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Framing climate policy around energy independence enhances acceptance and perceived effectiveness: evidence from a Finnish survey experiment

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Abstract
We investigated the impact of three justifications for implementing a road traffic emission trading system on policy acceptance and perceived effectiveness. One frame is based on increased energy independence from non-EU countries, another on potential economic benefits, and a third on ensuring efficient greenhouse gas (GHG) mitigation. The data utilized originated from an online survey experiment ($n = 1504$) administered in Finland in the spring of 2024. We found that the justification referring to energy independence marginally increased the acceptability of the policy, whereas the justifications appealing to potential economic benefits and effective emissions reductions did not. The energy independence frame particularly influences those who perceive climate change as a moderate risk. The results regarding perceived policy effectiveness are similar, indicating a strong association between these evaluations. It is likely that, at least in the Finnish context, the link between climate change mitigation efforts and energy independence has become more pronounced following the Russian attack on Ukraine.

Keywords Climate change policy · Policy acceptance · Framing effects · Mitigation · Survey experiment · Crisis

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1 Introduction

The public acceptance of climate policies holds significant value in representative democracies. It not only aids in the implementation of the policies but also contributes to their continuity and compliance. Despite the urgency of effective mitigation efforts, their acceptance should not be taken for granted. For instance, climate policies involving economic trade-offs or additional expenses, such as carbon tax or the emission trading system, are frequently met with disapproval (Mayer and Smith 2017; Drews and van den Bergh 2016), with support often diminishing during difficult times (Kachi et al. 2015; Beiser-McGrath 2022).

However, crises can present opportunities for climate mitigation, particularly when climate policies help address other challenges beyond climate change. For example, climate change regulations might stimulate economic growth by offering incentives for industries to accelerate the green transition. This, in turn, could lead to decreased dependence on energy imports from non-EU countries, which can bring geopolitical benefits.

Previous framing research has extensively explored the impacts of highlighting co-benefits on policy endorsement. However, we identify a significant research gap that justifies our study. While framing climate change with an energy independence message has been studied in the United States (Gainous and Merry 2021; Feldman and Hart 2018), it has not been examined in Europe. This is likely because previous research has focused on periods before significant recent events, like COVID-19 and the Russian invasion of Ukraine, which have made economic and energy security more prominent in public discussions. Specifically, European dependence on Russian fossil fuels has become increasingly associated with broader geopolitical issues. Transitioning to renewable energy is widely acknowledged as a crucial step in reducing these geopolitical vulnerabilities (IEA 2023), and this rationale has gained popularity among the Finnish public as well (Tiihonen et al. 2023). Communicating the additional benefits of climate measures has demonstrated the potential to enhance their endorsement (Drews and van der Bergh 2016; Bertolotti and Catellani 2014; Stokes and Warshaw 2017).

In this study, we seek to address this gap by presenting results from a factorial survey experiment, investigating how three different justifications as frames for the road transport emission trading scheme affect its acceptability in people's minds. This policy measure was selected for our study because, at the time of designing the survey, it was current, confirmed, and set to be implemented in the near future. We aimed to examine factors influencing the acceptability of a coercive policy, as opposed to non-coercive measures like government subsidies, which are generally viewed as more acceptable (e.g., Schuitema et al. 2010). We used a dataset of 1722 respondents drawn from a population-based sample in Finland, collected between March 6 and March 29. Our experiment provided three distinct justifications to three separate groups of respondents, while the control group received no justification. We selected two themes related to the Russian invasion and its economic consequences: reducing energy dependence from non-EU countries and potential economic benefits during future energy crises. Additionally, we incorporated the effective emission reduction justification, identified as one of the primary predictors of climate policy endorsement, among the justifications (Kallbekken and Sælen 2011).

Since climate mitigation is a politicized topic, the impact of justifications may vary across different groups (Gainous and Merry 2021; Hart and Nisbet 2012). Concerns about climate change and other attitudes have been found to exhibit a strong correlation (Ber-

nauer and McGrath 2016), perhaps due to motivated reasoning that stems from individuals' existing beliefs and attitudes (Taber and Lodge 2006). Therefore, in our study, we include respondents' risk perceptions of both climate change and economic instability to examine whether high-risk perceptions regarding one topic make people susceptible to different treatment impacts.

We found that presenting just any justification does not invoke an increase in the acceptance or perceived effectiveness of the mitigation policy measure. While respondents who received a justification about energy independence tended to report slightly higher values, the frames related to the economic benefits and emission reduction appeared to result in decreased acceptance compared to the control group. Nonetheless, these effects were mainly observed among respondents who view climate change as a moderate risk and not among those with high or low-risk perceptions. Both acceptance and perceived effectiveness are influenced by frames very similarly. Thus, the evidence suggests that people with stronger predispositions about climate change tend to be less prone to change their opinion when provided with alternative justifications. Furthermore, even when presenting justifications regarding potential co-benefits, there is no assurance that it will lead to heightened acceptance.

