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Driving public support for a meat tax: Fiscal policies and behavioral interventions

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**Driving public support for a meat tax:
Fiscal policies and behavioral interventions**

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Abstract

Taxing meat optimally is a first-best policy outcome to internalize environmental harms. However, meat taxes often lack public and governmental support. Recent research indicates that support for meat taxes can be improved by combining behavioral nudges with fiscal measures. In this study, we test this claim in a preregistered between-within-subjects experiment using a representative sample of the Dutch (N=2,032) population. The Netherlands is currently considering a meat tax legislation, thereby making our study timely and policy relevant. Participants were randomly assigned to a treatment condition in a 2x2 experimental setup, varying across a framing nudge (“tax” versus “levy”) and a reflection (“yes” versus “no”) dimension. Subsequently, all participants engaged in a discrete choice experiment where they selected their preferred meat pricing policy from six sets of choice cards. Each card included random variations in levels of four attributes: meat pricing (costs), revenue recycling, policy coverage, and pricing rationale. We find that policy support increases with greater revenue recycling and broader policy coverage but decreases as costs rise. The rationale behind pricing does not alter public support substantially. Importantly, we find no significant difference in public support across the different behavioral nudge or reflection treatments. Our experimental findings underscore the importance of policy design in enhancing support for meat taxes. The effective design of a meat tax is crucial, as superficial changes, such as behavioral nudges, may not be sufficient to sway public opinion.

Keywords: Meat tax, Framing nudge, Public support

1 Introduction

Sustainable food consumption patterns are likely unattainable without a tax system that adequately captures the “true cost” of environmental damages associated with behaviors that incur environmental externalities, such as eating meat. Yet low levels of public support for fiscal policy interventions makes this path forward politically difficult. Identifying an acceptable meat tax – and nudging citizens to reflect on it – has the potential to increase political feasibility. A Pigouvian (meat) tax – designed to correct for negative external effects – is widely recognized as the first-best response to regulate meat production and consumption optimally (Katare et al., 2020). In its absence, second-best policies like non-Pigouvian environmental taxes can steer us towards socially efficient outcomes by reducing meat demand (Funke et al., 2022). Empirical evaluations show net welfare gains associated with the use of meat taxes (Broeks et al., 2020). However, public acceptability of such “hard” policy interventions continues to stagnate (Douenne & Fabre, 2022; Grimsrud et al., 2020), with mixed evidence on what improves support (Beiser-McGrath & Bernauer, 2019; Douenne & Fabre, 2020; Grimsrud et al., 2020; Siegerink et al., 2022). This further puts governments in a bind, who are unwilling to implement them (Bähr, 2015).

Contrary to taxes, softer interventions like “nudges” offer an easier out – nudges are less intrusive, preserve freedom to choose, and are generally accepted but result in smaller behavioral shifts than pricing strategies (Hagmann et al., 2018; Vellinga et al., 2022). As such, nudges are progressively emerging as a policy tool adopted and implemented by government agencies worldwide (Halpern & Sanders, 2016; Whitehead et al., 2014). These interventions have been shown to reduce meat demand by framing food choices differently, both in the field and in online settings. However, their effect sizes are rather small, are difficult to scale-up, and might also reduce welfare in some cases. While for long scholars

have pit nudges against taxes, a growing consensus suggests there might be complementarities between them (Osman et al., 2021; Vellinga et al., 2022).

2 Theoretical Framework

2.1 Fiscal Policy Design Elements

This study aims to investigate how the policy design elements of a meat tax affect citizen support (*research question 1*). Studies suggest that certain policy design elements can address hesitance over the fairness and effectiveness of environmental pricing-instruments. These issues are top priorities for citizens and are more indicative of policy acceptance than knowledge about climate change or demographic variables (Bergquist et al., 2022). The perceived fairness will hinge on, for example, the stringency of taxation and who will shoulder the brunt of the tax burden, while perceived effectiveness will be reflected in how tax revenues are spent and the salience of incurred benefits. Taking this into account, designing holistic policies may be better accepted by the public, and therefore more politically feasible, compared to a stand-alone carbon or meat tax (L. P. Fesenfeld et al., 2020; Givoni et al., 2013). When packaged together, citizens make trade-offs between costly market-based instruments with command-and-control policy elements. Policymakers can leverage this compensatory mechanism to garner support for stringent policies that are politically unappealing in their own right (Bergquist et al., 2022; L. P. Fesenfeld et al., 2020).

Earmarking revenues for specific purposes (i.e., revenue recycling) can make the advantages of a carbon tax reform more visible than when revenue uses are unspecified, as well as hold policy makers accountable for allocating funds to publicly approved uses. Redirecting dividends to public good services, such as projects aimed at protecting the climate and supporting low-income groups, receive significant backing, although the perceived effectiveness and equity of these efforts vary (Maestre-Andrés et al., 2021).

Likewise, subsidizing low-emitting (vegetarian) foods has also been found to increase support for a meat tax (L. P. Fesenfeld et al., 2020). Building upon this foundation, we formulate our first hypothesis:

H1: Revenue recycling (direct or indirect) will increase policy support compared to no revenue recycling, on average.

The rationale for meat taxation is a subject of ongoing debate (Maestre-Andrés et al., 2021; Perino & Schwickert, 2023). Meat consumption contributes significantly to greenhouse gas emissions and poses environmental threats, with resources used for animal feed better allocated to cultivate plant-based foods for human consumption (Parlasca & Qaim, 2022). Laypersons are aware of this and may be inclined to support a meat tax, driven by environmental concerns (de Boer & Aiking, 2022; Ford et al., 2023; O’Keefe et al., 2016). While a carbon tax on meat primarily targets carbon emissions associated with climate change, it has broader implications, positively impacting areas such as human health (e.g., Godfray et al., 2018; Nelson et al., 2016; Parlasca & Qaim, 2022) and animal welfare (e.g., Parlasca & Qaim, 2022).

Overconsumption of meat is linked to heightened risks of chronic diseases (Godfray et al., 2018; Nelson et al., 2016; Parlasca & Qaim, 2022), with processed meats, in particular, being associated with specific forms of cancer (Bouvard et al., 2015). Highlighting human health as a rationale for the meat tax draws parallels with examples like the sugar tax in the UK, potentially making the concept more familiar and acceptable to the public. Despite these considerations, conflicting perceptions persist, as meat is acknowledged as a valuable contributor to a healthy diet and commonly viewed as *natural*, *normal*, *necessary*, and *nice*

(Piazza et al., 2015). The strong positive associations with the healthfulness of meat may consequently diminish health considerations as a primary motive for supporting a meat tax.

