alongside fairness perceptions in Germany; and Baranzini and Carattini (2017) linked higher perceived effectiveness of carbon taxes to greater acceptability in Switzerland. Although much of this research centres on financial instruments, perceived effectiveness has been shown to be important across a broader range of climate policies (Drews & van den Bergh, 2016; Steg et al., 2006; Swim & Geiger, 2021).

While perceived fairness and effectiveness have been identified as key determinants of support for climate policies (M. Bergquist et al., 2022; Ejelöv & Nilsson, 2020; Maestre-Andrés et al., 2019), most studies focus on appraisals of individual policies, particularly climate taxes, rather than examining how these perceptions vary across policy types. It therefore remains unclear whether such perceptions can help explain differences in support for different policies. For example, it is not yet understood whether push measures are seen as less acceptable than pull measures *because* they are considered less effective and fair (Ejelöv & Nilsson, 2020). There are indications that this may be the case: less supported policies, such as carbon taxes and regulatory restrictions, are also seen as less effective and fair, whereas more popular measures, such as subsidies and information campaigns, are generally viewed more favourably on both dimensions (Clayton, 2018). Indeed, emerging evidence suggests that anticipated benefits partly mediate the relationship between policy attributes and policy support (Swim & Geiger, 2021).

1.4. Second-order beliefs about climate policies

In addition to research on policy-specific appraisals, a growing literature has examined the role of second-order beliefs in climate policy support. The research is based on the idea that people often underestimate public support for climate action, a phenomenon that is known as 'pluralistic ignorance' (Sparkman et al., 2022), and are therefore less likely to express their own views, conforming instead to what they perceive as the majority opinion. This creates a spiral of silence, where supporters hesitate to speak out, reinforcing the belief that such policies are unpopular (Geiger & Swim, 2016). This then may make policymakers more reluctant to act, fearing a lack of legitimacy and public mandate to implement them (Lockwood, 2022; Patterson, 2023).

Sparkman et al. (2022) found that Americans underestimate the prevalence of support for major climate change mitigation policies by around 20–35%. A recent preprint found similar levels of underestimation across 18 pro-environmental policies in the US (Lees et al., 2023). Results align with the false consensus effect, whereby opponents of climate action underestimate public support to a greater extent than supporters. For example, while supporters of carbon taxation typically underestimate how common their view is, opponents tend to overestimate the prevalence of their own position (Drews et al., 2022). Similarly, Dixon et al. (2024) found that Republicans who oppose climate action are more likely to underestimate how supportive other Republicans are of climate policies (Dixon et al., 2024). Mildenberger and Tingley (2019) showed that US and Chinese respondents' estimates of public views on climate change largely reflected their own levels of support for climate policies. Pluralistic ignorance appears to be widespread: in a global study across 125 countries, Andre et al. (2024) found that, despite strong support for climate action, people consistently underestimated their fellow citizens' willingness to act.

As with the literature on perceived fairness and effectiveness, most research on second-order beliefs has focused on a single or small set of policies (Andre et al., 2024; Dixon et al., 2024; Drews et al., 2022; Sparkman et al., 2022). This similarly leaves open the question as to whether second-order beliefs can help explain differences in support for different policies. Some evidence suggests that perception gaps vary by policy type, with larger gaps for more coercive measures such as carbon taxes (Sparkman et al., 2022). However, findings are mixed: other studies report smaller effects for carbon taxation and suggest that pluralistic ignorance may be primarily driven by holders of minority views (Dixon et al., 2024).

1.5. The current study

The literature review has shown that, although many studies have examined public preferences for different policy types, as well as the role of policy appraisals (Bergquist et al., 2022; Ejelöv & Nilsson, 2020; Maestre-Andrés et al., 2019) and second-order beliefs (Andre et al., 2024; Dixon et al., 2024; Drews et al., 2022; Sparkman et al., 2022), important research gaps remain.

The current study addresses these gaps by combining research on policy attributes, policy-specific appraisals, and second-order beliefs to investigate how support varies across different climate policy types, and whether perceived fairness, perceived effectiveness, and perceived levels of climate policy support can help explain (or: mediate) these differences. The study employs a conceptual framework that combines the push–pull distinction (Ejelöv et al., 2022) with Vedung's (1998) categorization of financial and regulatory instruments. This 2×2 framework classifies climate policies based on whether they aim to discourage undesired behaviours through financial disincentives or regulatory restrictions, or encourage desired behaviours through financial incentives or regulatory support. This framework is applied across three behavioural domains (i.e. diet, household energy use and travel) where climate action is urgently needed (Verfuerth et al., 2023).

