The role and limits of strategic framing for promoting sustainable consumption and policy

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Abstract

Strategic issue framing is widely regarded as an effective communication strategy to alter public opinion and citizens’ policy support. However, it is unclear to what extent strategic framing can increase support for ambitious demand-side actions and policies that make the cost of mitigation perceptible in citizens’ everyday lives. Taking an exploratory approach, we conducted qualitative interviews and a comparative framing experiment with 9,750 survey respondents from China, Germany, and the United States. We analyzed strategic issue framing effects in two areas known to be key for increasing the sustainability of consumption: meat/fish consumption, and fossil-fuel car usage. Employing both classical linear regressions and advanced Bayesian sparse estimations, we show that in all three countries widespread arguments in favor of reduced meat/fish consumption and car use are unlikely to substantially alter citizens’ concern, willingness to pay, behavioral intentions and policy support for demand-side action. Our findings suggest that in the absence of a broader behavioral change campaign, strategic issue framing alone is unlikely to be effective in changing entrenched attitudes and behaviors. On its own, it is also unlikely to increase public support for ambitious demand-side policies to reduce consumption. More careful research is needed to help policymakers understand the role and limits of different strategic framing techniques.
Introduction

The significant potential for reducing humanity’s environmental impact lies particularly in contested areas where the costs of behavioral change are highest, such as reducing meat consumption and the use of fossil-fueled cars (Creutzig et al., 2018, 2016; Steg, 2018). A large body of research shows that such demand-side policy solutions are needed in addition to supply-side (e.g., technology-centered) policies to meet environmental and climate mitigation targets (ibid.). However, given the high visibility of costs related to demand-side environmental policy, such as higher taxes on fossil fuels or meat products, many governments face challenges of convincing citizens to accept policy interventions and changes in consumption areas like food and mobility. Arguably, the main hurdle to implementing such demand-side measures is their political feasibility, which depends on public support for policy interventions (Bernauer, 2013; Drews and van den Bergh, 2016). This, in turn, calls for a better understanding of how public support for such costly environmental policies and actions can be increased (Steg, 2018).

Accordingly, in the last decade social science researchers in various disciplines, including psychology, communication, and political science, have drawn on survey experiments to understand how political actors can influence public opinion by providing messages that motivate or justify policies and action (Aklin and Urpelainen, 2013; Bain et al., 2016; Bolderdijk et al., 2013a, 2013b; Chong and Druckman, 2007; Druckman, 2013; Druckman and McGrath, 2019; Nisbet and Mooney, 2007; Zhang et al., 2018). In this literature, political messages are usually called (policy) “emphasis frames” (Chong and Druckman, 2007). Emphasis framing takes place when political actors use messages to alter citizens’ preferences through “(often small) changes in the presentation of an issue or an event” (Chong and Druckman, 2007, p. 104) rather than through the provision of completely new information. Many researchers agree that “framing is an effective communication strategy with identity-protective reasoning (and also more generally)” (Druckman and McGrath, 2019, p. 116), even though there is not always agreement about the direction, strength, and mechanisms of framing effects (Druckman and McGrath, 2019; Leeper and Slothuus, 2018; Levine and Kline, 2017; Scheufele and Iyengar, 2014).

While there are many different types of frames (Chong and Druckman, 2007; Entman, 1993, Framework Institute, 2018), we focus in this paper on one of the most popular emphasis framing types: Strategic issue framing (Fesenfeld, 2020, Slothuus and De Vreese, 2010). Strategic issue framing is considered to take place when policymakers strategically emphasize specific subsets of arguments in favor of or against policy and behavior change (Chong and Druckman, 2007; Druckman and McGrath, 2019). Political actors do not always employ framing as a conscious and strategic communication strategy (Mace, 2014; Lakoff 2010). At the same time, an apparent consensus in the literature emerged that through strategic issue framing “elites can manipulate popular preferences” (Chong and Druckman, 2007, p. 120).
Nevertheless, it is an open empirical question to what extent strategic issue framing is effective in motivating ambitious demand-side environmental policy and sustainable consumption. Most research has focused on a single country and has not looked at the effects of issue framing for concrete behavioral implications of environmental policy. The paper at hand contributes to the literature by employing an exploratory comparative experimental research design to assess the effects of strategic issue framing on support for ambitious demand-side actions and policies across different cultures. Concerning deeply embedded cultural consumption habits, such a food and mobility behaviors, a comparative research design is important to assess the cross-country variance of framing effects on support for demand-side environmental policy (Wilk, 2002).

Moreover, while many researchers regard strategic framing as an effective communication strategy, it is less certain to what extent political actors can alter political attitudes and behaviors on personal meat consumption or the use of cars. This is, because such consumption changes require deep-seated cultural shifts and political measures that make the costs of mitigation visible, and are likely to become publicly salient. In such situations, respondents usually engage actively in debate and present more stable, preexisting attitudes (Bechtel et al., 2015; Ciuk and Yost, 2016; Druckman and Leeper, 2012; Slothuus, 2010). It is hence unclear if strategic issue framing can affect behaviors and public opinion about demand-side policies on such salient, culturally embedded and high-cost issues like meat consumption and car usage (Diekmann and Preisendörfer, 2003; Steg et al., 2014a). Thus, the main focus of our paper is to evaluate the effectiveness of strategic issue framing in political debates to shift support for policies aimed at changing such entrenched behaviors. In other words, we did not aim to assess effectiveness of strategic framing used as part of a broader behavioral change campaign in directly nudging and shifting peoples’ deep-rooted habits.

We test this open empirical question taking an exploratory approach in an original survey experiment with 9,750 respondents from China, Germany, and the US that used typical issue frames to motivate demand-side policies and action to promote sustainable consumption. Employing recent computational advances in Bayesian sparse regression approaches, in addition to classical linear models, we show that, in isolation and absent of a broader behavioral change campaign, emphasizing specific arguments in favor of sustainable consumption alone is unlikely to substantially increase public support for policies and actions to reduce consumption. Based on these findings, we discuss the implications for policy and future framing research.