Industrial animal agriculture is tied to poor animal rearing conditions, presenting another potential leverage point for meat tax support. This concern has gained prominence beyond small (vegetarian and vegan) consumer segments in recent years, with more individuals adopting a “less is better” ethos in their meat consumption to improve farm welfare (Eating Better Alliance, n.d.). Indeed, recent evidence indicates that taxing meat under the banner of animal welfare garners greater support than climate change mitigation (Perino & Schwickert, 2023). This is consistent with insights gleaned from experimental and survey data focused on labeling and information provision – individuals appear more moved by arguments centered around animal welfare than arguments emphasizing climate protection (Cordts et al., 2014; Koistinen et al., 2013; Palomo-Vélez et al., 2018; Van Loo et al., 2014). This preference may be linked to the potent emotional responses evoked by appeals to animal welfare, tapping into deep-seated empathy and compassion as powerful catalysts for behavioral change. Individuals may also anticipate additional personal benefits by associating higher welfare standards with healthier or tastier meat products (Perino & Schwickert, 2023). This dual appeal, grounded in ethical considerations and perceived product quality, further enhances the viability of leveraging animal welfare motives in the discourse surrounding a meat tax. To this end, we formally propose the following hypothesis:

H2: Policy proposals motivated by animal welfare will increase policy support compared to other rationales (environmental quality and/or health), on average.

2.2 Behavioral Design Elements

Beyond design of the fiscal instrument itself, we will also explore how a framing nudge – the simple re-framing of the policy as levy versus a tax – impacts support (*research question 2*). In general terms, framing refers to how a message is communicated, necessarily emphasizing certain aspects of an issue over others, thereby influencing people's perception (Entman, 1993). Across various contexts, studies have found that framing policies in different ways, even with slight changes in wording, have significant policy implications (L. Fesenfeld et al., 2022; Osaka et al., 2021; Roh & Niederdeppe, 2016). For example, substituting the term “sugar-sweetened beverage” with “soda” has been found to elicit significantly different levels of support for a sugar tax depending on ideological group identity, due to differing concept associations (Roh & Niederdeppe, 2016). In an adjacent literature stream, behavioral “nudges” have been widely used to reduce demand for meat by subtly reframing or altering the presentation of choices without imposing any bans or altering the economic incentives (Bianchi et al., 2018; Meier et al., 2022). Specific to our policy context, the negative connotations associated with the “t-word” may be mitigated by framing the policy as a “levy” versus “tax” (Perino & Schwickert, 2023). We expect the term “tax” more readily accesses associations with monetary burden due to its frequent use in that context. Consequently, we posit the following hypothesis:

H3: Policies framed as a “levy” will increase policy support compared to policies framed as a “tax”, on average.

In our final research question (*research question 3*), we investigate the impact of encouraging citizens to reflect on the policy implications of a meat tax. This exploration is contextualized within the ongoing discourse surrounding the ethical delivery of climate nudges and the cultivation of agency (Bovens, 2008). Grounded in the notion of empowered

participatory governance, current scholarly inputs have examined how encouraging deliberation before decision-making can foster prosocial behavior change (Banerjee et al., 2023b; Banerjee & John, 2024). This approach involves prompting decision-makers to reflect and justify their perspectives, commonly referred to as a “think”. Such reflective practices reveal unfounded opinions and promote considerations for the public good over self-interests (John et al., 2009). Reflective thinking encourages individuals to move beyond their initial, often self-interested, reactions and consider the broader implications of their choices. This is particularly relevant in the context of climate policies, which require collective action for the common good. A recent study targeting carbon emissions associated with meal choices found that deliberate pledging to an environmentally friendly diet before a default nudge resulted in a 40% decrease in intended meal emissions, compared to the nudge alone (Banerjee et al., 2023b). Termed “nudge+”, this combined approach integrated both a deliberative “think” and a classical nudge.

In our study, we anticipate that deliberation over the policy proposal will heighten the salience of framing effects. We specifically anticipate that this reflective practice will amplify the difference in support between different policy frames. While the term “tax” often carries negative connotations and is perceived as burdensome, reflection can engage individuals' System 2 processing, allowing them to move past initial biases. This deeper cognitive engagement helps individuals evaluate the policy on its merits rather than relying on quick heuristics or emotional responses. Conversely, the term “levy” is less negatively tainted and may naturally elicit a more neutral or positive initial reaction. Through reflective thinking, individuals are prompted to consider the rationale behind the policy, its goals, and its potential benefits for the public good. This process can mitigate the automatic negative response to the term “tax” by fostering a more nuanced understanding and appreciation of the policy's broader implications. However, we expect that reflection will be more effective in

increasing support for the “levy” frame compared to the “tax” frame, due to the absence of negative connotations associated with “levy.” Aligned with this theory, we propose the following hypotheses:

H4: A nudge+ policy frame will increase policy support compared to a pure nudge policy frame, on average.

H5: Reflection will increase policy support more for the “levy” frame compared to the “tax” frame, on average.

3 Methods

We employed a 2 (framing nudge: tax vs. levy) x 2 (reflection: yes vs. no) between-within subject discrete choice experiment to identify a carbon tax on meat that is most acceptable to the public. This resulted in four experimental groups: Nudge (levy + no reflection), Think (tax + reflection), Nudge+ (levy + reflection), and control (tax + no reflection). The experiment was administered online to a representative sample from the Dutch (N = 2,032) population. The experiment was pre-registered with Open Science Foundation (<https://osf.io/arzm2/>) and conducted between July and October 2023. Participant recruitment was carried out through the online panel provider Panel Inzicht. Ethical approval for the study was obtained from the VU University Review Board, and all participants provided informed consent.