2 Research objective and theoretical framework

2.1 Predictors of climate policy endorsements as framing effects

Previous research has assessed the determinants of climate policy endorsement. These have been classified into three distinct categories (see for a comprehensive review Drews and van den Bergh 2016). The first category encompasses social-psychological factors, including values (Harring and Jagers 2013; Smith and Leiserowitz 2013), political orientation (McCright et al. 2016), and perceptions of climate change, such as risk perceptions (DeBono et al. 2012). The second category involves perceptions of the climate measure in question, such as its economic impacts (Lam 2014; Brannlund and Persson 2012), effectiveness in reducing GHG emissions (Kallbekken and Sælen 2011; Schuitema et al. 2010), or the level of coerciveness (Schuitema et al. 2010; Cherry et al. 2012). However, it is often unclear whether people support a policy because it is effective or believe it is effective because they favor it (e.g., Eriksson et al. 2008). The third category encompasses contextual factors, including social norms, political dynamics, economic conditions, and how the issue is framed in public discourse (Drews and van den Bergh 2016). Our study was motivated by changes in the public discourse surrounding various societal adverse events and their intertwining with climate mitigation efforts. We delve into this context after addressing the concept of message framing and its relevance in climate policy communication.

Numerous studies have examined the effects of framing on citizens' thoughts and opinions regarding policy issues through experimental designs (see, e.g., Brewer and Gross 2005; Lecheler and de Vreese 2012; Severson and Coleman 2015; Ylisalo et al. 2023). Framing research, which investigates how information is presented and understood across various fields, has been widely utilized in many disciplines. This approach explores the "frames" or perspectives through which issues or events are perceived, shaping individuals' understanding and interpretation (e.g., Nisbet et al. 2013). By focusing on the explanatory

power of these frames, such research provides valuable insights into public comprehension of societal issues on both large and small scales, as well as into the impacts of different communicative strategies authorities can adopt in policymaking (Benford and Snow 2000; Chong and Druckman 2007; Scheufele and Tewksbury 2007; Ylisalo et al. 2023).

In the context of climate change or environmental attitudes, the effects of frames have also been investigated. Nisbet et al. (2013, p. 778) have distinguished that studies on framing effects on attitude change can be divided into two tracks: those that focus on identifying individual differences possibly moderating the frames' exposure and those that examine the framing effects within competitive or noncompetitive information environments. In their study, they chose the policy issue of climate change mitigation and examined whether contextual factors and individual differences have an impact on attitudinal responses to message frames (ibid.). Some framing studies have focused more on so-called "loss framings," an approach that is primarily applied in behavioral economics (see, e.g., Homar and Cvelbar 2021; Carlsson et al. 2021; Rothman et al. 2006; O'Keefe and Jensen 2007). The summarized finding in these studies has been that loss-framed appeals are not as effective as gain-framed appeals.

Other framing studies have concentrated more on communicative aspects rather than solely economic perspectives. For instance, a recent study from the UK (Howell et al., 2016) tested how public attitudes towards mitigation are influenced by varying climate change messages, which are framed either in terms of adaptation or responsibility. In addition, a study in the United States investigated how frames highlighting local versus global impacts and frames discussing only projected losses versus those also mentioning possible benefits affect individuals' perceptions of the severity of climate change as well as attitudes toward climate change-related policies (Wiest et al. 2015).

Generally, framing studies in the context of climate change and environmental attitudes indicate that framing effects are complex and highly context-dependent, influenced by individual differences. For example, climate change skepticism and concern significantly impact the explanatory power of framing effects (e.g., Howell et al. 2016; Rademaekers and Johnson-Sheehan 2014; Brügger et al. 2016). Experimental research supports the idea that framing climate change policies in terms of individual behavior change can reduce belief in climate change and willingness to act. People are more likely to adopt climate-friendly behaviors when the societal approach to climate change is emphasized (Xenias and Whitmarsh 2013; Spence and Pidgeon 2010). However, some studies show that frames do not always significantly influence public support. For instance, Bernauer and McGrath (2016) found that simply reframing climate policies did not substantially increase public support, contrasting with previous studies highlighting the impact of reframing. Nonetheless, their findings support the notion that framing climate change as a risk reduction measure can enhance public support. Although framing effects have shown promising results in influencing public opinions on climate policies, they could still be improved methodologically. For example, a recent study by Fesenfeld et al. (2024) highlights several methodological challenges, including issues with reproducibility, the robustness of findings, and methodological rigor.

In this study, we present three distinct justifications for implementing a road traffic emission trading system: increasing energy independence from non-EU countries, potential economic benefits during future energy crises, and ensuring efficient GHG mitigation. The context of our study significantly influenced the first two choices. Over the past four years,

significant societal events, including the COVID-19 pandemic, the full-scale Russian war on Ukraine, and their economic consequences, have been causing widespread concern among the Finnish population (Finnish Government 2023). In addition, along with rising inflation after the Russian aggression (Statistics Finland 2024a), consumer confidence reached its all-time low in late 2022 during the "energy crisis," remaining low up to our data collection period (Statistics Finland 2024b). Simultaneously, studies from Finland indicate that Finnish people's willingness to compromise living standards to protect the environment (Metelinen 2023) has diminished since the beginning of the pandemic and the Russian aggression, while media attention has shifted towards other political issues (Lyytimäki et al. 2020).