The study has three objectives, aligned with the main steps of regression-based mediation analysis (Baron & Kenny, 1986; MacKinnon et al., 2007). First, the study examines public support for climate policies with different attributes, specifically (i) push versus pull measures, (ii) financial versus regulatory instruments, and (iii) policies targeting diet-, energy-, or travel-related behaviours (Objective 1). Second, it investigates how these policies are appraised in terms of perceived fairness, perceived effectiveness, and perceived public support (Objective 2). Third, the study assesses the extent to which policy-specific appraisals and second-order beliefs mediate differences in support across policy types (Objective 3).

2. Methods

2.1. The study

An online survey was conducted on 16–17 October 2023, with 2,002 participants recruited through Prolific, an online research platform. Quotas for gender, age, and ethnicity were set to ensure the sample reflected the demographic composition of the UK population. Participants were compensated for their time. Supplementary Table 1 provides a description of the sample. The survey was introduced as being on climate change and what the government should do to address it. Ethical approval was obtained from the School of Psychology Research Ethics Committee at Cardiff University (ethics reference number: EC.23.09.12.6839).

2.2. Procedure

The survey examined twelve climate policies across the behavioural domains of diet, energy, and travel. Within each domain, four distinct policies were included, reflecting a 2 × 2 design of financial versus regulatory measures and push versus pull measures. Consequently, each domain featured a financial disincentive, a financial incentive, a regulatory restriction, and a regulatory provision (see Table 1). Respondents were presented with concise descriptions of the different policies, followed by questions assessing their policy support, policy-specific appraisals and second-order beliefs. The descriptions of the twelve policies were of similar length, structure and phrasing to ensure comparability (see Supplementary Table 2). Respondents were shown six out of twelve policies to reduce the burden on them, by randomly selecting two of the four policies for each behavioural domain. This stratified randomization ensured that each policy was assessed by approximately 1,000 respondents and each unique pairwise policy combination by around 500 respondents, providing sufficient statistical power (0.80) to detect small effects (Cohen's $d = 0.11$) at the 5% significance level, even within subsamples used for policy comparisons.

2.3. Measures

Policy support was measured by asking respondents to what extent they support or opposed the 12 different climate policies. The question had a 5-point response scale ranging from 1 'Strongly oppose' to 5 'Strongly support', and 3 'Neither support nor oppose' as the scale midpoint.

Perceived fairness of the climate policies was measured with two items from Poortinga et al. (2023) that were shown to have good psychometric properties. Respondents were asked 'How confident, if at all, are you that [POLICY] will … ' (1) give a fair outcome to everyone affected, and (2) not be biased towards any one particular group. The 5-point response scale ranged from 1 'Not at all confident' to 5 'Extremely confident'. The items were highly correlated in all three behavioural domains of energy ($r = 0.78$–0.83), travel ($r = 0.61$–0.73) and diet (0.74–0.85), and therefore combined into scales.

Perceived effectiveness of the climate policies was measured by asking respondents 'How effective, if at all, do you think [POLICY] is in reducing carbon emissions to address climate change?' Respondents could use the following 5-point scale: 1 'Not at all effective', 2 'Not very effective', 3 'Fairly effective', 4 'Very effective', and 5 'Extremely effective'.

Table 1. Attributes, descriptions, and labels of the twelve climate policies.

Push vs pull	Financial vs regulation	Behavioural Domain		
		Diet	Energy	Travel
Push	Financial (disincentive)	Higher tax on meat/dairy products (Diet tax)	Higher tax on energy (Energy tax)	Higher tax on fuel (Travel tax)
Pull	Financial (incentive)	Subsidise meat-free/plant-based options (Diet subsidy)	Subsidise low-carbon heating systems (Energy subsidy)	Subsidise electric vehicles (Travel subsidy)
Push	Regulation (restriction)	Phase out meat/dairy products (Diet restriction)	Phase out gas/oil boilers (Energy restriction)	Phase out petrol/diesel cars (Travel restriction)
Pull	Regulation (provision)	Provide meat-free/plant-based options (Diet provision)	Provide low carbon heating systems in new homes (Energy provision)	Provide EV charging infrastructure (Travel provision)

Note: Full descriptions of the twelve climate policies are provided in Supplementary Table 2.

Table 2. Associations of policy attributes with policy support, perceived public policy support, perceived effectiveness, perceived fairness.