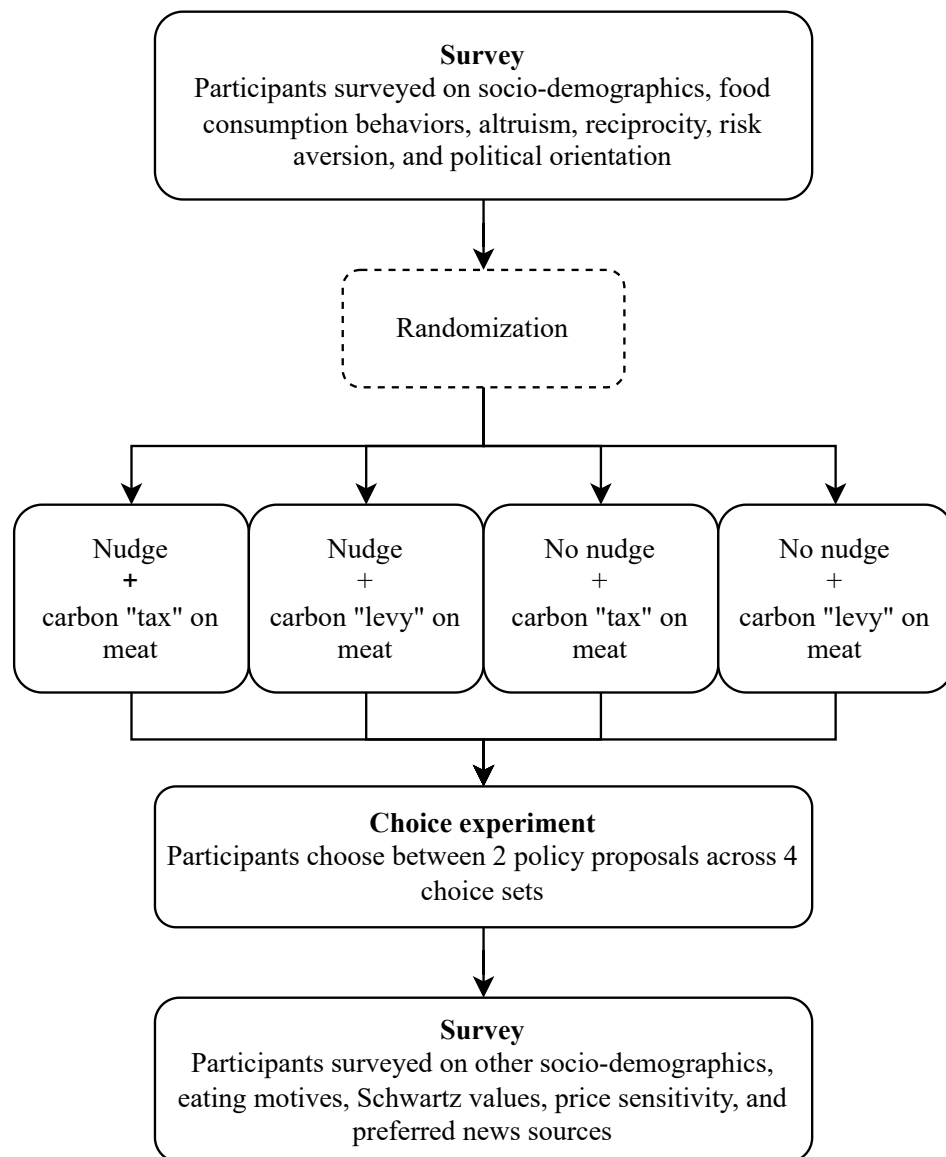
3.1 *Experimental design*

To offer a comprehensive overview of the online survey and experimental design, please refer to Figure 1. The survey was administered using the Qualtrics platform. After completing

initial survey items concerning socio-demographics, food consumption behaviors, altruism, reciprocity, risk aversion, and political orientations, participants were randomly assigned to one of two framings: “tax” or “levy”. Furthermore, participants were instructed to reflect on the policy proposal or placed in a control group without this reflection.

Figure 1

Diagram of Experimental Design



In all groups, participants were introduced to the policy context prior to the reflection element (Appendix C). The framing nudge was embedded into this introductory text such that

the pricing instrument was referred to as either a tax or levy according to treatment group assignment. They were informed that the Dutch government was considering a price increase on meat and provided with a description of key policy features:

- i. **Tax rate:** The proposed tax rates were 10%, 40%, 70%, and 100% of the external costs associated with meat production. These rates were designed to reflect a percentage of the actual external costs of meat, including factors such as greenhouse gas emissions, other emissions contributing to environmental pollution, land use-related impacts on biodiversity, and livestock diseases (Robert Vergeer et al., 2020). The tax schemes varied among different meat products, with higher charges applied to beef, followed by pork, and chicken (i.e., a differentiated tax scheme). Accordingly, it was explained that these meat products would be taxed at different rates. This approach was chosen over a uniform scheme (i.e., where all meat products are taxed at the same rate), as it is considered more effective from an environmental standpoint and previous research has shown no discernible difference in support between these strategies (Perino & Schwickert, 2023).
- ii. **Revenue recycling:** The revenues from this tax could be allocated to subsidize fruits, vegetables, and legumes, support low-income families, or remain unallocated for any specific purpose. Earmarking revenues for specific purposes can make the advantages of a tax reform more visible than when uses are unspecified and hold policy makers accountable for allocating funds to publicly approved uses. This approach has shown positive effects in previous studies on the acceptance of a meat tax (L. P. Fesenfeld et al., 2020; Maestre-Andrés et al., 2021).
- iii. **Policy motivation:** The proposed policy aims to improve environmental quality, personal and public health, or animal welfare. While the primary target of a carbon

tax on meat is to reduce carbon emissions and address climate change, it can also have positive effects in areas such as animal welfare and human health. Recent evidence suggests that framing the tax with a focus on animal welfare can garner greater support than emphasizing climate change mitigation (Perino & Schwickert, 2023).

- iv. **Policy scope:** The tax could be implemented either at a national level or on a broader scale throughout the European Union. Previous research on general carbon taxes has indicated that support can be influenced by the behavior of other EU member states (Beiser-McGrath & Bernauer, 2019).

Following the policy proposal presentation, participants were randomized into a reflection condition. Those in the reflection condition were asked to reflect on this policy proposal and write down their honest opinion in a few lines, while those in the control conditions were not given this task (see Appendix A for reflection prompt).

Subsequently, participants were presented with two tax proposals, side by side, across a total of 6 choice sets. Each choice task presented all attributes listed in the policy introduction. For tax rate, the cost of beef, pork, and chicken were displayed with imagery of these three products as they would be found in the grocery store. The pre-tax price was visible alongside the price inclusive of the tax. All other attributes were displayed in the same manner as described in the policy introduction. An example of one choice task can be found in Appendix D. The levels for each attribute were randomly selected with equal probability within each profile in accordance with methodology developed by (Hainmueller et al., 2014). Attribute and level order were randomized between participants to minimize carry-over effects between choice tasks and profile-order effects within a choice task. Identical profiles were intentionally avoided. For each choice task, participants were asked to choose the

option they supported more (i.e., forced-choice), as well as rate on an 11-point scale, how likely they would be to support each policy scenario if implemented by the government.