Finland offers a compelling case for examining the interplay between crises and climate policy framing, particularly in the European context. While a new crisis can strain an individual's emotional or attentional capacity and reduce the perceived urgency of addressing existing issues, it can also create a window of opportunity to tackle them (Bergquist et al. 2022; Rinscheid and Koos 2023). This has been demonstrated by prior framing studies showing how highlighting national security and energy (in)dependence can increase support for climate policy (Gainous and Merry 2021; Feldman and Hart 2018; Attari et al. 2009). However, previous research has primarily concentrated on the U.S., and the topic has not been examined in Europe. Since the Russian attack, energy security has become an established rationale for the fossil phase-out (IEA 2023; Finnish Ministry of the Environment 2022), potentially increasing its effectiveness as a policy justification (see Baumgartner et al. 2010). Finland, in particular, provides valuable insights, as a nationwide survey conducted in the autumn of 2022 revealed that reducing energy dependency on non-EU countries, especially Russia, was the most widely supported rationale for the fossil phase-out (Tiihonen et al. 2023). This underscores Finland's relevance as a case study for understanding how crises can reshape public support for climate policies in Europe.

Considering this context, we aim to investigate whether different policy justifications—such as emphasizing energy independence from non-EU countries or economic benefits for future energy crises—affect policy acceptance. Additionally, we explore how these rationales measure up against the primary objective of mitigation measures, the effective reduction of GHG emissions, which has been identified in previous studies as a critical determinant (Huber et al. 2019; Kallbekken and Sælen 2021), and possibly an effective justification for increasing climate policy support (Dechezleprêtre et al. 2022). After reflecting on the literature outlined above, our first two hypotheses are:

H1 *Providing any of the three frames increases the support for the proposed policy in comparison to providing no frame at all (control group).*

H2 *Frames stressing economic growth and energy independence result in comparably higher acceptance than the emission reduction frame.*

2.2 Framing effects and risk perception

The second part of our analysis concentrates on the interplay between framing effects and risk perception. We assess whether framing has a more significant impact on individuals with heightened risk perceptions regarding climate change or economy-related topics. Respondents do not appear in this study out of thin air; each of them had encountered the topic before and likely formed preconceptions based on those encounters. In this sense, the

participants were already more or less "pre-treated" (Gainous and Merry 2021; Bernauer and McGrath 2016; Nisbet et al. 2013). Participants' predispositions are likely to affect how they process information. Motivated reasoning refers to the inclination to interpret or assess information in a manner that supports one's existing beliefs, desires, or interests, frequently resulting in biased conclusions (Kunda 1990). Individuals often actively seek and prioritize information that supports their current beliefs and attitudes while diminishing or dismissing information that challenges their preconceived notions (Taber and Lodge 2006).

Prior studies have demonstrated how frames can gain more influence when they resonate with the pre-existing beliefs and attitudes of respondents (Gainous and Merry 2021; Feinberg and Willer 2013; Jones 2014; Howel et al. 2016). These beliefs may also influence the relevance of each frame to a participant (Bernauer and McGrath 2016). Thus, informing individuals about potential co-benefits of climate policies may elicit varied reactions depending on their preconceptions regarding climate change, the economy, and the specific co-benefit. Our frames highlight co-benefits for different societal issues, and we expect participants' risk perceptions to moderate the impact of each frame, with those concerned about economic instability being more influenced by the "economy" and "independence" frames and those worried about climate change being more swayed by the "emissions" frame. This leads us to hypothesize:

H3 *Perceiving economic topics as higher-risk issues will increase the effect of the "economy" frame and the energy "independence" frame on acceptability.*

H4 *Viewing climate change as a high-risk issue will increase the positive effect of the "emissions" frame.*

However, it may be that those who do not view climate change as a noteworthy risk find emission reduction as a non-relevant or opposable objective. This can trigger a backfire effect, where strong negative attitudes toward a topic make individuals more resistant to it when confronted with information that contradicts their pre-existing beliefs (Taber and Lodge 2006; Hart and Nisbet 2012). Prior studies conducted in the U.S. have found evidence of motivated skepticism, particularly according to political orientation (Zhou 2016; Hart and Nisbet 2012), suggesting that individuals who are already opposed to governmental climate action tend to be resistant to frames supporting it. Thus, our final hypothesis is:

H5 *The "emissions" frame results in lower acceptance among those respondents who initially perceive climate change as a low-risk issue.*

3 Materials and methods

3.1 Data

The study was carried out in Finland, employing a population-based data sample. The survey experiment was carried out by *Kansalaismielipide* (translated as Citizen Opinion) online panel with a pool of over 4000 respondents. The panel is part of the Finnish Research Infrastructure for Public Opinion (FIRIPO) and is maintained by the Åbo Akademi University and University of Turku researchers. The experiment was administered in Finnish and

Swedish, both of Finland's official languages, utilizing the online survey platform Qualtrics and the data collection period extended from March 6th to March 29th. In total, 1722 participants completed the survey.

To improve data quality, we excluded 237 respondents who took less than three minutes or more than one hour to complete the survey, ensuring that participants were focused on the task. In addition, weights adjusted for respondents' gender, age, and education were calculated to correct sampling bias and nonresponse. The weights are used in all reported analyses (see demographics Table A1 in Online Resources 1). Based on a priori calculations performed by *G*Power* (Faul et al. 2009), the 1 616 valid respondents mean that we can detect small effect sizes (f = 0.10) with a power of 0.95.