Debating the effectiveness of strategic issue framing in changing public opinion

Framing theory explains that variability in the effectiveness of emphasis frames in changing opinions is due to the availability, accessibility, and applicability of policy-relevant arguments (Chong and Druckman, 2007; Nelson et al., 1997). In essence, the effectiveness of frames in altering participants’ attitudes varies according to whether the related arguments are stored in individuals’ memories, are retrievable, and are evaluated as appropriate in a given situation (Chong and Druckman, 2007; Nelson et al., 1997). To explain such variation in framing effectiveness,
researchers have also employed Bayesian updating and directional-motivated reasoning (Druckman and McGrath, 2019), which suggest that framing messages around prior beliefs, personal and cultural values increases the chance that individuals will update their attitudes in line with messages. Accordingly, social psychologists (Festinger, 1962; Kunda, 1990) suggest that individuals selectively focus on information that corresponds to prior attitudes and discard new evidence that challenges existing beliefs to reduce cognitive dissonance and effortful thinking.

Indeed, empirical research on environmental attitudes and behavior has indicated that frames that match individuals’ values are more likely to motivate changes in attitudes and behaviors (Bolderdijk et al., 2013a; Boomsma and Steg, 2014; Borgstede et al., 2014; Graham and Abrahamse, 2017; Nilsson et al., 2016; Schultz and Zelezny, 2003). For instance, frames tailored to individuals’ ideological beliefs have been evaluated as less threatening and can hence more effectively lead to the updating of environmental attitudes (Baumer et al., 2017; Druckman and McGrath, 2019; Hart and Nisbet, 2012; Wolsko et al., 2016). In the case of meat consumption, for example, it is assumed that a personal health frame appeals particularly to people with strong self-centered motives, while a animal-welfare frame more strongly to people with high self-transcended values (Cordts et al., 2014; Wellesley et al., 2015). In sum, a large number of individual-level factors could potentially moderate framing effects, including sociodemographic, ideological, and psychological variables, in line with directional motivated reasoning theory (Beiser-McGrath and Huber, 2018; Bolderdijk et al., 2013a; Drews and van den Bergh, 2016; Hornsey et al., 2016).

However, Druckman and McGrath (2019) have recently challenged the model of directional-motivated reasoning, arguing that existing evidence is also in line with an accuracy-motivated model in which individuals seek to assess the credibility of messages. Moreover, not all individuals consciously deliberate about the applicability of policy arguments they receive; according to dual-process theory, some individuals are persuaded by messages simply through being confronted with them (Eagly and Chaiken, 1993; Petty and Cacioppo, 1986). The degree of information processing and active deliberation appears to depend also on individual-level priors (Druckman and McGrath, 2019). Moreover, issue-specific and contextual-level factors might change the effectiveness of frames in altering citizens’ opinions. However, we currently lack comparative experimental evidence to assess the degree to which such context-level factors moderate effects.

Hence, we contribute to this debate by presenting results from a comparative and exploratory survey experiment across countries and consumption areas. Studies about the framing of environmental issues have centered primarily on the US (Aklin and Urpelainen, 2013; Bain et al., 2016, 2012; Bernauer and McGrath, 2016; Fesenfeld, 2020; Hardisty et al., 2010). Also, framing studies have rarely compared public opinion across countries with different economic, political, and cultural contexts (with some notable exceptions, e.g., Beiser-McGrath and Bernauer 2019a, Bernauer and Gampfer 2015, Whitmarsh et al. 2019). This narrow empirical focus leaves the potential of sustainability transitions in emerging economies underexplored, although the latter countries have rapidly increased their resource use and consumption footprints (He et al., 2018; Schleifer and Sun,
Given that individuals’ values and socio-economic and political conditions differ greatly between countries, framing effects may vary as well. For example, the availability, accessibility, and applicability of policy-relevant arguments for demand-side mitigation are likely to be different in China compared to the US and Germany, given the differences in the political communication cultures across those countries. Moreover, it has been argued that differences in socio-economic conditions and values explain why people in higher-income countries tend to prioritize environmental protection more than citizens in emerging economies (Franzen and Vogl, 2013; Inglehart, 1995). Such differences might also translate into cross-country differences in the effectiveness of frames in increasing support for demand-side environmental policies and actions.

However, while both individual- and contextual-level factors potentially moderate issue framing effects across countries, it is unclear whether such differences are substantially relevant when focusing on a contested and publically salient issue such as demand-side environmental policy in the food and transport sector. In line with the above-outlined framing theory and the elaboration likelihood model of persuasion (Petty and Cacioppo, 1986), typical policy arguments are more readily available, accessible, and applicable to citizens than in the context of salient and contested issues rather than less contested issues. According to Petty and Cacioppo, for highly salient and personally relevant issues, individuals “scrutinize and elaborate upon externally provided message arguments in light of associations available from memory; draw inferences about the merits of the arguments for a recommendation based upon their analysis; and consequently derive an overall evaluation” (Petty and Cacioppo, 1986, p. 128). In other words, individuals have greater incentives to engage in cognitively more-demanding than less-demanding, heuristic-based decision-making (Kahneman, 2011) when their personal stake is bigger and an issue more proximate to their everyday lives (see also related discussions about the effects of construing proximate and distant actions (Liberman and Trope, 2008)). This argument is in line with prior research that has shown that framing is less likely to change beliefs if citizens have already engaged in debate and have strong related preexisting attitudes (Bechtel et al., 2015; Ciuk and Yost, 2016; Druckman and Leeper, 2012; Slothuus, 2010). It is also in line with the low-cost hypothesis that postulates environmental attitudes and normative considerations to be less important predictors of environmental behavior when the cost of behavioral change increases (Diekmann and Preisendörfer, 2003; Steg et al., 2014a).