Upon completing the choice tasks, participants were questioned about their perception of the likelihood that the government would introduce a meat pricing policy in the next term. This assessment was conducted to account for potential hypothetical bias in participant responses. The survey was concluded with questions related to participants' motives for their eating behavior, utilizing the Eating Motivation Survey (Renner et al., 2012). Schwartz values (Schwartz et al., 2015), price sensitivity, information on their preferred news sources, and socio-demographics (those not previously used for quota determination at the start of the survey) were also collected. Attention checks were incorporated into the survey to ensure participant engagement and data quality. All materials were first developed in English and then translated to Dutch by a native speaker.

3.2 *Sample*

Our study involved a sample ($N = 2,032$) of adult respondents from the Netherlands. To ensure the sample's representativeness, we applied quotas based on age, gender, and education. Only participants that did not adhere to a meat-restricting diet were recruited. Individuals that failed the first stand-alone attention check at the beginning of the questionnaire were terminated from the survey flow. Appendix E provides a summary of the demographic characteristics of our sample. To assess the balance of the treatment groups, we conducted group balance checks and found that the experimental groups were well-balanced.

3.3 *Statistical analysis*

For all statistical analyses, we used the statistical software R (version 494). Each participant evaluated two policy profiles across 6 choice sets, resulting in a total of 24,384

policy evaluations (i.e., 2,032 participants \times 2 policy profiles \times 6 choice pairs). We estimated the Average Marginal Causal Effects (AMCEs) for policy design elements, which quantify the average impact of each attribute level on participants' support for a policy profile. To this end, we employed least squares regression to model policy choice as a binary outcome. We represented the attribute using sets of indicator variables, designating one level of each attribute as the reference category. Additionally, we clustered the standard errors by respondent for our analysis (Figures 2 and 4 in results). For balance checks, we performed bartlett test (age) and chi square (categorical variables) to inspect the balance of age, gender, rural-city residence, and education across experimental conditions, which were found to be balanced (see appendix E). No statistically significant differences were observed among the groups.

4 Results

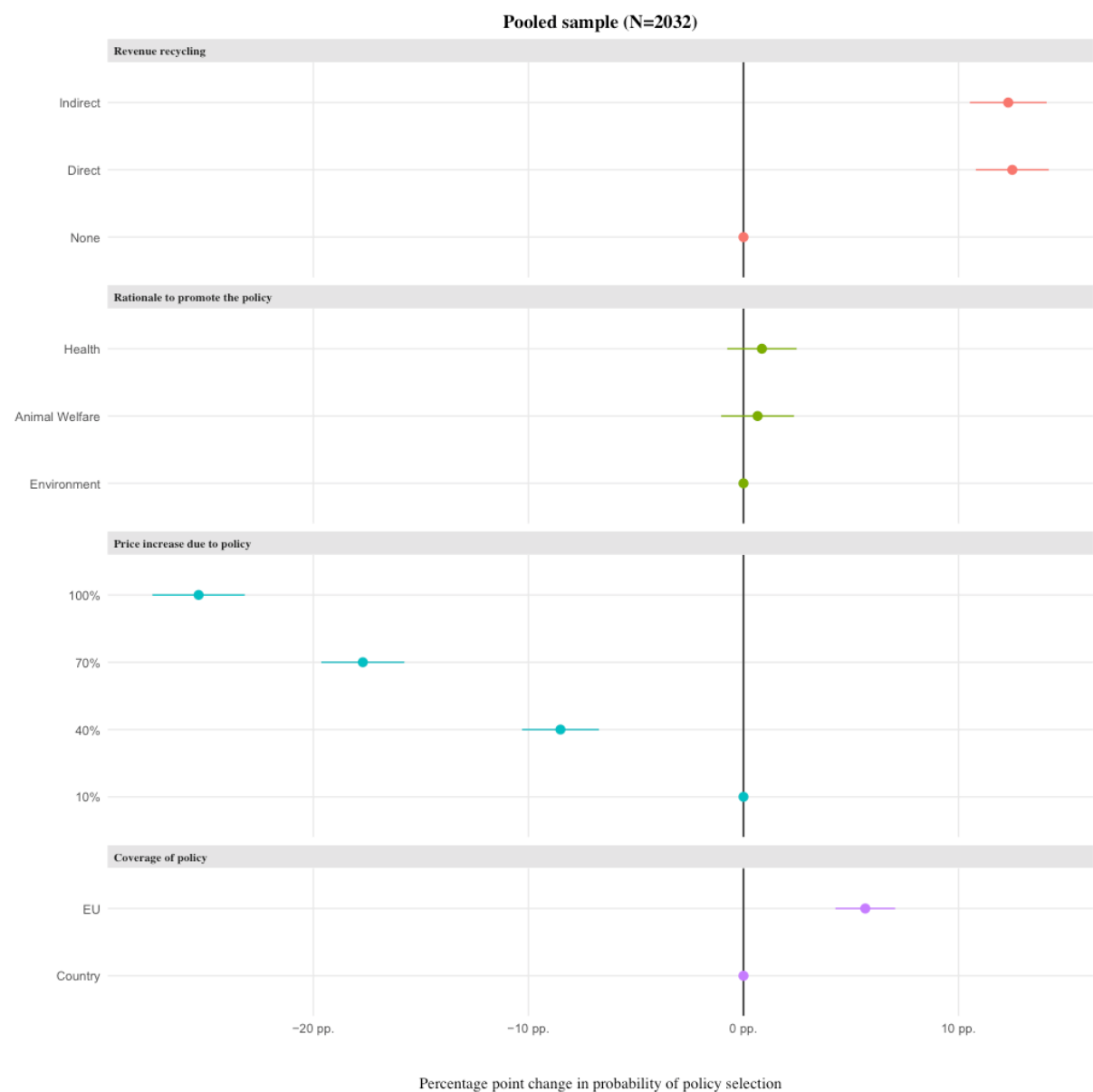
4.1 *Influence of Hard Policy Design on Public Support for a Meat Tax*