3.2 Experimental design

In the experiment, the participants were randomly assigned to one of three treatment groups (T1–T3) or the control group when opening the survey questionnaire (Online Resource 2). The experiment design is depicted in Fig. 1 below. The design, treatments and hypotheses have been preregistered (Leino et al. 2024). First, all the respondents received a brief survey covering essential background information and risk perceptions about different societal issues. Each group was then given a brief introduction to the road transport emission trading system. The brief introduction text as well as the three justifications are presented below this paragraph. We did not frame the traffic emission trading system particularly at a national level or EU-level policy, since the main focus here was to test the effect of the frame, i.e. economic beliefs, energy independence, and climate change mitigation. For the three treatment groups, the statement proceeded to provide a short and unique justifications for the phase-out of fossil fuels in the transportation sector for each group. Group 1 received a justification highlighting national economic benefits during an energy crisis. Group 2 was provided with a justification focusing on the advantages of energy independence. Group 3 was presented with a justification emphasizing the effective reduction of Finland's carbon dioxide emissions. The control group received no framing.

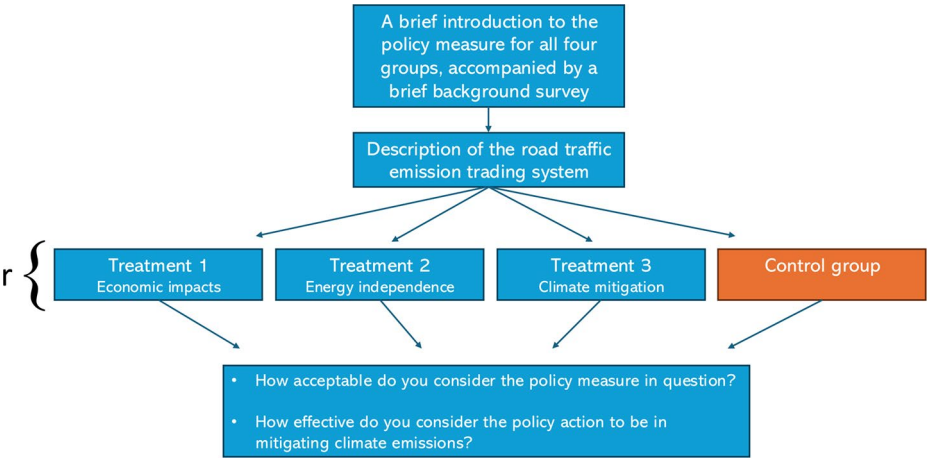

Fig. 1 The structure of the experiment

A brief introduction (to T1–T3 and control group).

Road transport will implement emissions trading from 2027, requiring fuel suppliers to buy emission allowances matching the carbon dioxide content per liter of fossil fuel sold. This sets a price for transportation-related carbon dioxide emissions, which fuel sellers and consumers will shoulder. This action promotes the transportation sector's transition away from fossil fuels….

Justifications (to T1–T3).

T1… which mitigates the negative economic impacts of energy crises on Finland.

T2… which increases Finland's energy independence from non-EU countries (e.g., Russian fossil fuels).

T3… which effectively reduces Finland's carbon dioxide emissions.

We chose not to offer any accurate economic estimates in the "economy" frame to ensure that respondents did not receive more detailed information on the policy's impacts than what was provided in the other justifications. Otherwise, the exact figures could become the explanatory factor, overshadowing the topic of the justifications and hindering their comparability.

Next, we measured the outcome variables in a short survey. We also measured participants' expectations concerning factors that have been recognized as significant explanatory variables for supporting climate policies, specifically, the anticipated economic effects and perceived effectiveness of the policy measure (Drews and van den Bergh 2016). This also allows us to see whether the treatments affected these perceptions. They were also asked to gauge the effectiveness of the measure in reducing carbon dioxide emissions. Expected economic impacts and effectiveness have been found to be key explanatory variables of climate policy support.

Following the experimental survey, we asked participants to respond to a short set of questions that measured various attitudes toward climate change and climate mitigation on a general level. Also, we separately asked about their willingness to pay taxes and higher consumer prices to combat climate change. These measures can also serve to evaluate whether the potential treatment effects extend to a broader range of attitudes toward mitigation beyond just the acceptance of the road transport emission trading system.

3.3 Variables

Our main outcome variables are the acceptance and perceived effectiveness of the road transport emission trading system. The main variables are depicted in Table 1. The former was measured by asking the participants, "[H]ow acceptable do you consider the policy measure in question?" and requested to express their level of acceptance by using an eleven-point scale with 0 representing "not at all acceptable" and 10 indicating "highly acceptable." The perceived effectiveness was measured by asking, "How effective do you consider the

Table 1 The descriptive statistics for the main variables

	N	Mean	Std. dev.	Min	Max
Policy acceptability	1599	5.370	3.244	0	10
Perceived effectiveness	1597	4.810	2.779	0	10
Risk climate	1616	7.229	2.827	0	10
Risk economic downturn	1616	7.222	1.761	0	10

policy action to be in mitigating climate emissions?" on a similar scale, with 0 representing "not at all effective" and 10 indicating "highly effective."