In sum, although past studies have found that strategic issue framing can change public opinion on various issues, it remains unclear whether and how this framing strategy is effective in the context of costly demand-side policies and actions and to what extent their effects vary across different cultures. We, therefore, designed an exploratory, cross-country survey experiment to empirically assess the effects of strategic issue framing in the area of sustainable consumption.
Research design and data analysis

Case selection

We conducted our comparative survey experiment (n=9,750) in three countries with large environmental footprints that are also central players in global environmental governance: China, Germany, and the US. These three countries belong to the ten countries with the highest total ecological footprint worldwide (Global Footprint Network, 2018). They vary substantially in terms of population size, socio-economic, cultural, and political systems, while they can shape global production and trading systems through changes in domestic demand. Thus, domestic policies in those countries can substantially impact global environmental change and potentially trigger policy feedback in other countries (Spilker et al., 2017). A potential limitation of our case selection is, however, that Germany is much smaller than China and the US and embedded into the EU multi-level, supra-national governance system. In contrast, the other two countries are not embedded in such a supranational political system.

In particular, we focus on costly- and demand-side mitigation policies and action in two consumption areas known to be key to achieving greater sustainability of consumption and which are also intertwined with citizens’ everyday lives: meat/fish products, and cars that run on fossil-fuels (Godfray et al., 2018a; McCollum et al., 2018). Around twenty-six percent of worldwide greenhouse gas (GHG) emissions and seventy-eight percent of global eutrophication is associated with food systems (Poore and Nemecek, 2018). In particular, (red) meat products are a major driver of biodiversity loss (Godfray et al., 2018b; Springmann et al., 2018; Willett et al., 2019) and a principal source of global emissions of methane – a powerful greenhouse gas that increases the risk of self-accelerating climate change in the near term (Fesenfeld et al., 2018). Similarly, the vast increase in the number and use of cars that run on fossil fuels has significantly contributed to local air pollution and global climate change (Creutzig et al., 2015; Fuglestvedt et al., 2008; Howey, 2012; Lelieveld et al., 2015; Mills et al., 2009). However, while the burden of consumption habits on the global ecosystem calls for a rapid transition towards more sustainable lifestyles, ordinary people may perceive such change as inconvenient, interventionist, and costly (Creutzig et al., 2018; Steg, 2018). These perceptions make these two areas particularly suitable in the study of whether strategic issue framing is an effective strategy for increasing public support for ambitious demand-side mitigation. Participants were randomly assigned to either a questionnaire about meat/fish consumption or the use of fossil-fuel-powered cars.

Sampling

To obtain representative samples in terms of age, occupation, gender, education, income, rural-urban, and region, we used quota sampling (see further details in the supplementary information (SI), Tables A-3-China, A-3-Germany and A-3-USA). Our survey experiments were internet-based and drew on samples provided by Ipsos in the three countries. While the panels maintained by Ipsos are not probability-based, they are non-convenience samples as Ipsos actively manages and
refreshes them to target respondents that match census statistics. For our survey, Ipsos pre-selected respondents from their panels according to the quota and constructed samples that were representative of the national voting age population in the three countries. More specifically, we used a hard quota in our sampling in an attempt to match distribution by gender, age, and region, according to each country’s latest census data (China in 2010, Germany in 2013, and the US in 2015; see details, SI). Additionally, we also employed a soft quota for education, income, rural-urban population, and occupation to ensure that the samples were not extensively skewed towards certain sociodemographic groups.

The quota worked well in Germany and the US such that our samples in these two countries closely followed distribution by income, education, rural-urban divide, and occupation in the national population (see details, SI-Tables 6b, 6c). Chinese respondents were recruited from tier I and II cities. The sample was thus skewed towards a higher-income and urban population, as rural low-income populations in China remain under-represented in all existing internet-based samples (see details, SI-Table 6a). However, due to uneven economic development in China, our sample primarily represented the most relevant population subgroup of the urban middle-class whose consumption patterns have the most significant environmental impact in the country (Wiedenhofer et al., 2017; Zhang et al., 2016) – the consumption-based carbon footprint of the urban middle-class in China (more than 6.4 tCO2/cap) is comparable to that of citizens in industrial countries like those in the EU (Wiedenhofer et al., 2017). Our samples in all three countries were thus representative of politically relevant citizens that represent the voting-age population in the two democratic cases, US and Germany, as well as the politically important, middle-class and urban population with large environmental footprints in China. The survey was conducted in the three countries during the same period – between February 15, 2018, and March 8, 2018. The median average time for survey completion was 18 minutes in the US, 17 minutes in Germany, and 14 minutes in China. We invalidated responses that were submitted within six minutes to ensure that only those respondents who had paid enough attention to the questionnaire were included in the final sample, which was thus comprised of 9,750 responses in total (i.e., 325 respondents x 5 treatment/control groups x 2 consumption areas x 3 countries).

**Experimental and survey design**

Before fielding the survey, we conducted explorative, semi-structured interviews with experts (N=11) and citizens (N=33) in all three countries to identify typical issue frames that might realistically motivate citizens to support relevant sustainable consumption behavior and policies (see details in the SI, Tables SI-1a and SI-1b). In all three countries and across the two consumption areas of interest we found that arguments in favor of sustainable consumption center on four broad types of risk and benefit; namely, the protection of: animal welfare/wildlife habitat (1), the global climate (2), the local environment (3), and personal health (4) (see Figure 1). We hence designed
our treatments for the experiment along the lines of these real-world arguments to identify realistic policy implications concerning the effects of strategic issue framing on public support for demand-side mitigation policy and action. To increase the comparability of results across the two consumption areas, we formulated the treatments very similar concerning meat/fish consumption and car use. For example, the global climate frame read as follows in both areas:

“A large body of scientific evidence has shown that [consumption of meat and fish products (such as farmed beef, lamb, pork, chicken, and fish)/ the use of cars that run on fossil fuels (such as diesel or gasoline)] has a negative effect on the climate worldwide. Notably, [meat and fish farming/ road traffic] results in substantial emissions of so-called greenhouse gases. Greenhouse gases such as methane and carbon dioxide cause climate change (also known as global warming), which in turn leads to sea-level rise and increases the frequency and intensity of droughts, floods, storms, and other extreme weather events in countries around the world. Reducing [consumption of meat and fish, and with this also meat and fish farming/the use of cars, and with this also road traffic], would thus help to avoid dangerous climate change that affects all countries worldwide.”