	Policy support *B* (SE)	Perceived effectiveness *B* (SE)	Perceived fairness *B* (SE)	Perceived public policy support *B* (SE)
Fixed effects				
Constant	3.245*** (0.075)	2.581*** (0.063)	2.580*** (0.055)	39.685*** (1.246)
Push (vs Pull)	−1.101*** (0.018)	−0.380*** (0.015)	−0.735*** (0.014)	−22.699*** (0.356)
Regulation (vs Financial)	0.192*** (0.018)	0.101*** (0.015)	0.208*** (0.014)	4.015*** (0.354)
Energy (vs Diet)	0.441*** (0.021)	0.433*** (0.017)	0.100*** (0.017)	8.956*** (0.416)
Travel (vs Diet)	0.481*** (0.021)	0.284*** (0.017)	−0.018 (0.017)	6.500*** (0.416)
Gender: female (vs male)	0.051 (0.041)	0.081* (0.035)	−0.028 (0.030)	−1.020 (0.679)
Age	−0.110*** (0.013)	−0.109*** (0.011)	−0.105*** (0.010)	−1.228*** (0.222)
Ethnic background: White (vs non-White)	0.072 (0.063)	−0.089 (0.053)	−0.113* (0.046)	−1.624 (1.037)
Income: £30,000 to £59,999	0.092 (0.049)	0.130** (0.041)	0.077* (0.036)	1.592* (0.809)
Income: £60,000 or more	0.205*** (0.055)	0.106* (0.046)	0.102* (0.040)	1.895* (0.907)
Income: prefer not to say	−0.140 (0.100)	−0.058 (0.084)	−0.050 (0.074)	0.072 (1.655)
Perceived opposition (vs perceived support)	0.004 (0.041)	0.005 (0.034)	0.035 (0.030)	12.668*** (0.676)
Random effects				
Level 2 (individual)	0.824	0.697	0.597	12.99
Level 1 (policies)	0.951	0.771	0.738	18.50
AIC	35,858.47	30,996.96	29,519.39	105,688.26
Log likelihood	17,915.24	15,484.48	14,745.69	52,830.13
Observations	11,858	11,846	11,818	11,868

*$p < 0.05$.
**$p < 0.01$.
***$p < 0.001$.

Perceived public policy support was assessed by an item adapted from Drews et al. (2022). Respondents were asked 'To the best of your knowledge, what percentage (%) of people in the UK do you think [SUPPORT/OPPOSE] [POLICY]'. Respondents could use a sliding scale that ranged from 0% to 100%. The slider was anchored at 0%, and respondents had to move the slides in order to continue to the next question. Respondents were randomly assigned to one of two versions of the question: asking them to either estimate the percentage of people *supporting* the policies or the percentage of people *opposing* the policies. The estimates were combined after reversing the responses of people who asked to estimate opposition to the policies (e.g. 67% was turned into 33%).

The mean policy support, perceived fairness, perceived effectiveness and perceived public policy support ratings for the twelve climate policies are presented in Supplementary Table 3. These ratings were all standardised for the mediation analysis.

The study further included the sociodemographic variables of gender, age, ethnic background, and household income as covariates (see Supplementary Table 1). Gender included male and female categories. Other responses ($n = 10$) were coded as missing values. Ethnic background was categorised into two groups: 'White' and 'Other', which included individuals from Asian/Asian British, Black/African/Black British/Caribbean, Mixed/Multiple, and other ethnic backgrounds. Household income was recoded into four categories: £29,999 or less, between £30,000 and £59,999, £60,000 or more, and 'Prefer not to say'.

Separate Level-1 dummy variables were created to capture the policy attributes of push vs. pull, financial vs. regulatory, and behavioural domain (energy vs. diet; travel vs. diet), and a Level-2 dummy variable indicated whether respondents were asked to estimate public support or opposition to the different policies.

2.4. Analytical approach

The study used a multilevel approach to the mediation analyses (Baron & Kenny, 1986; MacKinnon et al., 2007), with multiple policy evaluations (Level 1) nested within individuals (Level 2). This repeated-measures structure with substantial clustering (see ICCs below) justified the use of multilevel modelling, enabling the decomposition of within-person variation (i.e. differences in support across policies) and between-person variation (i.e. individual differences in overall support). A key advantage of multilevel modelling is its capacity to

handle incomplete designs (Fitzmaurice et al., 2008; Snijders & Bosker, 2012), unlike traditional repeated-measures ANOVAs that require complete data (cf. Swim & Geiger, 2021). All statistical analyses were conducted using R statistical software (version 4.3.2) and RStudio (version 2021.09.0 + 351).

First, a series of multilevel regression analyses were conducted for policy support to address Objective 1. A 'null' model without predictors was used to estimate the intraclass correlation (ICC). The ICC is calculated as the Level-2 random intercept variance divided by the total variance (i.e. Level-2 plus residual variance). For policy support, the ICC was 0.42, indicating that 42% of the variance occurred at the individual level and 58% at the policy level. This was followed by a model that included the policy attributes (i.e. push vs. pull, regulatory vs. financial, behavioural domain) and person-level predictors (i.e. gender, age, ethnicity, income). The full model specifications are provided in Supplementary Text Box 1.