For the interaction effect, we measured participants' risk perceptions concerning "climate change" and "unstable economic conditions" by asking, "[T]o what extent do you perceive the following things as risks to society? Rate each one on a scale of 0–10, where 0 means "no significant risk to society at all," and 10 means "significant risk to society". Risk perceptions were asked before providing any justifications.

3.4 Research ethics

The analysis and reporting of the research adhere to the guidelines outlined by the Finnish National Board on Research Integrity TENK (2019). According to these guidelines, an ethical review statement must be obtained from a human sciences ethics committee if research involves any of the following: deviating from informed consent, intervening in the physical well-being of participants, involving minors under 15, exposing participants to strong stimuli, risking mental harm beyond normal daily life limits, or posing safety threats to participants, researchers, or others. Although none of these conditions applied to this study, we submitted the experimental design for ethical review. The University of Turku's ethical review board approved the study to adhere to all guidelines outlined by TENK (decision number TY/936/06.01.01/2023).

Following the standard national guidelines applicable during participant recruitment, upon enrolling in the online panel, participants were provided with details regarding their rights under the European General Data Protection Regulation (EGDPR) and the utilization of data in scientific research and publications. Participants provided informed consent to participate in studies conducted through the panel. Participants could withdraw from the study at any time and request correction or deletion of the information they provided. All participants were at least 17 years of age.

4 Results

4.1 Treatments' impacts on acceptability and perceived effectiveness of policy proposal

The means of our main outcome variable (acceptance) and secondary outcome variable (perceived effectiveness) across all three treatment groups are presented below in Fig. 2, with the boundaries of the 95% confidence interval. Generally, by looking at the figure, respondents tended to consider the proposed policy moderately acceptable and perceived it to be somewhat effective in terms of reducing emissions. This confirms what was already

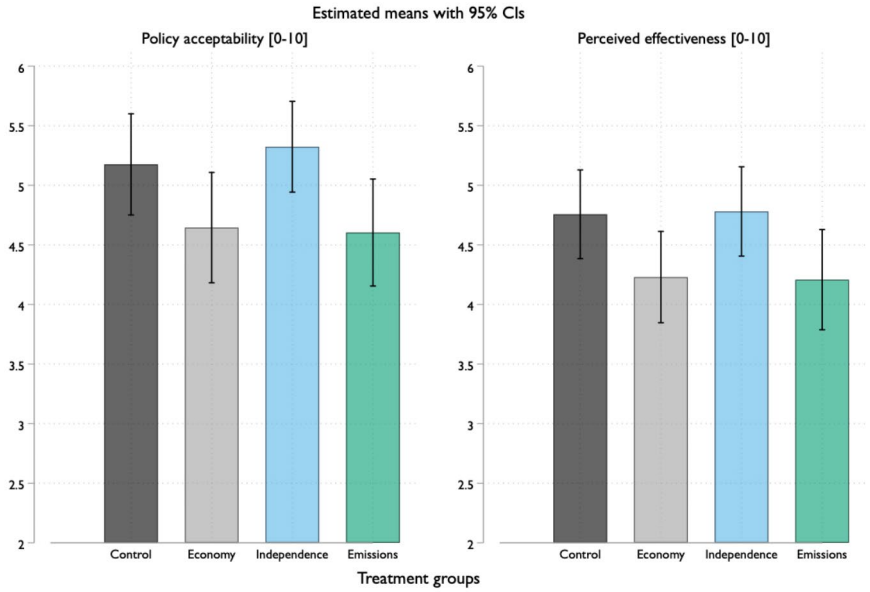

Fig. 2 The means of the dependent variables across treatment groups

suggested by the dependent variable descriptive statistics presented previously. We can, however, witness that perceptions were not equal among all treatment groups.

Our first hypothesis maintains that providing any justification for the proposed policy would result in higher mean acceptance when compared to the control group. Looking at Fig. 2, we can see that this is not the case. In fact, only the mean score in the "independence" treatment is higher than that of the control group, with the two other groups, "economy" and "emissions," resulting in lower mean acceptance. Therefore, the information in Fig. 2 yields partial support for H2, i.e., the acceptance seems to be higher when presented with the "independence" frame but not after reading the "economy" frame. When it comes to our secondary dependent variable, the results are the same, i.e., only the "independence" framing seems to have a marginal increasing impact on the perceived effectiveness of the policy proposal.

To account for the possibility that these observed differences in mean scores were created by chance, we proceed with the significance of the between-group differences by analysis of variance (ANOVA). For our main outcome variable, we observe that Levene's tests produced statistically significant results ($p=0.003$), which indicates heterogeneity of variances. However, looking at descriptive statistics, the variances seem quite close to each other (10.31, 11.19, 9.11, and 11.08, respectively). For our secondary outcome variable, the results are similar, even though the variances are even closer to each other. Because the differences between variances for each dependent variable can be considered minor and the number of respondents in each group is relatively even, we proceed with ANOVA (see, for example, Ylisalo et al. 2023).