We examined pre-registered hypotheses regarding the impact of specific attributes of a meat tax on public support. Figure 2 illustrates the primary outcomes derived from the conjoint experiment conducted on the overall sample, as captured by the forced-choice responses. The AMCEs provide insight into the average change in the probability of garnering support when altering the attribute value from the baseline to the listed value. Significantly, the cost factor emerges as a pivotal determinant influencing support levels. Elevating the tax rate from the lowest (10%) to the highest (100%) leads to an approximately 25% reduction in support. Notably, each incremental increase in the tax rate corresponds to diminishing support. Furthermore, participants exhibit sensitivity to the utilization of tax revenues. Both direct and indirect recycling of revenues yield a 13-14% increase in policy

support compared to leaving revenues unallocated without a specified purpose. Lastly, a distinct trend emerges regarding the jurisdiction of implementation, as participants demonstrate a stronger preference for an EU-wide meat tax policy over a national one. However, support remains unaffected by the rationale behind taxation, as evidenced by comparable AMCEs for environmental, health, and animal welfare policy justifications.

Figure 2

Average Marginal Component Effects (AMCEs) for Pooled Sample



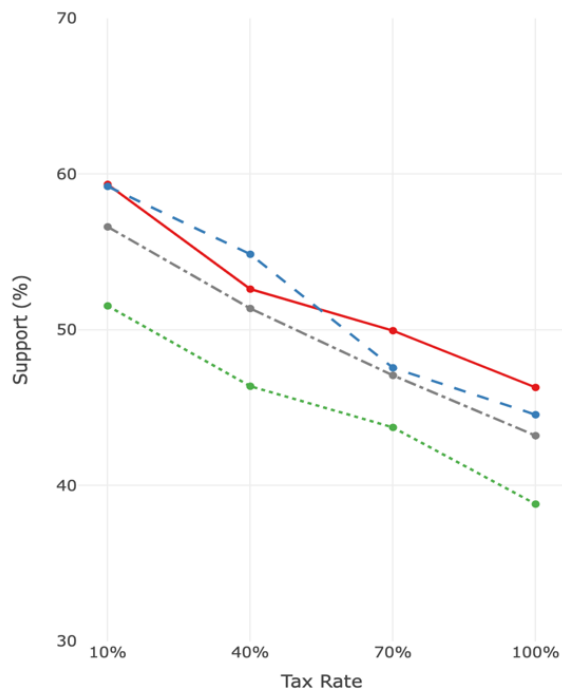
Note. Reflection and framing nudge groups are pooled. AMCEs displayed as percentage points.

In figure 3, we present the distribution of citizen support for meat tax proposals at varying taxation levels, both within the Netherlands and the European Union (EU), as captured by Likert-scale responses. Responses scoring above the neutral point (5) were coded as indicative of support for the policy. Consistent with the trends observed in the AMCE results, the percentage of individuals supporting the policy tends to increase as the tax rate decreases, regardless of whether it is implemented nationally or at the EU level. Importantly, support is generally higher when the tax is implemented EU-wide compared to a national implementation. Moreover, the positive impact of revenue recycling on citizen support is evident across all tax rates and policy coverages. While support declines with increasing tax rate, at a 40% tax, over 50% of voters still support it, regardless of whether revenue recycling is direct or indirect.

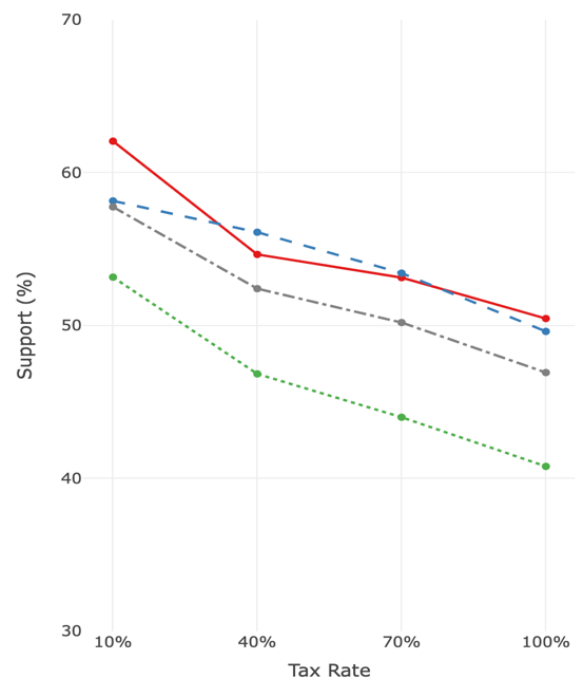
Figure 3

Support for Meat Tax Across Policies

Policy Coverage: Netherlands



Policy Coverage: European Union



—●— Direct revenue recycling
 - - -●- Indirect revenue recycling
 ...●... No revenue recycling
 - - -●- Total

