

WHICH FRAMING EFFECTS, AND FOR WHOM, TO PROMOTE PRO-ENVIRONMENTAL BEHAVIORS?

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Overview

The European Union is aiming for climate neutrality by 2050 (*i.e.* net-zero greenhouse gas emissions). In the meantime, global transport CO₂ emissions are still rising and constitute one of the main contributors with a quarter of total emissions (IEA, 2020). To reduce these emissions, especially in the transportation sector, answers based solely on technological improvements or carbon tax appear to be not sufficient to deal with climate emergency: a behavioral shift is needed. Such a shift would lead to low-carbon modes of travel, from private to public transportation, soft mobility or even a reduction in distances traveled.

This article investigates the following question: **How can environmental considerations be better considered in travel decisions?** The literature has increasingly advocated new approaches based on non-price interventions to limit climate change (Stiglitz, 2019). It has been shown that although the effect of information and communication policies generally only have a marginal direct effect, they can help raise public awareness and gain acceptance of other public policy instruments as part of a larger set of measures (Givoni et al., 2013). The introduction of such a nudge could have a significant impact on pro-environmental behaviors by increasing environmental sensibilities. A nudge can be defined as "*any aspect of the choice architecture that alters individuals' behavior in a predictable way without forbidding any options or significantly changing their economic incentives*" (Thaler and Sunstein, 2008, p. 6). **The most well-known type of nudge is probably the framing effect** The framing effect is the measurable impact of selecting of one frame *vs.* another on decision-making. Kahneman and Tversky (1981) suggests that the formalization of a communication message accompanied by a recommendation suggesting a behavior can modify the effectiveness of this communication by altering the perception of some aspects of the considered problem. For instance, the consequences of this modification can be presented either in terms of expected gains when adopting the change (gain framing) or in terms of losses incurred when not adopting the change (loss framing).

Here, we consider **whether attribute valence framing, *i.e.* a description of the same object/characteristics positively or negatively, could promote pro-environmental transport behaviors. The findings from a discrete choice experiment focusing on travel choice are reported herein.** Attribute valence framing is one the three distinct types of valence framing effects – among attribute framing, goal framing and risky choice framing – "*in which some characteristic of an object or event serves as the focus of the framing*" (Levin et al., 1998). Given the magnitude of CO₂ emissions from the transport sector, it is essential to determine all the types of framing that could encourage individuals to take into account CO₂ emissions in their travel behaviors. In this context, it is thus important to be able to estimate the effect of each framing, to allow public authorities to choose the best policies to implement. **The framing of a choice with supplementary information about a climate-related topic has already been examined in transportation economics through discrete choice experiments** (Hilton et al., 2014; Raux et al., 2020). However, the framing effects proposed by these authors relied on information and descriptive norms delivered **before the choices were made, not within the choice exercise** by directly framing some choice attributes (the so called attribute valence framing), **which is the case here.** One of the main advantages of such framing is that it would be especially simple and inexpensive to set up in the context of a comparison between different travel options.

Methods

A **discrete choice experiment** have been conducted on a national sample of the **French population**, with a manipulation of the framing of two considered attributes. The web survey sample was administered in **June 2020** by a public opinion research company, to a sample representative of the general population of France with respect to age, gender and professional status. A total of **1,032 individuals** living in metropolitan France and aged between 18 and 75 years completed the survey. The administration of the questionnaire lasted less than 15 min. The goal of the study being to analyze the framing effect on attributes, it was important to avoid the question of the transport mode in the survey, which would have led to misleading information. **A hypothetical scenario was presented to participants, in which they have to travel for private purpose using public transport (domestic haul).** Origin and destination of the travel is fixed, and two alternatives of travel by public transport are proposed. Each individual has to make ten choices, each between **two travel alternatives** with various combinations of **travel time, cost, CO₂**

emissions and sanitary measures (see Table 1). Our experimental design provided 20 different choice sets. These choice sets were divided into two blocks. The main framing effects studied are the gain and the loss on two different attributes: travel time and CO2 quantity emitted. Therefore the total sample is divided into **five treatments** (each composed of approximately 200 respondents): the control group (T1), gain in travel time (T2), gain in CO2 emissions (T3), loss in travel time (T4) and loss in CO2 emissions (T5). The same experimental design with 2 groups of 10 choice sets is used for each of the five sub-samples. Inside each treatment sample, respondents were assigned randomly to one of the two blocks. The questionnaire was structured as follows: (i) basic socio-demographic information, (ii) choice experiment between travel alternatives and (iii) follow-up questions on psychological positioning to evaluate respondents' psychological features.

Table 1: Levels of the attributes values of the alternatives.

Attribute	Levels			
Price (€)	50	75	125	175
Duration (min)	180	235	305	395
CO2 (kg)	30	39	51	66
Sanitary (One seat gap)	Yes	No	—	—

Results

In order to analyze the impact of the framing on the respondents' preferences for each choice attribute, a Willingness To Pay (WTP) approach based on estimated individual coefficients from a Random Parameter Logit (RPL) model is used.

First, we check the coherence of the coefficients by analyzing their signs and their relative values. Signs of all attributes are relevant and statistically significant. Respondents try to minimize the price and duration of their travel, and maximise the sanitary measure they can benefit from. A negative coefficient for the CO2 attribute is observed, meaning that in general people care about their emissions and try to minimise them. When observing the absolute values of the standard deviations, the difference of price between the alternatives has twice the importance of the difference in duration for the choice. The presence of a gap seat comes in third, before the CO2 attributes, which seems quite relevant given our expectations of individuals' priorities.

Second, results indicate that a loss framing on the travel duration or CO2 emissions is significant and increases the weight of the framed attribute in the individual's decision. On the contrary, this effect is not observed for gain framing. The loss framing effect is larger when applied to CO2 than to duration, an attribute to which individuals are more used to.

Third, the magnitude of the framing effect on CO2 emissions depends on individuals' motivational orientation: those with a low promotion focus score (Higgins, 1997) and a high environmental self-identity score (Van der Werff et al., 2013a) are even more strongly affected by loss framing on the CO2 emissions attribute.

Conclusions

The **main contribution** of our work to the existing literature is **threefold**: (i) to explore if an easy way to implement type of framing could increase pro-environmental behaviors in transport choices, (ii) to estimate the effect of this framing, (iii) to analyze if the framing effect could vary according to individual's psychological heterogeneity. **A loss framing on CO2 emissions significantly increases the respondents' practice of pro-environmental behaviors** and a loss framing in duration increases the average preference for shorter trip duration.

Our work has raised **some issues that require further investigations**. **First**, the fact that framing effects depend on individuals' motivational strategies is a powerful result that should be further analyzed and validated with respect to psychological theory. More generally, future research should focus on these findings and include new psychological factors capable of improving our understanding of individuals' behaviors in the field of transportation. Such an advance would lead to a better understanding of traveler choices, which could serve to design appropriate pro-environmental policies. **Second**, we showed that the effect of loss framing was greater for CO2 than for duration. One possible explanation for this finding is that framing on a more distant or complex attribute (e.g. kg of CO2 emissions) has a greater effect than a framing on an already well-known and typical attribute (e.g. duration). This difference should be investigated in order to ascertain whether it is caused by the fact that CO2 emissions is an abstract indicator. If so, it would be beneficial to find a way to communicate on CO2 emissions with a more understandable unit of measurement.

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