In contrast, the local environmental protection frame, for example, referred to more tangible, local environmental impacts like local soil and water pollution in the home country of the respondent. While the health frame emphasized self-centered motives and major potential personal health problems, the animal welfare frame focused on self-transcendent values and the negative effects of consumption on animals and wildlife habitat. While both animal welfare (meat case) and the protection of wildlife habitats (car case) share an underlying appeal to self-transcendent values, these two frames are not perfectly comparable (see exact wording in SI, p. 4ff). After conducting several expert and citizens interviews, we, however, decided to opt for these two framing conditions as citizens perceive them to be realistic arguments focused on changing either food or mobility behaviors.

We combined treatment texts with graphical illustrations to ensure that individuals fully understood the treatment message (Beiser-McGrath and Bernauer, 2019). Participants assigned to the control group received a placebo text and an illustration of the same length and style, but with unrelated content (see full treatment/control group wordings and graphical illustrations in the SI, p.4ff). We employed a factual manipulation check (Kane and Barabas, 2018) to ensure that participants had understood the essential information in the related frames and treatments worked as expected. Approximately 91% of respondents successfully passed the factual manipulation checks (see details per country and treatment group in SI, p.12 and p.13). To examine the effects of strategic issue framing on participants’ support for demand-side policy and action, we examined framing effects according to the more conservative intention-to-treat logic for all participants, including those who failed the manipulation check.
Before providing the treatments, we measured several individual-level covariates that potentially explain environmental policy preferences and could moderate framing effects (Bain et al., 2012; Beiser-McGrath and Huber, 2018; Bolderdijk et al., 2013a; Drews and van den Bergh, 2016; Druckman and McGrath, 2019; Graham and Abrahamse, 2017; Steg et al., 2014b). Respondents first answered a series of questions designed to collect general sociodemographic data about items such as their gender, age, income, education, number of adult and non-adult family members, and several items on their political ideology (the questions about political ideology could not be asked in China due to government restrictions on such survey activity). All items were measured via established question scales (e.g., variables for left-right ideology, party identification, and degree of government intervention were based on measures taken from the US General Social Survey, Gallup, and the German GESIS database).

Second, participants were asked to report their current pattern of personal meat/fish consumption or personal use of cars, depending on the questionnaire to which they had been randomly assigned. Namely, they were asked to indicate the average amount and type of meat/fish they eat per week or the yearly driving distance and type of car they drive most often.

Third, we inquired about the potential criteria participants apply when choosing food products or means of transport (e.g., sustainability-related criteria such as a product’s impact on the environment and health, but also other more egotropic choice criteria like product prices). Also, we measured to what extent individuals would perceive it personally challenging to stop their...
consumption of meat/fish products or use of cars (depending on the personal consumption behavior, as indicated in the previous section of the survey), and how much they perceived that consuming those goods is important for their personal quality of life. We also measured their prior awareness of potential sustainability problems associated with meat/fish consumption or fossil-fuel-powered car use, as highlighted by the respective framing treatment. Please note that we have only asked respondents about their prior awareness about the potential sustainability impact of their consumption behavior related to the respective framing treatment they received in order to avoid any potential pretreatment effects. To avoid any pretreatment effects, we also did not ask this question in the control group.

Fourth, we used the Environmental Portrait Value scale, which is based on the Human Value scale (Bouman et al., 2018; Bouman and Steg, 2019; Schwartz et al., 2001), and is an established measure for assessing how personal values (i.e., hedonic, egoistic, biospheric, and altruistic values) affect environmental attitudes and behaviors across cultures and countries. Prior research suggests that the effectiveness of frames in motivating sustainable behavior and policies varies specifically concerning such personal values (see e.g., Bolderdijk et al., 2013a).

After the treatments, we employed four outcome measures. While stated-preference outcomes face the risk of social desirability and ceiling effects, we designed the dependent variables in a way to minimize these risks. The first outcome variable is individuals’ concern about the impact of unsustainable consumption with two items, which we used to construct an additive index. The order of these items was randomized to prevent ordering effects. Both items were measured on a seven-point Likert scale and asked individuals to evaluate how concerned they are about the impact of either consuming meat/fish products or using cars that run on fossils for themselves and their families.

Second, we measured support for public policies to reduce the consumption of meat/fish products or use of cars that run on fossil fuels. Here, we asked respondents to indicate their level of support for those policies with costly implications in everyday life on a seven-item Likert scale (“strongly oppose” to “strongly support”).

Third, we measured respondents’ willingness to pay more for meat/fish products or motor fuel as part of an increase in tax on those products. In line with the literature on environmental taxes (see e.g., Klenert et al., 2018; Springmann et al., 2017), we assume that higher prices discourage consumption of those products. We first showed respondents a realistic average price for meat/fish or motor fuel in their country and asked them to indicate on a scale from 0 to 100 percent how much more they would be willing to pay for the respective product. To increase the external validity of our findings and reduce potential social desirability bias, we connected respondents’ responses (as percentages) to the respective price increase. We showed them how much money on average they would personally have to pay for meat/fish or motor fuels under the related tax scenario.
The fourth outcome variable is individuals’ intentions to change personal behavior. To measure it, we reminded respondents about the amount of meat/fish products they personally consume or their personal average driving distance (as reported by respondents before the treatments). In addition, we asked them if and by how much they would be willing to reduce their individual consumption on a scale from 0 to 100 percent. A slider was used to illustrate the respective reduction in the amount of meat/fish they would consume (or personal driving distance) to help them relate their response to real data and their everyday lives. As the cognitive interviews during the survey pretests showed, the design of this question was user-friendly and supported the external validity of findings.