Second, a series of random multilevel models were constructed for the policy-specific appraisals of perceived effectiveness, perceived fairness, and perceived public support respectively (Objective 2), using the same model specifications as for policy support. Null models were again used to calculate ICCs, which were 0.47 for perceived effectiveness, 0.42 for perceived fairness, and 0.39 for perceived public support.

Third, regression-based mediation analyses were conducted to examine whether policy-specific appraisals and second-order beliefs about perceived levels of public support can explain differences in support for the different types of climate policies (Objective 3). This involved the construction of multilevel regression models in which the standardised perceived effectiveness, perceived fairness, and perceived levels of public policy support variables were regressed on the different policy attributes. Two models were constructed for the standardised policy support measure: Model 1 regressed policy support on the different policy attributes, and Model 2 added the policy-specific appraisals and second-order beliefs. All models controlled for gender, age, ethnic background, and household income, as well as the opposition vs support dummy.

3. Results

3.1. Public support for climate policies

The results show large differences in support for and opposition to the twelve climate policies, with a clear pattern. Figure 1 shows that all pull measures were supported by a majority and opposed by less than a

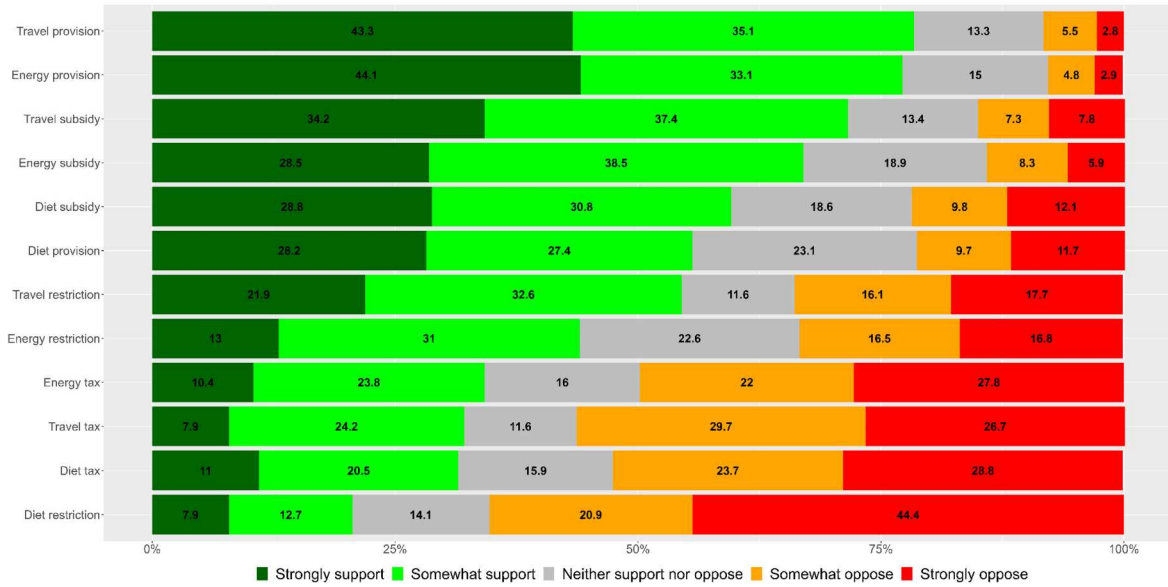

Figure 1. Support for and opposition to the twelve climate policies (in %).

quarter of the sample (also see Supplementary Table 3). The travel provision and energy provision policies (78% and 77%) and travel subsidy and energy subsidy policies (72% and 67%) were all supported by large majorities. Diet subsidy and diet provision policies were somewhat less supported, but still by clear majorities (60% and 56%). Most push measures were supported by a minority and opposed by a majority, apart from travel restrictions, which still had majority support: Travel restriction and energy restriction policies were supported by 55% and 44%, respectively; travel tax and energy tax policies by 32% and 34%, respectively. Diet tax and diet restriction policies were the least popular, with 32% and 21% support.

Multilevel regression analyses conducted to address Objective 1 show that push measures are supported less than pull measures; financial measures less than regulations; and dietary measures less than energy and travel measures (see Table 2). In terms of the covariates, the results shows that climate policy support decreases with age, with older age groups less supportive overall. Higher-income individuals are more supportive of these policies compared to those with a lower income. Gender and ethnic background do not appear to be significantly associated with climate policy support. The policy support model showed significant improvement in fit compared to the null model, indicated by a significantly lower deviance ($\chi^2(155) = 4170.14$, $p < .001$) and a much lower AIC (Model 0: AIC = 40,006.61; Model 1: AIC = 35,858.47; ΔAIC = 4148.14).