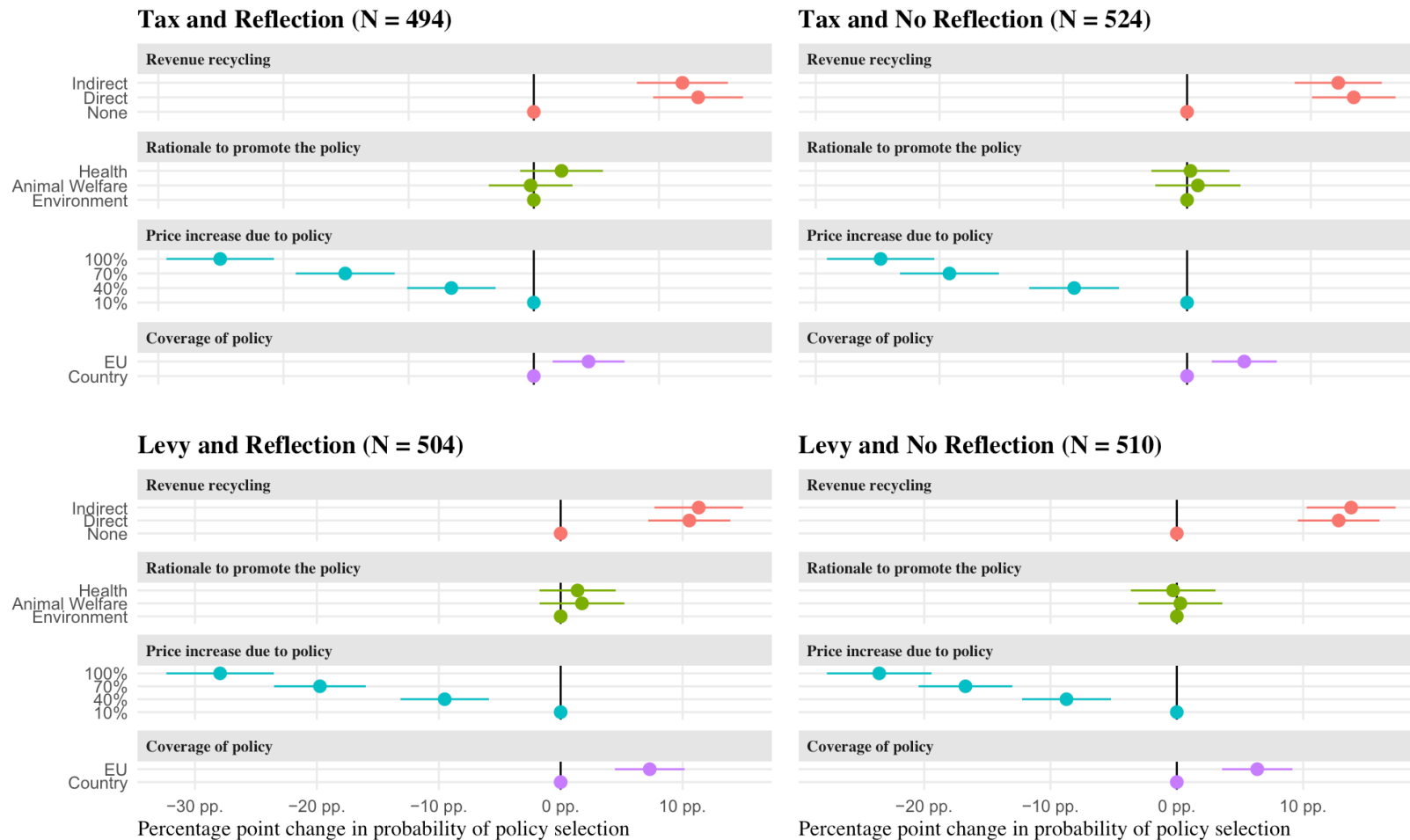
Note. Data points show the percentage of participants that chose the policy at each tax rate, as captured by the Likert-scale responses. Reflection and framing nudge groups are pooled.

4.2 Influence of Soft Policies on Support for a Meat Tax

Upon examination of the AMCEs within each treatment group as captured by the forced-choice responses, our analysis reveals no significant differences between the Nudge (levy + no reflection), Think (tax + reflection), Nudge+ (levy + reflection), or control (tax + no reflection) treatments, as illustrated in Figure 4. This indicates that the incorporation of soft policy interventions had no discernible impact on policy support. To reinforce this observation, Table 1 presents the results of linear regression analyses, providing further confirmation of the absence of statistically significant effects.

Figure 4

Average Marginal Component Effects (AMCEs) Across Treatment Groups



Note. AMCEs displayed as percentage points, as captured by the forced-choice responses.

Table 1. Regression results

	AMCE	P-value
(Intercept)	0.519	> 0.001
<i>Cost</i>		
40%	-0.091	> 0.001
70%	-0.192	> 0.001
100%	-0.247	> 0.001
<i>Recycling</i>		
Direct	0.135	> 0.001
Indirect	0.125	> 0.001
<i>Coverage</i>		
EU	0.048	> 0.001
<i>Motivation</i>		
Health	0.003	0.847
Animal welfare	0.009	0.552
<i>Nudge</i>		
Levy	-0.017	0.527
<i>Reflection</i>		
Reflection	-0.015	0.580

Note. Linear regression with robust standard errors clustered at the respondent level, as captured by the forced-choice responses. The reference level is the missing attribute level, i.e., 10% for cost, none for revenue recycling, NL for policy reach, environment for motivation, levy for frame, no reflection for nudge.

5 Discussion

5.1 *Implications for Strategic Policy Design*

Our study highlights the central role of policy design in shaping public support for a meat tax. Participants' preferences were significantly influenced by fiscal elements of the proposed meat tax policy, underlining the need for careful consideration in formulating effective environmental taxation strategies. Public support for a meat tax appears primarily driven by economic factors and considerations of fairness, which include perceptions of equitable burden-sharing and the economic justification of the tax. These finding aligns with previous research, indicating that individuals are more likely to endorse such policies when they perceive them as equitable and economically justifiable (Beiser-McGrath & Bernauer, 2019; L. P. Fesenfeld et al., 2020).

As expected, the level of taxation emerged as a critical factor in shaping public opinion. Higher tax rates were found to be less acceptable, highlighting the balance required to implement effective but palatable taxation on meat products. To navigate this balance effectively, it may be prudent to consider an incremental approach, starting with a modest tax rate and gradually increasing it (e.g., Perino & Schwickert, 2023).

Consistent with prior research on meat taxes and general carbon taxes, our findings affirm that earmarking tax revenues contributes to an overall increase in support for a meat tax (Beiser-McGrath & Bernauer, 2019; L. P. Fesenfeld et al., 2020; Maestre-Andrés et al., 2021). In particular, our results are in line with findings from Fesenfeld et al. (2020), who found no significant differences in support for a meat tax between different revenue recycling uses (in their case, environmental and climate protection programs, aid for low-income households, and the reduction of income taxes). However, in a study that examined a greater breadth of recycling options, revenues allocated to assist low-income families garnered greater support for a carbon tax compared to various other uses, including reducing corporate

taxes, which notably decreased overall support (Beiser-McGrath & Bernauer, 2019). This would imply that revenue recycling should be geared towards what makes sense in a given context.

The observed difference in support can be ascribed to the reassurance earmarking provides regarding the fairness and effectiveness of environmental tax schemes. While citizens may harbor doubts about the efficacy of the tax itself, there is a perceptible belief in the effectiveness of targeted climate programs. Specifically earmarking revenues for low-income support directly addresses voter concerns regarding the regressive nature of a meat tax. These concerns are substantiated, given that low-income households, allocating a larger share of their income to food, bear a disproportionate burden from food taxes. Encouragingly, research suggests that regressivity can be alleviated in most cases through non-targeted revenue recycling, accomplished via uniform per capita transfers. Additionally, the reduction of Value-Added Tax (VAT) on fruits and vegetables is identified as a measure to tackle regressivity, although it may not entirely eradicate the issue (Klenert et al., 2023). However, evidence from countries with existing carbon tax rebate programs reveals that partisan affiliations and low visibility of rebates can lead to an underestimation of refunds, weakening support for the carbon policy. The authors emphasize that sustained communication efforts will be essential to enhance support through this approach, indicating that a one-time information dissemination may not be sufficient (Mildenberger et al., 2022).