Overall, the survey and treatment design followed the established process for conducting survey-embedded framing experiments, and we carefully used qualitative and quantitative pretests to ensure a high level of treatment and question comprehensibility and external validity. The full treatment texts and graphs, as well as full question wordings, are attached to the supplementary information (SI).

Data analysis

We focused our main analyses on individuals who eat meat and/or fish products or drive a car themselves. Given that these respondents are particularly affected by demand-side mitigation measures, it is particularly important to assess the effects of strategic issue framing for this subsample. Moreover, following an obvious logic, we could only ask respondents for their willingness to pay and intention to change behavior if they had already indicated that they either consume meat/fish products or drive a car that runs on fossil fuels. In essence, to enable easy and valid comparability across the different outcome variables, we focused the presentation of results for all outcomes on the subsample of individuals who stated that they eat meat and/or fish products, or drive a car themselves. Moreover, robustness tests (see Tables SI-2a-Robust and SI-3a-Robust) show that the results do not change substantially when computing effects based on the full sample. This is because most respondents in our sample do eat meat and/or fish products (97% of all respondents, N=4738), or drive a car themselves (86% of respondents, N=4223; see country-level details in SI, Tables SI-7a and SI-7b). We employed classical ordinary least squares (OLS) regressions with robust standard errors to estimate treatment effects. All dependent variables were standardized (z-transformed) to allow for a comparative assessment of effect sizes.

It is important to highlight that effect sizes in message and framing research are often misunderstood, and “the effect size - a quantitative representation of the effect of a variable on an outcome is often confused with the size of the effect of a message on an outcome” (O’Keefe, 2017, p. 210). In our experiment, we are interested in both the potential differences between different framing treatments as well as in comparison to a placebo control group. Using a placebo control group allows us to distinguish between the effect size as a difference between treatment conditions and the size of our framing treatments on an outcome compared to the control group. To ensure
sufficient statistical power to detect even small to moderate framing effects we build on Cohen's d
standardized estimates from meta-analytical reviews of emphasis framing experiments in the
political domain. According to Amsalem and Zoizner (2020) the standardized mean effect size of
emphasis frames on individuals’ political attitudes is \( d = 0.4 \). Based on this meta-analytical estimate
for Cohen’s d, we reach 0.95 statistical power (using two-tailed student’s t-test, \( \alpha = 0.05 \)) with
164 respondents per treatment group. Given our experimental design with an average of 325
respondents per condition, our findings are clearly based on sufficient statistical power.

To check for the robustness and substantive relevance of framing effects, we went beyond the use
of standard linear regression. We employed a recently developed Bayesian sparse regression
method, LASSOplus, to identify not only relevant main, but also heterogeneous treatment effects
(Ratkovic and Tingley, 2017). Sparse regression tools like LASSOplus use a “regularization
parameter” to shrink or remove weak and irrelevant estimates from the model in order to avoid
overfitting and focus on the key predictors for the outcome variable in question. In other words,
LASSOplus penalizes weak and noisy effects to reduce variance. This penalization lowers the risk
of reporting false positives and substantially irrelevant effects. While this approach leads to very
conservative estimations of main effects, the method is a particularly suitable tool for testing
heterogeneous treatment effects in a situation of limited \( N \). Specifically, it allows for the estimation
and selection of multiple effects simultaneously, without engaging in potentially arbitrary sub-
setting of data. Thus, compared to classical linear regressions, LASSOplus provides more
conservative and robust estimates with credible intervals and permits the efficient estimation of
interaction effects that can be interpreted independently of their lower-order terms (see further
details on its prior structure and regularization parameters in Ratkovic and Tingley 2017). We use
LASSOplus in addition to classical OLS models to assess the robustness and substantial relevance
of results more carefully. Such advanced sparse regression and machine learning techniques should
not substitute theoretically driven selection of model parameters, but be seen as a complementary
method for assessing the relevance and robustness of estimated treatment effects, especially
interaction effects, to predict policy support and behavioral intentions. Our premise is that
substantially relevant treatment effects should be detectable when using both OLS and LASSOplus
regressions. This is, the differences between treatment effects that are only detectable by OLS
regressions but not the more conservative LASSOplus regressions tend to be weak and not
substantially relevant for shifting policy attitudes and behavior in real-world settings.
Results

Figure 2: Comparison of framing treatment effects on concern about meat/fish consumption and use of cars that run on fossil fuels from classical linear regressions (marked in red) and Bayesian LASSOplus sparse regressions (marked in blue).

Note: Red triangles and error bars represent treatment effects and 95 percent confidence intervals obtained from OLS regressions with robust standard errors using the R “estimatr” package. Blue circles and error bars represent the posterior median and 95 percent credible intervals obtained from Bayesian LASSOplus regressions using the R “sparsereg” package, with the default settings of 200 saved posterior samples, and a burn-in of 200 samples using thinning (retaining every tenth sample).

Turning to the empirical findings, Figure 2 shows that when using classic linear regression models with robust standard errors (OLS estimates and 95% confidence intervals marked in red), in China, a personal health message increased respondents’ concern about the impact of using cars that run on fossil fuels only slightly, by 0.16 standard deviations. While in Germany all frames slightly boosted average concern compared to the control group by 0.18 and 0.27 standard deviations, in the US none of the frames increased concern about the impact of fossil-fueled car use. Also using OLS regressions, we find that in China respondents’ concern about the impact of meat/fish consumption increased by 0.31 and 0.15 standard deviations for respondents in the health and local environmental treatment group, respectively. In Germany and the US, when conducting classical linear regression analyses all frames increased concern by 0.21 and 0.44 standard deviations compared to the control group. Importantly, differences between framing treatment conditions were not significant across countries and consumption areas, with the exception of the health frame that significantly increases concern of Chinese respondents about the impact of meat/fish consumption.