3.2. Perceived effectiveness and fairness of climate policies

Multilevel regression analyses conducted to address Objective 2 show similar patterns for perceived effectiveness and fairness: push measures were perceived as less effective and fair than pull measures, financial measures were perceived as less effective and fair than regulatory measures, and dietary measures were perceived as less effective and fair than energy and travel measures (see Table 2). In both cases, model fit improved significantly over the null model, as evidenced by lower deviance and AIC values (For the effectiveness model: $\chi^2(155) = 1807.72$, $p < .001$; AIC = 32,782.67 (Model 0) vs. 30,996.96 (Model 1), ΔAIC = 1785.71. For the fairness model: $\chi^2(155) = 3135.18$, $p < .001$; AIC = 32,632.57 (Model 0) vs. 29,519.39 (Model 1), ΔAIC = 3113.18). In terms of the covariates, the results show that both perceived effectiveness and perceived fairness of climate policies decline with age, with older individuals perceiving them as less effective and less fair than younger individuals. Mid- and high-income groups are more likely to think than low-income groups that climate policies are effective and fair. Women perceive climate policies as more effective than men, while respondents from white ethnic backgrounds perceive the climate policies as less fair as compared to those from non-white backgrounds.

3.3. Second-order beliefs about climate policies

Further multilevel regression analyses conducted to address Objective 2 show that public support is perceived to be lower for push than for pull measures, lower for financial than for regulatory measures, and lower for dietary policies than for those targeting energy and travel behaviours (see Table 2 and Supplementary Figure 1). The perceived public support model showed significant improvement in fit compared to the null model, indicated by a significantly lower deviance ($\chi^2(155) = 5565.0$, $p < .001$) and a much lower AIC (Model 0: AIC = 111,231.3; Model 1: AIC = 105,688.3; ΔAIC = 5546). In terms of the covariates, the results show that older respondents tend to perceive lower levels of public support for climate policies compared to younger ones, while people in middle- and high-income groups perceive higher levels of support than those in low-income groups.

The more detailed results reported in Supplementary Table 3 show that actual public support is systematically underestimated by about 18%, while opposition is overestimated by 16%. However, the degree of misperception varies across policy types. Support for push measures was underestimated to a lesser extent than support for pull measures. Specifically, support for taxes was underestimated by approximately 9–13%, and support for restrictions by 4–21%. In contrast, support for subsidies was underestimated by 21–25%, and support for provisions by 17–30%. A reverse pattern was observed for opposition estimates, with opposition to taxes overestimated by 15–17%, and opposition to restrictions by 6–26%. In comparison, opposition to subsidies was overestimated by 23–24%, and opposition to provisions by 25–28%.

3.4. Role of policy-specific appraisals and second-order beliefs in support for climate policies

The results of the mediation analyses conducted for Objective 3 are summarised in Figure 2. It shows that the policy attribute of push versus pull (Panel A), regulatory versus financial (Panel B) and diet versus energy and travel (Panel C) are all significantly associated with perceptions of fairness, effectiveness and public policy support (at the $p < 0.001$ level), consistent with the earlier findings. There was one exception: no significant difference was found between travel-related and dietary measures. The policy-specific appraisals and second-order beliefs in turn are significantly associated with policy support (again all at the $p < 0.001$ level).

The total effects in Figure 2 show that, before controlling for mediators, push policies are significantly less supported than pull policies, financial policies are less supported than regulatory ones, and diet-related policies are less supported than energy-related ones. The direct effects, after accounting for the mediators of perceived effectiveness, fairness, and perceived public policy support, are substantially smaller. The effect of push versus pull policies is more than halved. Likewise, the preference for regulatory over financial policies drops to a near-null effect.

The differences across behavioural domains also diminish, particularly between energy and diet. The indirect effects can be derived from Figure 2 using the product-of-coefficients approach. Panel A shows that lower support for push policies can be largely explained by perceived effectiveness ($B = -0.142$, SE = 0.006, $Z = -22.39$, $p < .001$), perceived fairness ($B = -0.160$, SE = 0.007, $Z = -24.69$, $p < .001$), and perceived public policy support ($B = -0.164$, SE = 0.006, $Z = -25.52$, $p < .001$). Panel B indicates that the higher support for regulatory over financial instruments is also primarily explained by the indirect effects through perceived effectiveness ($B = 0.038$, SE = 0.006, $Z = 6.60$, $p < .001$), perceived fairness ($B = 0.045$, SE = 0.004, $Z = 12.76$, $p < .001$), and perceived public policy support ($B = 0.029$, SE = 0.003, $Z = 10.73$, $p < .001$). Panel C shows that energy-related policies receive greater support than diet-related ones partly because they are viewed as more effective ($B = 0.161$, SE = 0.007, $Z = 22.24$, $p < .001$), fair ($B = 0.022$, SE = 0.004, $Z = 5.88$, $p < .001$), and popular ($B = 0.065$, SE = 0.004, $Z = 16.77$, $p < .001$). Similarly, travel-focused policies receive greater support than diet-related because they are seen as more effectiveness ($B = 0.105$, SE = 0.007, $Z = 15.43$, $p < .001$) and popular ($B = 0.048$, SE = 0.004, $Z = 13.41$, $p < .001$). However, the indirect effect via fairness is non-significant ($B = -0.0039$, SE = 0.004, $Z = -1.06$, $p = .290$).