Public backing for meat taxes was found to be sensitive to broader European Union contexts, a trend consistent with the insights shared by Beiser-McGrath & Bernauer (2019). Their work indicates that the rationales guiding environmental policies are shaped by the conduct of neighboring countries, an observation that can also be interpreted through the lens of fairness concerns. Recognizing these cross-border dynamics is imperative for formulating policies that are effectively harmonized within the EU.

Contrary to expectations, the underlying motivation behind the meat tax policy did not meaningfully impact public support. This finding contradicts previous research, which suggested that animal welfare could be a more effective motive for imposing a tax on meat compared to environmental or human health concerns (Perino & Schwickert, 2023). Compared to this seminal study in Germany, where an animal welfare label is only now being considered, our study took place in the Netherlands, where the Animal Welfare Label (The Better Life label) has been around since 2007. Alternatively, our findings may stem from individuals perceiving the rationale as ethically abstract, lacking tangible real-world implications. In contrast, other dimensions of the policy design were perceived as carrying more concrete economic and fairness ramifications, shaping public perception to a greater extent. This suggests that citizens, in their evaluation of a meat tax, were more attuned to the practical and immediate implications rather than the abstract ethical motivations, highlighting a rational approach to decision-making in this context.

It is important to recognize that, for feasibility reasons, the internalization of external costs in our study was calculated to reflect environmental harms rather than human health and animal welfare dimensions. Participants were informed of this, which may have led them to perceive the tax as primarily aimed at improving environmental outcomes. Additionally, participants were made aware that the hidden costs of meat were lower for chicken than for beef, which holds true for environmental and health impacts. However, this does not account for animal welfare, as significantly more chickens need to be killed to produce the same amount of protein as a single cow, and chickens are generally raised in worse conditions (Ritchie, 2024). This discrepancy may have influenced participants' focus on the economic and environmental aspects of the tax rather than the ethical motivations related to animal welfare. Despite this, we do not expect the average consumer to be aware of the environmental-animal welfare trade-offs.

5.2 *Limitations of Behavioral Policies*

While behavioral interventions are widely embraced as policy tools due to their potential for cost-effective solutions, they are not suitable in every context. We found that the effectiveness of “soft” behavioral interventions, including framing nudges and reflective elements, in influencing public support for a meat tax was limited. While more intrusive nudges, such as defaults, have demonstrated the ability to shift behavior in favor of climate-friendly choices (Berger et al., 2022), our study indicates that less intrusive cosmetic and reflective nudges are insufficient to significantly influence support for a meat tax. This calls into question the applicability of “mere nudges” to policy contexts where individuals think critically about their beliefs, such as when voting a policy into action.

While our study finds null effects of the behavioral interventions, there was no evidence of a negative impact. Prior research suggests that nudges can have rebound effects, resulting in unwanted outcomes (Damgaard & Gravert, 2018; Sunstein, 2017). Relatedly, research indicates that nudges, specifically those aimed at reducing carbon emissions (e.g., a green energy default nudge), can potentially diminish support for a general carbon tax (Hagmann et al., 2019). This concern arises because such interventions provide only limited progress while creating the illusion of substantial change, potentially undermining support for more comprehensive and effective policies (Fishbach et al., 2006). However, this phenomenon requires individuals to be aware of the nudge and recognize both the nudge and tax as working toward the same goal. In the case of Hagmann and colleagues (2019), participants were presented with a description of a default green energy nudge and a carbon tax before deciding on policy implementation. In situations where citizens are not actively attending to or scrutinizing a nudging intervention as an alternative to a tax, as observed in our study,

support for the tax can remain stable. Consequently, even though these nudges were ineffective, at the very least, they did not erode support for a meat tax.

Although our study highlights the limitations of behavioral interventions, it is important to note that we do not dismiss their utility within the policy toolkit. Nudges, thinks, and the combined approach of nudge+ have demonstrated greater efficacy in influencing more routine and intuitive decisions, particularly in contexts where individuals may not be deeply engaged in deliberative decision-making processes, such as daily food choices (Banerjee et al., 2023b, 2023a; Bauer & Reisch, 2019; Erhard et al., 2023; Lohmann et al., 2022; Meier et al., 2022; Vellinga et al., 2022). In the realm of daily food choices, individuals frequently rely on heuristics and routines (Cohen & Babey, 2012) and may not have formed strong contemplative preferences, making them more responsive to subtle nudges or reflective prompts (de Ridder et al., 2022). The stability and reflective nature of political beliefs make them less amenable to the subtle interventions that have proven effective in other contexts.

Still, it may be that simple re-frames could exert positive effects even in policy choices if substantial enough. Frames can vary greatly in the degree to which they reframe concepts related to an issue. While some frames leverage polarizing aspects, others minimally change the wording of a message using synonyms with fewer connotations, as we did in our study. For example, framing climate policy in terms of avoiding future losses rather than gains can significantly increase willingness to pay for such policies (Svenningsen & Thorsen, 2021). Similarly, framing the benefits of clean energy policies by emphasizing climate change, air pollution, or energy security has swayed support, particularly among Republicans in the US (Feldman & Hart, 2018). Nonetheless, on the whole, our findings suggest that a more effective approach than relying solely on behavioral economic interventions involves designing a meat tax that individuals can support in its own right.