When using a more conservative sparse regression estimation approach (LASSOplus-based posterior median and 95% credible intervals marked in blue), only the personal health frame still had a robust and positive effect (compared to the control group) on citizens’ concern about the
impact of meat and fish consumption in all three countries. The estimated posterior median of the health-framing effects in China, Germany, and the US ranged between 0.18 and 0.21, while all other framing effects across countries and consumption areas converged to a posterior median of nil and are thus effectively irrelevant when using the more conservative estimation approach of LASSOplus. In other words, this result implies that the health frame is the most likely strategic issue frame to substantially increase individuals’ level of concern about meat/fish consumption in real-world settings across all three countries.

Moreover, LASSOplus permits the estimation of a large-set of potential interactions between individual-level characteristics and framing conditions without risking over-fitting or arbitrary subsetting of data. However, including a large number of potential moderating variables did not lead to any significant interaction effects with the frames in the three countries and two consumption areas (see all evaluated moderators in the survey design section and detailed regression results in SI-Tables 2b). These results challenge directional-motivated reasoning theory and existing studies (Bolderdijk et al., 2013a; Boomsma and Steg, 2014; Borgstede et al., 2014; Graham and Abrahamse, 2017; Nilsson et al., 2016), which suggest that individuals with high biospheric values react significantly more to framing arguments centered on such values (e.g., animal welfare, local environmental- or global climate protection), and the personal health frame is expected to particularly appeal to individuals with strong egoistic values. In fact, our empirical findings do not show any relevant and significant interaction effects between individuals’ personal values and any of the treatment effects in all three countries and in both the context of meat/fish or fossil-fueled car use (see posterior median is zero for all interactions between personal values and treatment conditions in SI-Tables 2b).

Likewise, while individuals’ ideological beliefs have been mentioned as important moderators of framing effects (Baumer et al., 2017; Druckman and McGrath, 2019; Hart and Nisbet, 2012; Wolsko et al., 2016), in Germany and the US we do not find any significant interactions effects. In both consumption areas, the framing effects did not significantly differ between individuals with different ideological predispositions (see posterior median is zero for all interactions between individuals’ ideological positions [e.g., left-right position] and treatment conditions in SI-Tables 2b). Please note that we could not gather any information on ideological positions of Chinese respondents due to the country’s regulation. We also find no robust evidence that framing effects vary systematically across countries. Yet, some differences exist between the two consumption contexts: the health frame increases concern primarily in respect to meat/fish consumption, but not with the use of fossil-fueled cars.
Figure 3: Comparison of framing treatment effects on policy support to reduce meat/fish consumption and use of cars that run on fossil fuels from classical linear regressions (marked in red) and Bayesian LASSOplus sparse regressions (marked in blue).

Note: Red triangles and error bars represent treatment effects and 95 percent confidence intervals obtained from OLS regressions with robust standard errors. Blue circles and error bars represent the posterior median and 95 percent credible intervals obtained from Bayesian LASSOplus regressions. The dashed line represents the control group.

Figure 3 shows that based on classic linear regression models with robust standard errors (OLS estimates and 95% confidence intervals marked in red) only the wildlife habitat/animal welfare treatment in Germany slightly increased policy support for reducing the use of cars that run on fossil fuels (0.16 standard deviations). None of the other treatment conditions had any effect on policy support across all three countries. All effects drop to nil, including the wildlife habitat/animal welfare treatment effect in Germany, when employing more conservative Bayesian LASSOplus regressions (posterior median and 95% credible intervals marked in blue). Moreover, there are no significant effect differences between the various framing conditions on policy support to reduce car use countries when using both OLS and LASSOplus.

In contrast to the lack of policy support for reducing car use, in all framing conditions Chinese respondents increased their policy support for reducing meat/fish consumption by 0.19 to 0.37 standard deviations compared to the control group when using OLS regressions. However, those effect estimates are again not substantially relevant in size and not significantly different compared to each other. Using LASSOplus regressions shows that the posterior median for all frames drops to nil. In essence, it is very likely that the positive framing effects detected through OLS regressions are false positives or of negligible size in real-world settings. We see a similar pattern when looking at the German and US sample. While based on OLS regressions in Germany the animal welfare frame has a positive effect of 0.18 standard deviations compared to the support level for policies
aimed at reducing meat consumption in the control group, the posterior median of the animal welfare frame is zero when using LASSOplus regressions. In the US, based on OLS regressions all frames, but the health frame, have positive effects on policy support that range between 0.19 and 0.21 standard deviations compared to the control group. However, again for all treatments we do not find any significant differences between framing conditions. Moreover, LASSOplus reveals that the posterior median is zero. In essence, the positive framing effects (compared to the control group) identified through classical OLS models are likely false positives or reveal effect sizes that are substantially-speaking negligible.

We also do not find any positive and robust interaction effects between any of the frames and individual-level factors like individual ideological predispositions (e.g., left-right position), personal values (e.g., self-transcendent and self-centered values), prior consumption habits (e.g., amount of meat consumed per week) and criteria (e.g., convenience or price criterion), or sociodemographics (e.g., age, gender, or education). In essence, for all these treatment-covariate interactions the posterior median is zero (see detailed regression output in Tables SI-3b). In other words, our findings do not support prior research that suggests that tailoring messages to an audience increases the effectiveness of frames in changing individuals’ environmental attitudes (Bain et al., 2012; Bolderdijk et al., 2013a; Druckman and McGrath, 2019; Graham and Abrahamse, 2017).