4. Discussion

4.1. Summary of results

This study investigated differences in public support for climate policies in the UK and whether policy-specific appraisals and second-order beliefs can help explain these differences. The findings show that restrictive push measures are supported far less than non-coercive pull measures; financial measures are less popular than regulatory measures; and measures aimed at changing dietary behaviours are supported less than those aimed at energy and travel behaviours. The study also finds that perceived effectiveness, perceived fairness and perceived levels of public policy support ('second-order beliefs') follow similar patterns across these policy attributes. It shows that these perceptions mediate the link between policy attributes and public support. The study further finds that levels of pluralistic ignorance are generally smaller for less supported push measures than for more popular pull measures.

4.1.1. Contributions to the literature

The results show substantial differences in public support for different climate policies, aligning with previous research in the UK, such as Bretter and Schulz (2024) and Poortinga et al. (2022, 2023), who found that stringent policies receive less support than more lenient ones. This pattern is consistent with other international research demonstrating that push measures are generally less popular than pull measures (Drews & van den Bergh, 2016; Ejelöv & Nilsson, 2020; Steg et al., 2006). Similarly, the results align with studies showing that financial instruments are supported less than non-financial regulatory measures (Kirchgässner & Schneider, 2003), with financial disincentives, such as environmental taxes, being particularly unpopular (Levi, 2021; Poortinga &