5.3 *Limitations and Future Research*

Though our study contributes valuable findings, certain limitations highlight areas for future research. Firstly, our examination of revenue recycling options for a meat tax specifically focused on subsidizing plant-based foods and directing funds to support low-income groups. This limited scope suggests that there may be additional revenue recycling mechanisms worth exploring, such as earmarking funds for innovative climate-projects. Thus, future research could extend this inquiry to encompass a more comprehensive range of revenue recycling options to capture the nuanced preferences and impacts associated with different approaches. Secondly, the application of conjoint survey experiments, while robust, may be susceptible to social desirability bias. Our study employed a forced-choice design to capture the trade-offs individuals are willing to make, requiring respondents to choose between presented options. However, this design does not account for opt-out preferences, potentially overestimating the acceptability of the presented options, which could be incorporated in future studies. Furthermore, our study focused on the Dutch context, where a meat tax was under consideration. Given the substantial variability in attitudes and support for a meat tax across different countries due to cultural and contextual factors, future research could employ our experimental design to conduct cross-national comparisons. This approach would contribute to a more comprehensive understanding of the diverse determinants influencing public support for meat taxes on an international scale. However, one challenge in doing so will be accounting for semantic differences and varying familiarity with terminology across languages, such as with the term “levy,” which may not have a direct equivalent or may carry different connotations in different cultural contexts. Lastly, of note is the recent change in the political landscape of the Netherlands, where a conservative party secured victory in the national elections. Given this party's opposition to a meat tax, reassessing public support in this altered political context is essential. Future research should

investigate how this political shift influences policy preferences and public attitudes towards a meat tax, providing updated insights into the evolving dynamics of meat tax support in the Netherlands.

6 Conclusion

A global transition towards plant-based diets is necessary to curb the greenhouse gas emissions associated with current food systems. A tax on meat will be a powerful tool to facilitate this transition, yet limited public support renders its political implementation challenging. To address this dilemma, we conducted a conjoint experiment aimed at discerning the most acceptable attributes of a meat tax policy and assessing the potential leverage of insights from behavioral economics to cultivate public support. Our findings illuminate the pivotal role of policy design in influencing support for meat taxes, emphasizing the imperative of striking a balance between economic considerations, fairness, and an understanding of contextual factors shaping public opinion. Furthermore, our study demonstrates the limitations of soft behavioral interventions; neither a mere framing nudge nor encouraging citizens to reflect on the policy contents exhibited any discernible effect. As countries such as the Netherlands, Germany, and Sweden contemplate the implementation of meat tax policies, our results offer valuable insights to inform policy discussions. Policymakers can draw on these findings to craft meat tax policies aligned with citizen preferences, navigating the complexities of public opinion and advancing sustainable dietary transitions on a broader scale.

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Appendix A

Reflection Prompt

“Last year, tax/levy was proposed by the Dutch parliament. This would affect the price of meat for everyone. Currently, some political parties are against this proposal (e.g. Boer Burger Beweging) while others are in favor (e.g. Groen Links). Think about the pros and cons of this policy proposal and tell us your honest opinion in a few lines.”

Appendix B

Tax Rate Calculations

Table B1. Tax rate by type of meat (€/kg meat)

	10% of hidden costs	40% of hidden costs	70% of hidden costs	100% of hidden costs
Beef	€ 0.52	€ 2.08	€ 3.64	€ 5.20
Pork	€ 0.41	€ 1.64	€ 2.87	€ 4.10
Chicken	€ 0.18	€ 0.72	€ 1.26	€ 1.80

Note. Calculations taken from CE Delft, 2020. Calculations reflect the environmental costs of greenhouse gas emissions causing climate change, other emissions causing environmental pollution, land use-related impacts on biodiversity, and livestock diseases.

Appendix C

Introductory Survey Text to Attributes and Levels

Cost: The product price could include the hidden costs of meat production to different degrees (such as its environmental harms). The lowest tax/levy rate accounts for 10% of the hidden costs of meat, while the highest tax/levy rate accounts for 100%. Depending on the rate, chicken, pork, and beef could increase in price by varying amounts.

Revenue uses: The tax/levy revenues could be used to subsidize the cost of fruits, vegetables, and legumes, to compensate low-income families, or left unallocated for any specific goal.



Policy reach: The tax/levy could be implemented EU wide or only in the Netherlands.

Motivation: The tax/levy could benefit your personal and public health, animals, or the environment.

Appendix D

Figure D1

Example Choice Task from Survey

	Policy Scenario 1	Policy Scenario 2
Cost	<p>10% of hidden costs</p> 	<p>100% of hidden costs</p> 
Policy reach	Policy is implemented EU wide	Policy is implemented EU wide
Revenue uses	Revenues are used to subsidize fruits, vegetables, and legumes	Revenues are not allocated to a specific goal
Motivation	To improve personal and public health	To improve animal welfare

Which one of the two policy scenarios are you more likely to support?

- ☐ Policy scenario 1
- ☐ Policy scenario 2

On a scale of 0-10, how likely are you to support policy scenario 1, if it was implemented by the government?

Not at all likely

Extremely likely

[illegible]

On a scale of 0-10, how likely are you to support policy scenario 2, if it was implemented by the government?

Not at all likely

Extremely likely

[illegible]

Appendix E

Table E1

Socio-Demographic Information for the Dutch Sample (N = 2,032)

	Nudge Levy + No reflection	Think Tax + Reflection	Nudge+ Levy + Reflection	Control Tax + No reflection	Total	
Age, mean (SD)	51.37 (17.86)	51.17 (17.49)	50.28 (17.54)	51.44 (17.46)	51.07 (17.58)	0.95
Gender, n (%)						0.47
Female	52.75	47.98	50.60	49.24	50.22	
Otherwise	47.25	52.02	49.40	50.76	49.78	
Education, n (%)						0.09
Lower professional	14.90	17.00	15.48	17.18	16.14	
Intermediate high or secondary	49.80	40.49	47.22	42.18	44.93	
Bachelor's Degree	22.94	29.35	27.18	26.72	26.53	
Postgraduate Degree	12.35	13.16	10.12	13.93	12.4	
Urbanicity						0.90
Rural	3.33	4.66	2.78	3.82	3.64	
Village	19.80	17.41	18.25	18.89	18.6	
Small Town	18.82	18.62	18.65	16.41	18.11	
City	32.94	32.39	33.13	35.69	33.56	
Big City	25.10	26.92	27.18	25.19	26.08	
Income						0.79
Less than 19,999 Euro	12.17	10.07	8.33	10.00	10.13	
20,000 - 25,999 Euro per year	14.84	13.67	12.14	14.32	13.74	
26,000 - 42,999 Euro per year	27.25	30.70	30.95	31.82	30.21	
43,000 - 61,999 Euro per year	24.09	23.98	24.29	24.09	24.11	
62,000 Euro per year or more	21.65	21.58	24.29	19.77	21.8	

Notes. This table presents balance checks of sample characteristics between four treatment groups. Significance values indicate whether means (continuous variables) or proportions (categorical variables) are significantly different based by bartlett and chi-squared test, respectively.