Figures 4 and 5 show a very similar pattern to Figure 3. While OLS regressions suggest that some of the framing conditions increase individual willingness to pay more for meat/fish products (but less so for motor fuels) in the form of an additional tax, differences between framing conditions are not significant and weak. Moreover, the posterior median in LASSOplus regressions drops to zero and indicates a high probability of false positive or small effects (see Figure 4). Figure 5 shows framing effects on individuals’ intentions to reduce personal car use and meat/fish consumption. Here, the posterior median of almost all framing conditions is zero – only the global climate frame in China increases the intention of respondents to reduce meat/fish consumption substantially and robustly in both OLS (0.50 standard deviations greater than for the control group) and LASSOplus regression models (0.16 standard deviations). Again we do not find any relevant interaction effects between the frames and various individual-level variables (e.g., personal consumption habits, income, education, ideological predispositions and personal values) in respect to the willingness to pay and behavioral intention outcomes (see posterior median is zero for all treatment interactions in Tables SI-4b and SI5b). In sum, the consistent finding of our experiment across the two consumption areas and three countries is that via classical OLS regressions we can identify some framing effects compared to the control group, but most effect differences between treatment conditions are not significant. Finally, the more conservative LASSOplus models suggest that most of the identified framing effects from OLS regressions are likely to be false positives or of negligible size.
Figure 4: Comparison of framing treatment effects on willingness to pay more for motor fuels and meat/fish products (by adding a tax on those products) from classical linear regressions (marked in red) and Bayesian LASSOplus sparse regressions (marked in blue).

Note: Red triangles and error bars represent treatment effects and 95 percent confidence intervals obtained from OLS regressions with robust standard errors. Blue circles and error bars represent the posterior median and 95 percent credible intervals obtained from Bayesian LASSOplus regressions. The dashed line represents the control group.

Figure 5: Comparison of framing treatment effects on intentions to reduce the use of cars that run on fossil fuels and meat/fish products from classical linear regressions (marked in red) and Bayesian LASSOplus sparse regressions (marked in blue).

Note: Red triangles and error bars represent treatment effects and 95 percent confidence intervals obtained from OLS regressions with robust standard errors. Blue circles and error bars represent the posterior median and 95 percent credible intervals obtained from Bayesian LASSOplus regressions. The dashed line represents the control group.
Overall, our results point to the limits of strategic issue framing techniques used in isolation, rather than integrated into a holistic behavioral change campaign, with regard to increasing public support for measures to reduce meat/fish consumption and the use of cars running on fossil fuels. In essence, we find that only the personal health frame robustly increases individuals’ concern about the impact of meat/fish consumption across all three countries. The finding of a robust effect of the personal health frame is in line with prior research that suggests appealing to egoistic motives is the most successful strategy for motivating a reduction in meat consumption (Cordts et al., 2014; Wellesley et al., 2015). It is, however, very questionable if these increased levels of concern translate into real behavioral changes and support for ambitious demand-side policies. In fact, across countries and consumption areas we do not find any robust evidence that increased levels of concern translate into changes in behavioral intentions, willingness to pay, or policy support. In other words, even in a stated-preference context that does not require individuals to reveal actual behavioral change, we do not find any robust and substantially meaningful framing effects. This underscores existing skepticism about the effectiveness of using strategic issue framing on its own in respect to demand-side measures with visible cost-implications for citizens’ everyday lives.

Moreover, our findings show that strategic issue framing alone is ineffective in motivating a reduction in the use of cars that run on fossil fuels. None of the issue frames (not even the personal health frame) had any robust effects on the outcome variables in the car-related case across all three countries. Our comparative study also does not find any evidence that any of the issue frames typically used to motivate demand-side measures affect individuals to a substantially different degree from each other or differently depending on the country context or individual-level parameters. This finding contrasts with prior research that has highlighted the importance of tailoring political messages in order to increase their effectiveness in changing public opinion (Bain et al., 2012; Baumer et al., 2017; Bolderdijk et al., 2013b, 2013a; Druckman and McGrath, 2019; Graham and Abrahamse, 2017; Wolsko et al., 2016).

Our results suggest that strategic issue framing alone is not sufficient to increase support for ambitious environmental policies that involve clearly visible cost implications in citizens’ everyday lives. The findings also suggest that we need to be more cautious when interpreting framing effects from survey-embedded experiments, especially at the subgroup level. The nil finding of strategic issue framing effects across the three countries, two consumption areas and across different subgroups could suggest that directional motivated reasoning (Druckman and McGrath, 2019) plays a less important role when evaluating the strategic issue frames presented in this study. Cognitive dissonance theory (Festinger, 1962) and directional-motivated reasoning models (Druckman and McGrath, 2019; Kunda, 1990) imply that individuals actively focus on information that corresponds to their prior attitudes and values, while discarding information that contrasts existing beliefs. Yet, we do not find that individuals react more positively or negatively to any of the issue frames if those
align or not align with their prior attitudes or values. In contrast to most of the existing literature that has investigated support for environmental policies in general, our study makes the costs and everyday implications of demand-side environmental policies easily perceptible to respondents.

There are several interpretations of this finding. First, it could be that the tested frames in this study were not strong enough to lead to substantial motivated reasoning, and that stronger frames would lead to significant interactions in line with individuals' priors. The second interpretation could be that in respect to more salient issues, people generally engage in more conscious decision-making routes and actively weigh different arguments against each other. In other words, in such more conscious situations individuals employ their priors less often as heuristics to evaluate framing treatments. As outlined above according to the elaboration likelihood model of persuasion (Petty and Cacioppo, 1986), in such salient settings, it is more likely that individuals have stable prior attitudes that are not easily affected through a simple issue frame (Bechtel et al., 2015; Ciuk and Yost, 2016; Druckman and Leeper, 2012; Slothuus, 2010). Potentially, strategic issue framing could have larger effects on attitudes in areas in which costs are less visible. However, it is questionable to what extent the cost implications of ambitious environmental policy measures can and should be obscured from citizens.

While we have good confidence in the robustness of our results, there are clearly some limitations. Even though the findings are based on large samples in different countries and consumption contexts, conservative Bayesian sparse regressions, and both quantitative and qualitative pretests, we acknowledge the following shortcomings. To start with, we did not use the full spectrum of available frames to motivate support and behavioral change. In this study, we only focus on one particular – while widespread – type of emphasis framing: strategic issue framing. Future research should extend the generalizability of our results to other types of frames, for instance social norm (Bouman and Steg, 2019; Mildenberger and Tingley, 2017), source-cue (Dür, 2019) or psychological distance frames (Brügger et al., 2015). For example, social norm- or second-order belief frames that emphasize a broad consensus about the importance of protecting the environment and changes in personal lifestyles (Bouman and Steg, 2019; Mildenberger and Tingley, 2017) could be more effective in altering environmental attitudes and behaviors than the arguments typically used to communicate the benefits of ambitious environmental policy. Future research should also test the degree to which active information processing mediates different types of framing effects.