The results of between-treatment comparisons for both dependent variables are presented in Table A2 (Online Resource 1). We can confirm that the "independence" justification did

result in a small increase (0.15) in acceptance when compared to the control group, but the difference is not statistically significant. Similarly, the other two justifications seemed to be linked to lower acceptance (−0.53 and −0.57, respectively) in comparison to the control group. Still, again, the observed differences are over the standard thresholds of statistical significance. There is, however, a statistically significant difference between the observed mean scores of the "independence" treatment and the other two treatments. This difference indicates that the justification relying on energy independence produces higher levels of policy acceptance when compared to justifications that rely on national economic benefits or emission reductions. In general, based on observation of mean scores across treatment groups, we find no evidence to support H1. Regarding H2, the results confirm partial support as the "independence" frame is associated with a comparably higher level of policy acceptance.

The results of our secondary outcome variable are notably similar (see Table A2 in the Online Resource 1). While the perceived effectiveness was somewhat the same in the "independence" and control groups in terms of mean scores, the other two treatments produced lower mean scores. When compared to the "independence" justification, the "economy" and "emissions" justifications produced lower levels of perceived policy effectiveness.

4.2 Potential interaction effects

To test hypotheses H3, H4, and H5, we investigated whether the different frames resulted in uneven influences dependent on the prior views of the respondents. The views we are especially interested in are risk perceptions concerning climate change and economic instability.

Responses to both items vary between 0 and 10 ($n = 1452$), and they indicate that the respondents were a bit more concerned about economic instability (mean = 7.25) when compared to climate change (mean = 6.88). Also, the risk perceptions were more divided when it came to climate change (std. dev. = 2.97) in comparison to economic instability (std. dev. = 1.78). Using ANOVA, we found no statistically significant differences between the treatment groups when it comes to these variables ($p = 0.213$ and $p = 0.418$, respectively).

To observe potential uneven influences across treatments, we employed an analysis of covariance (ANCOVA). In addition to interactions between treatment variables and variables measuring risk perceptions, we also included several covariates to check for the robustness of our findings. The results of ANCOVA are presented in detail in Table A3 (Online Resource 1) for the main outcome variable and Table A4 (Online Resource 1) for the secondary outcome variable. Even so, we will illustrate and discuss our findings here.

When it comes to pre-test risk perceptions related to economic instability, we expected higher risk perception to be associated with higher acceptance if the policy was framed in national economic or energy independence-related terms (H3). The results of ANCOVA (see Table A3 in Online Resource 1) lend no support for this expectation. The interaction effect between the treatment variable and the variable capturing economic risk perception is not significant ($p = 0.669$). Based on this, we find no support for H3.

When testing hypotheses H4 and H5, we were especially interested in pre-test risk perceptions regarding climate change. The results of ANCOVA (see Table A3 in the Online Resource 1) indicate that the interaction between climate change risk perceptions and the treatments warrants further investigation. In the model, the interaction is statistically significant ($p = 0.039$). However, one must be careful when making conclusions reliant on p-values

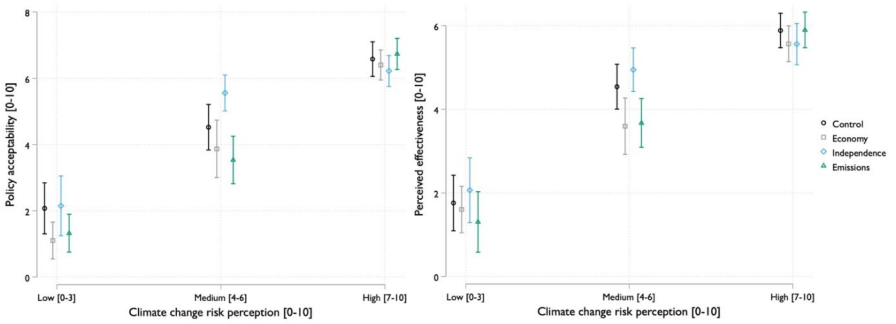

Fig. 3 Adjusted predictions of treatment effects on policy acceptance and perceived effectiveness, with 95% confidence intervals

of interaction effects alone. Therefore, visual confirmation of uneven effects is also needed (see, for example, Franzese and Kam 2009). A visual inspection of means scores is provided in Figure A1 (Online Resource 1), but we outline the results here.

Based on our hypotheses, we are especially interested in respondents at each end of the 0–10 scale measuring climate change risk perceptions. Namely, we expected that respondents with more substantial views on the matter would be the most affected by the different frames. Looking at Figure A1 (Online Resource 1), we determined that this was not the case. In fact, respondents with high climate risk perceptions reported very high levels of policy acceptance regardless of their treatment group. These respondents report high levels of acceptance regardless of the justification provided to them and even if no justification is provided. The same kind of conclusion can be made concerning respondents who view climate change as a very low-risk issue. As the mean acceptance among respondents in the control group is already close to zero, there is very little room for potential backfire effects created by different justifications. Therefore, we find no support for H4 or H5.

Instead, mean scores point to a different kind of result. It seems that it is, in fact, that the respondents who view climate change as a moderate-risk issue are most influenced by the treatments. For moderates, framing climate policies as also promoting energy independence and lower reliance on import energy resulted in higher acceptance when compared to providing no justification at all. Justifications based on national economic benefits and emission reduction are not as efficient. Instead, especially being confronted with "emissions" treatment is associated with slightly lower policy acceptance among the moderates.