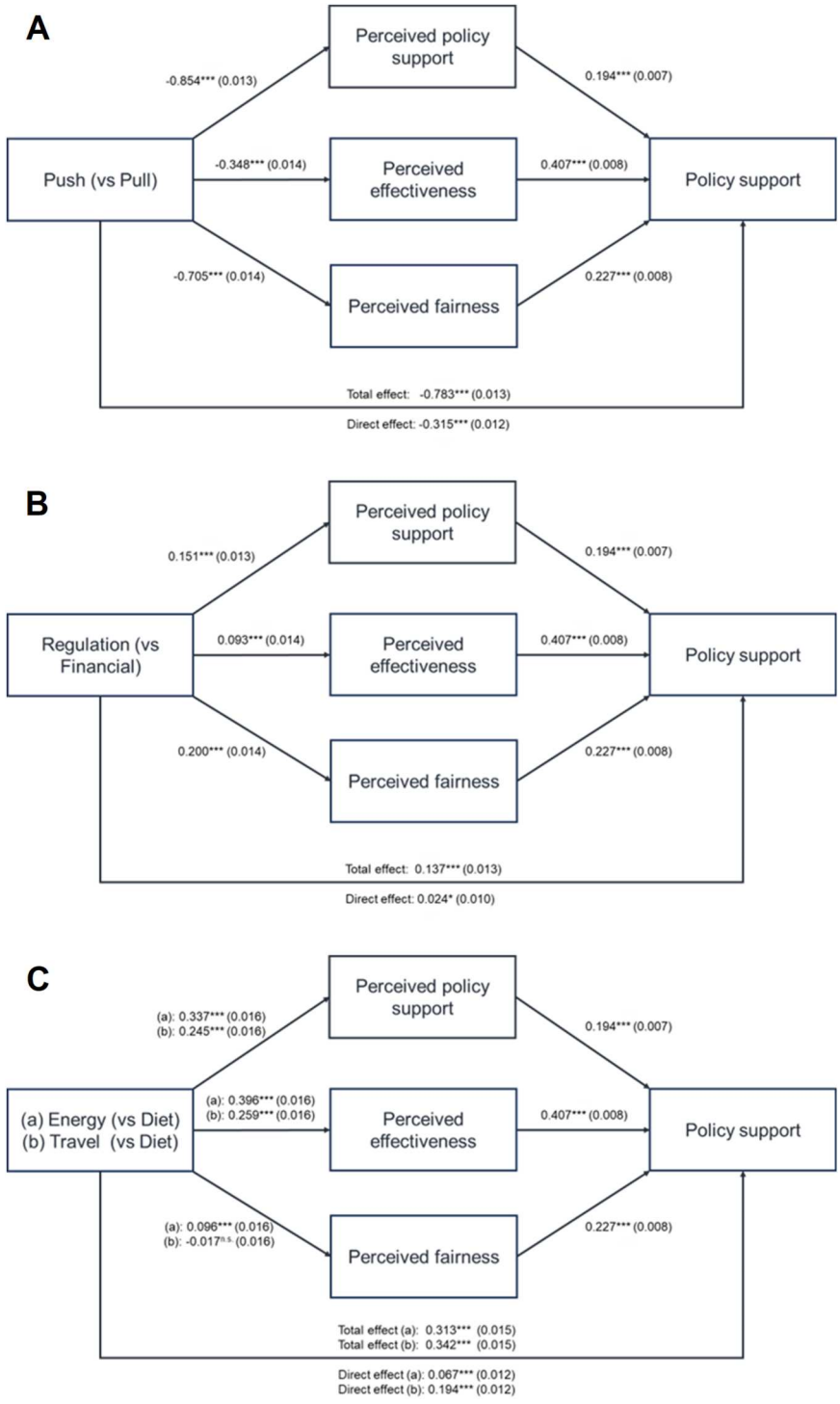

Figure 2. Associations of attributes of the twelve climate policies with perceived public policy support, perceived effectiveness, perceived fairness, and policy support. Panel A shows the results for Push versus Pull measures, Panel B shows the results for Regulatory versus Financial measures, and Panel C shows the results for Energy and Travel versus Diet measures.

Drews, 2023; Rhodes et al., 2017). The key contribution of this study is that it systematically demonstrates these effects using a conceptual framework combining the push–pull distinction (Ejelöv et al., 2022) with Vedung's (1998) categorisation of financial and regulatory instruments across three behavioural domains. It shows that policies targeting dietary behaviours receive consistently lower support than those targeting energy or travel behaviours.

Although previous research has highlighted the importance of policy-specific appraisals, such as perceived effectiveness and fairness (Bergquist et al., 2022; Ejelöv et al., 2022; Maestre-Andrés et al., 2019), most has focused on a single or small number of policies. Although studies have found that more widely supported measures, such as subsidies and informational campaigns, are also perceived as fairer and more effective (e.g. Clayton, 2018), the current study systematically shows that patterns of perceived fairness and effectiveness closely mirror those of policy support across different attributes and behavioural domains. This is in contrast to other recent research suggesting that perceived effectiveness and fairness do not always go hand-in-hand with policy support (Dechezleprêtre et al., 2025). Research on second-order beliefs has similarly focused on a small number of specific measures (Andre et al., 2024; Dixon et al., 2024; Drews et al., 2022; Sparkman et al., 2022), with only few studies examining how these perceptions vary across different policy types (Lees et al., 2023). The current study confirms that public support for climate policies is systematically underestimated (Andre et al., 2024; Drews et al., 2022; Sparkman et al., 2022). Unlike earlier studies that reported gaps large enough to invert public opinion (e.g. Sparkman et al., 2022), our findings show that pluralistic ignorance is smaller for push measures than for pull measures. Whereas support for popular pull policies with majority support tends to be underestimated, estimates of minority support for push measures are generally more accurate, except for travel restriction policies. The main contribution of this study is to demonstrate, for the first time, that both policy-specific appraisals and second-order beliefs can largely explain differences in support across various types of climate policies. While the importance of these perceptions have been demonstrated for individual measures, here it is shown that they partly mediate the relationship between policy attributes and public support.

4.2. Strengths, limitations, and future research

The current research has a number of strengths and limitations, which provide pointers for future research. A strength is the large and representative sample, which has advanced our understanding of public support for different types of climate policies in the UK, and the role of policy-specific appraisals and second-order beliefs therein. When studying public attitudes towards climate change policies, researchers must decide whether to use hypothetical climate policies, which can be stylised to focus on specific attributes, or existing policies to elicit more meaningful public responses (Bretter & Schulz, 2024). In this study, we selecting a set of policy proposals from existing reports (Poortinga et al., 2022), and then stylising them across different behavioural domains. While these remain hypothetical instruments, they are grounded in existing or proposed policies.

A limitation of the study is its reliance on cross-sectional data, which precludes making claims about causality. While the analyses assume that policy-specific appraisals and second-order beliefs influence policy support, it is equally plausible that the results reflect a rationalisation bias whereby individuals' pre-existing support shapes their further perceptions of the policy. The association between personal and perceived public policy support can also be interpreted as a false consensus effect (Ross et al., 1977). This bias is well documented in the context of climate policies, with opponents being more likely to underestimate public support for climate action (Leviston et al., 2013; Sokoloski et al., 2018; Sparkman et al., 2022). However, experimental evidence on the effects of second-order beliefs is mixed: while some studies find that norm interventions communicating information about other people's beliefs can change policy support (Mildenberger & Tingley, 2019; Tankard & Paluck, 2016), others report that information provision has little or no effect on policy support (de Groot & Schuitema, 2012; Drews et al., 2022). Particular caution is needed when interpreting the direction of the mediation relationships. Mediation analysis is based on the assumption that there are no unmeasured confounders between the mediator and the outcome (Imai et al., 2010; Schulz et al., 2022), which is difficult to satisfy in cross-sectional research, as omitted variable bias remains a concern even after adjusting for observed covariates.