Moreover, research has also shown that affective campaign messages, for example with respect to health issues, are more effective in changing attitudes and behaviors when paired with a specific call to action (Noar, 2006). Hence, further research should assess whether strategic issue framing is more likely to create substantially meaningful effects when embedded into broader behavioral change campaigns that effectively follow established principles of campaign design (e.g., audience segmentation, message design, and channel selection) and provide individuals with clear, tangible action guidance and nudges for changing their attitudes and behaviors.
In addition, the information context is key to understanding the effectiveness of frames in altering attitudes and behaviors (Chong and Druckman, 2007; Jacobs, 2011). Not only is the availability, accessibility, and applicability of potential counterframes relevant in real political debates (Aklin and Urpelainen, 2013; Druckman, 2013), but also the salience of particular arguments. The salience of arguments is likely to depend heavily on political context and the existence of focal events (Jacobs, 2011). Recent extreme weather events or food scandals can offer policymakers windows of opportunity to employ framing strategies and effectively shift public opinion, potentially even in relation to ambitious demand-side environmental policies. Future research should also conduct similar experiments across different EU countries and emerging economies with growing population and consumption demands to test the generalizability of our findings.

Finally, and more fundamentally, one can question the suitability of the widespread methodological approach taken by survey-embedded framing experiments. While only a few studies have scrutinized this standard empirical approach to conducting framing experiments (Barabas and Jerit, 2010; Bechtel et al., 2015; Kahan and Carpenter, 2017; Kinder, 2007; Leeper and Slothuus, 2018; Levine and Kline, 2017), our study suggests that the existing literature might have over-reported significant framing effects. In light of well-known biases against the reporting of zero effects (Fanelli, 2010) and weak pre-registration standards, many insignificant and weak framing effects may well not be published or enter the review process in the first place. It could also be that the established method of embedding information-based framing experiments into surveys simply lacks sufficient ecological validity and results would substantially change when testing frames in more field-experimental settings (Barabas and Jerit, 2010). In particular, we note three general concerns about the current standard of conducting survey-experimental research to understand public opinion about environmental or sustainability issues – including the study at hand.

First, most studies have employed survey-embedded experiments at one point in time and in one specific country, often the US. This is particularly problematic, as in reality changes in the framing of a political issue such as climate change may only have effects over time and may strongly depend on the information context (e.g., the presence of focal events). Second, confronting individuals with simple information treatments in a single survey-experiment runs the risk of involving them in unrealistic settings of low ecological validity. In reality, political entrepreneurs use multiple combined rational and emotional cues, building on voice, imagery, and written text to alter citizens’ climate attitudes and action (Kinder, 2007). Also, counter-framing and argumentative competition take place in reality, but seldom in survey-embedded experiments. Framing effects are likely to be substantially weaker if arguments in favor of and against climate mitigation cancel each other out (Aklin and Urpelainen, 2013; Druckman, 2013). Accordingly, field experiments may be a better approach than online survey experiments to investigate to what extent strategic framing changes behavioral intentions, support for the uptake of policy incentives to change behavior, or the behavior itself. The third concern is that most studies do not make use of advanced methods, such as Bayesian sparse regressions, to reduce the risk of the inefficient and noisy estimation of effects.
This failure to use more conservative estimations approaches to control for valid covariates and interactions can lead to false-positive results and underpowered analyses, even in perfectly randomized experiments (Grimmer et al., 2017; Ratkovic and Tingley, 2017).

**Conclusion**

In this paper, we present the results of a comparative framing experiment with 9,750 survey respondents in China, Germany, and the US that studied strategic issue framing effects in two areas known to be key to increasing the sustainability of consumption: meat/fish consumption, and fossil-fuel car use. Employing both classical linear regressions and advanced Bayesian sparse estimations, we show that strategic issue framing alone is unlikely to alter concern, willingness to pay, behavioral intentions, and policy support for demand-side action. We do not find robust and substantially relevant differences between the effects of different popular strategic issue frames across the two studied consumption areas and three countries. Our findings question the effectiveness of strategic issue framing used in isolation, rather than embedded into holistic behavioral change campaigns, in influencing public support for ambitious environmental policy that makes the cost of mitigation visible in citizens’ everyday lives. Moreover, we call for a systematic review of existing framing studies that extends the generalizability of the present study, that checks the robustness of existing research on different framing types to alter environmental attitudes and behaviors, and that empirically validates the assumption that the literature might have over-reported significant framing effects and false positives. Our results also encourage researchers to rethink established methods of conducting framing experiments, an activity that we consider to be crucial to advance knowledge about effective communication and understanding its limits in relation to building public support for effective environmental actions and policies.

For political actors interested in adopting ambitious environmental policies, it is key to better understanding how strategic framing and the substantive features of policies interact and can be designed in ways to increase public support. One promising strategy for increasing public support is packaging policies with visible demand-side mitigation costs together with policies that compensate citizens by including clear benefits for the latter, or that redistribute costs to producers (Beiser-McGrath and Bernauer, 2019; Carattini et al., 2018; Fesenfeld et al., 2020; Fesenfeld, 2018; Klenert et al., 2018; Wicki et al., 2019a, Wicki et al, 2019b). Policy packaging accounts for the prevailing beliefs and preferences of citizens rather than trying to change them through strategic framing. In particular, in the context of policy packaging it is essential for political entrepreneurs to highlight those policy design features that benefit citizens and effectively mitigate sustainability problems, rather than to re-frame the contextual issue and focus of the overarching debate (e.g., trying to emphasize animal welfare rather than climate change impacts of meat consumption).

In summary, future studies should embrace the full spectrum of available methods, account for the potential interactions between strategic policy framing and design, and thereby actively identify feasible and effective environmental policies.
List of References


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