To confirm this finding, we investigated predicted treatment effects adjusted for climate change risk perception. To account for the fact that meaningful interactions took place among the "moderates," we divided the respondents into three groups according to their pre-test scores: respondents with low (0–3, $n=251$), medium (4–6, $n=355$), and high (7–10, $n=868$) climate change-related risk perception. The plot on the left-hand side of Fig. 3 confirms our finding; justification based on energy independence results in higher policy acceptance among respondents with medium-level climate change risk perceptions while framing it predominantly as an emissions reduction measure or, in national economic terms, leads to a comparably lower level of support.

There are likely numerous reasons for these results. For respondents who view climate change as either a high-risk or low-risk issue, appraisal of different climate change mitiga-

tion policies is firm to begin with. These are not swayed easily regardless of the framing of the issue, i.e., people support or oppose policies, whether provided with justifications or not. Instead, for respondents with more moderate initial views, the justifications are essential. It can be that for these respondents, the issue is less salient, providing possibilities for evaluations dependent on the framing of the issue.

Next, we move on to investigate the perceived effectiveness of the proposed policy. Findings regarding our secondary output variable are strikingly similar to the main dependent variable. The results of ANCOVA are reported in Table A4 (Online Resource 1). As shown in the plot on the right-hand side of Fig. 3 (see also Figure A2 in the Online Resource 1), the "independence" frame resulted in increased perceived effectiveness of the policy among respondents with initially medium levels of climate change risk perceptions—and more mildly among those viewing climate change as a low-risk issue, but not among those most worried about the issue in the first place. Both the "economy" and "emissions" framings resulted in lower effectiveness evaluations among the moderate when compared to the "independence" group.

The main purpose of this article is not to evaluate the relationship between climate policy acceptance and its perceived effectiveness. However, based on our results, these concepts are clearly connected, i.e., they have common determinants. It is likely that if a person thinks a policy is acceptable, they also evaluate its effectiveness more favorably, and vice versa, as demonstrated by earlier research (Kallbekken and Sælen 2011). In general, our findings regarding both variables and their interconnectedness seem to highlight the importance of outcome favorability (Arnesen 2017) when assessing policy proposals.

4.3 Robustness of results

An experimental design in which respondents are randomly assigned to different treatment groups should ensure that the results reported can be attributed to the impact of different frames. Still, we included several other covariates in our analysis of covariance (see Tables A3 and A4 in the Online Resource 3) to check whether these variables affected the result. We summarize the results here.

In addition to commonly utilized covariates, such as gender, age, and education level, two variables are of particular interest. Since climate change mitigation policies are—in Finland and elsewhere—strongly associated with leftist parties and leftist political orientation (see, for example, Fisher et al. 2022; Leino and Tiihonen 2023), we included a measure of left-right self-placement. The variable was included in the pre-test and varied between 0 and 10 ($n = 1374$; mean 5.28; std. dev. = 2.79).

Also, as the proposed policy most strongly influences people with a non-electric and non-hybrid car as their most important measure of transport, these respondents are most likely to view the policy as unacceptable. Therefore, we included a pre-test dummy variable, where 63.1% ($n = 901$) of the respondents indicated that they used a non-electric and non-hybrid car as their primary means of daily transport.

Adding these covariates into the model ensures that we can control for their influence when assessing treatment effects. Results of ANCOVA confirm that variables such as education, political orientation, and using a car as a means of daily transport are indeed important determinants of individuals' policy acceptance evaluations or perceptions of policy effectiveness. However, as the interaction effects between political orientation and car use and

treatment variables, respectively, remain nonsignificant, we can conclude that our findings remain robust. In other words, even though, for example, those with a more rightist orientation and those with a non-electric or non-hybrid car as their primary form of transport did evaluate the policy proposal as less acceptable and less effective than others, these effects remain the same regardless of the frame introduced to them.

5 Discussion

We analyzed how providing different justifications for a road transport emission trading system affects its acceptability and perceived effectiveness and how these effects differ according to participants' risk perceptions about climate change and economic instability. Out of the three different justifications, only the "independence" justification had a positive effect on acceptability. In contrast, justifications related to "economy" and "emissions" showed comparable or slightly lower levels of acceptability, with framing effects generally small in magnitude. However, these effects were not statistically significant when compared to the control group. This suggests that framing has a limited impact on both outcome variables—acceptability and perceived effectiveness among respondents.

These results indicate that simply providing any justification is not necessarily sufficient to boost policy endorsement. Also, frame impacts were only noticeable among respondents whose risk perceptions about climate change were at a moderate level, suggesting that those with less strong predispositions were more likely to alter their views when presented with different justifications compared to the ones with strong prior views. Risk perceptions regarding economic instability had no impact on how different justifications affected acceptability. This implies that the impact of justification on acceptability is more tied to climate change concerns than economic ones.