It is important to recognise that public perceptions of fairness and effectiveness may not always align with actual policy outcomes (Dresner et al., 2006). For example, carbon taxes are often viewed negatively in terms of fairness and effectiveness, despite them aligning with the 'polluter pays' principle and offering strong incentives to reduce emissions (Baranzini & Carattini, 2017). Individuals' effectiveness appraisals even appear opposite of experts' assessments of effectiveness (Drews et al., 2024). Both regulation and financial disincentives can effectively reduce emissions (Best et al., 2020; Horbach et al., 2023), with pricing interventions, particularly energy taxes, being uniquely capable of delivering substantial emissions reductions (Stechemesser et al., 2024). In contrast, other instruments, such as bans, labels, or subsidies, may only be effective as part of a broader policy mix. Although carbon taxes tend to outperform emissions trading schemes (Green, 2021), their success depends on being set at sufficiently high levels (Haites, 2018).

While this study systematically investigated support for different policy types, it did not focus on the finer details of policy instrument design (Maestre-Andrés et al., 2019) or policy mixes (van den Bergh et al., 2021). The finding that financial disincentives such as carbon taxes are perceived as particularly unfair may reflect the disproportionate burden they place on lower-income households, who spend more on energy-intensive goods. This may explain a public desire for more supportive policies. Indeed, social disadvantage contributes almost as much to fuel tax opposition as climate change attitudes (Büchs et al., 2024). One promising policy response may therefore involve revenue recycling, where tax revenues are returned to lower-income households to compensate for regressive distributional effects (Maestre-Andrés et al., 2019), or earmarked for socially or environmentally beneficial initiatives (Baranzini & Carattini, 2017). Future research should examine such design features, particularly in terms of how they shape perceptions of fairness and effectiveness. A stronger emphasis on policy combinations is also needed, as existing evidence on their impacts is mixed. Although some studies suggest that bundling policies can enhance public support (Bergquist et al., 2020), others find little evidence of synergistic effects (Drews et al., 2020).

Furthermore, the study focused specifically on the attributes of climate policies and the way they are appraised by the public. However, policy support can also be explained by individual-level factors, such as climate concern, institutional trust, values, worldviews, and ideological orientation (Bergquist et al., 2022; Drews & van den Bergh, 2016; Jones, 2011; Kahan & Braman, 2006; Poortinga et al., 2022, 2023). More research is needed to examine how these interact with policy attributes (Bretter & Schulz, 2025). Different instruments address the same problem in distinct ways, but have implications that may or may not resonate with individuals' worldviews or notions of fairness. As Bretter and Schulz (2025) argue, individuals with particular worldviews tend to favour specific types of policies. Furthermore, perceptions of fairness are not monolithic; but reflect different normative principles, such as merit, equity, or need, which in turn shape individuals' acceptance or rejection of particular policies (Povitkina et al., 2021). Future research should investigate these diverse conceptions of fairness to better understand why certain policies are perceived as more or less unfair by different individuals.

4.3. Conclusion

The path to net-zero emissions depends not only on the effectiveness of climate policies but also on public support for them. While this study found that the public favours less restrictive measures, such policies are often insufficient to achieve deep carbon reductions. More ambitious instruments are needed, yet these often face significant opposition due to concerns about fairness and personal freedom. This raises a dilemma for policymakers, as the trade-off between effectiveness and acceptability putting the feasibility of reaching net-zero at risk (Nature Sustainability, 2021). The smaller perception gap for restrictive measures may limit the potential for informational norm interventions to increase public acceptance of more ambitious policies (Drews et al., 2022). While communicating actual levels of public support may help with already popular measures, additional strategies are needed to enhance the acceptability and legitimacy of less-supported push measures. Addressing this challenge requires better integration of environmental and social outcomes in the design of eco-social policy instruments (Koch et al., 2023), with features such as revenue recycling to address concerns about fairness (Levi, 2021; Maestre-Andrés et al., 2019). As fairness is inherently normative and contested, it must be considered in conjunction with public values and worldviews to understand how

they shape judgments, thereby better enabling policymakers to navigate conflicting perceptions of fairness, effectiveness, and support across society.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

We acknowledge support from the Economic and Social Research Council (ESRC) through the Centre for Climate Change and Social Transformations (CAST) [Grant Ref: ES/S012257/1].

Data availability statement

Data supporting this study are openly available from the UK Data Service at https://dx.doi.org/10.5255/UKDA-SN-857389.

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