Consistent with prior research (Gainous and Merry 2021; Feldman and Hart 2018), our findings imply that arguments concerning energy independence could potentially enhance the acceptance of climate policy within the Finnish context. Nevertheless, the effectiveness is more pronounced among those with moderate risk perceptions about climate change, highlighting the role of predispositions for policy acceptability. Individual predispositions can make participants resistant to straightforward information treatments (Bernauer and McGrath 2016). For example, individuals with firmer convictions and a deeper understanding of a subject may exhibit less propensity to alter their perspectives on related issues. This would also explain why we did not discover compelling evidence supporting our hypothesis that higher perceptions of climate change risk would result in a more substantial impact of the "emissions" justification. Furthermore, as climate change is a mainstream policy topic in Finland (Lyytimäki et al. 2020), it is plausible that most respondents already find emission reduction through the trading system self-evident and thus are not affected by this justification.

Moreover, we observed that different justifications had a remarkably similar impact on both the acceptability and perceived effectiveness of the policy measure. They also exhibited a strong correlation, indicating that individuals may not always differentiate strongly between these characteristics. In our data, those who reported high climate risk perceptions perceived the emission trading system as both more acceptable and effective than those with low-risk perceptions. Often, endorsement for climate policies correlates with

their perceived effectiveness (Kallbekken and Sælen 2011), but individuals might also view actions as effective simply because they favor them. For example, people tend to not only prefer noncoercive climate policies to coercive ones but also perceive them as more effective, irrespective of their actual efficacy (Eriksson et al. 2008). In addition, previous studies have also demonstrated that people find those kinds of frames less threatening, which align with their (political) ideology especially in politically polarized contexts such as in the U.S. (see Druckman 2019). Our findings indicate a bias towards outcome favorability, where an individual's interests or desires shape their perception of a particular policy.

Despite the strengths of using an experimental survey design, our study has certain limitations. Firstly, our data is not nationally representative, which means that we cannot generalize the findings to the Finnish population. Also, our findings cannot be readily generalized to other countries, as the effects could differ based on the importance of climate change and energy dependency as policy topics in each nation. In Finland, the phase-out of Russian energy imports might be more apparent compared to countries that do not share a similar history and a long border with Russia, are located further away, or import their energy mainly from elsewhere. Therefore, conducting a cross-country comparison would provide greater insight into how these frames operate across various nations.

Another set of limitations has to do with choices considering the policy measure and different justifications. Firstly, emission trading can be considered as a coercive and possibly high-cost policy measure. These characteristics may together relate to the policy measure's acceptability (Tobler et al. 2012; De Groot and Schuitema 2012) and perhaps the impact that various justifications have on it. In other words, the acceptability of a noncoercive measure, like government subsidies for electric vehicles, might not be equally influenced because of its unrestrictive nature and less apparent impact on consumers. Future research could assess if coercive and noncoercive climate policy measures are affected differently by justification related to energy dependency and the economy.

Secondly, we only used so-called gain frames, presenting possible gains or benefits of a policy, and not loss frames involving possible downsides. This distinction has been found to be important by earlier research (Homar and Cvelbar 2021). Another interesting distinction would be to assess if presenting justifications as co-benefits or alternative benefits matters (see Gainous and Merry 2021). The former would entail omitting any reference to climate change in the justifications, as we did with "independence" and "economic" frames, while the latter would involve mentioning both climate mitigation and the additional benefit (Gainous and Merry 2021). These differences could also be explored in future studies.

Finally, while experimental surveys can provide certain kinds of evidence about the influencing factors of policy acceptability, experimental designs do not closely resemble real-life conditions. We do not know how long the impact of our frames lasts and whether it would be similar if the message were communicated in different contexts, through different channels, in a different format, or by different people. Still, the study provides indications of which arguments may influence the perceived acceptability of policy measures among different groups. Framing experiments have faced methodological critique and those apply to this study as well. As Fesenfeld et al. (2024) have pointed out, framing effects should be methodologically more transparent, they could be tested more profoundly among subgroups and diverse contexts. Future studies could delve into these questions.

Given the urgency of climate change mitigation, it is crucial to ensure that new societal adverse events do not create significant impediments to climate action. The societal circum-

stances may change rapidly, as they did after the onset of the pandemic and the Russian full-scale invasion of Ukraine, which may affect the extent to which policy topics remain salient (Lyytimäki et al. 2020; Sisco et al. 2023) and prioritized (Beiser-McGrath 2022). It is also possible that the energy independence frame has triggered respondents to think about the Russian invasion of Ukraine and thus start thinking about geopolitical threats, which might have made the justification even more effective.

When mitigating relatively short-term crises, the impacts on climate mitigation should be kept in mind. Ideally, solutions can be found that address more than one issue at a time. This can help reduce avoidance (Latkin et al. 2022) and engage voters who do not consider climate policies their primary concern (Bergquist et al. 2020). In a representative democracy, it is essential to be able to communicate these co-benefits to voters efficiently based on reliable evidence. This approach may help increase public acceptance of effective climate policies and prevent ineffective communication or messaging that exacerbates opposition within specific social groups (Taber and Lodge 2006). If climate mitigation remains a top priority and appears less like an uncomfortable trade-off, decision-makers will not need to concern themselves with their popularity when addressing the issue.

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Data availability The datasets generated and analyzed during the current study will be available in the Finnish Social Science Data Archive repository, https://www.fsd.tuni.fi/en/.

Declarations

Competing interests The authors have no relevant financial or non-financial interests to disclose.

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