



## Framing Decisions in Uncertain Scenarios: An Analysis of Tourist Preferences in the Face of Global Warming

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### ABSTRACT

This paper presents the results of a choice experiment survey of tourists in Mallorca, Spain, to elicit preferences for designed policies aimed at addressing the attractiveness losses of the destination in the face of global warming. The study is novel in two main ways. First, it introduces the uncertainty deriving from the stochastic nature of global warming, not as a policy attribute but as an inherent feature of the valuation scenario. For this reason, the expected temperature change and its probability of occurrence were kept constant across alternatives but not across different choice tasks. Second, it measures the willingness-to-pay for a set of pro-environmental policies under different framings. Results show that the inclusion of uncertainty shapes individuals' decisions.

### 1. Introduction

There is a growing concern within the environmental economics literature about the effects that risk and uncertainty can have on stated choices and, therefore, on estimated welfare measures (Johnston et al., 2017). In this context, some works have introduced the degree of risk or uncertainty as an attribute describing the good to be valued. More precisely, Alberini et al. (2006), Lew et al. (2010), Brouwer and Schaafsma (2013), and Veronesi et al. (2014) have centred on examining preferences for changes in environmental or health risk exposure through risk-reducing policies where risk is one of the policy attributes. Additionally, Wielgus et al. (2009), Glenk and Colombo (2011, 2013), Wibbenmeyer et al. (2013), Lundhede et al. (2015), Rolfe and Windle (2015), Torres et al. (2017), and Williams and Rolfe (2017) have examined the effects of delivering information about risk and uncertainty over policy outcomes through an attribute representing different degrees of policy effectiveness.

However, risk and uncertainty can also be present as an inherent feature of the hypothetical scenario where individuals are asked to make choices. This is a relevant issue whichever the kind of policy being valued, either certain or uncertain. Even if the outcomes presented in the choice sets are assumed to be completely certain, the underlying conditions of the valuation scenario can be uncertain and, hence, the benefits that individuals obtain can vary significantly depending on the degree of uncertainty. This may be especially true when such scenario is defined by environmental conditions highly dependent

on the stochastic nature of ecosystems' dynamics, such as climate (e.g. temperature, precipitation, etc.) and severe extreme events (e.g. heat waves, hurricanes). Thus, it would be interesting to assess whether preferences of individuals for policies pursuing adaptation to uncertain environmental impacts would change if they were informed about the uncertainty over the magnitude and occurrence of such impacts.

To the best of our knowledge, no study to date has analysed the framing effects from introducing uncertainty in the valuation scenario. As Kragt and Bennett (2012; p.44) explain: framing is a selection process occurring “through the *inclusion* and *exclusion* of, as well as *emphasis* on, available information, providing a context that shapes people's perspectives about the world”. Accordingly, framing effects exist when individuals are sensitive to one or more elements of the context in which they have to make particular trade-offs (Rolfe et al., 2002; Swait et al., 2002; Kragt and Bennett, 2012). In this sense, the stated preference literature has given evidence of framing effects from varying the information about different elements of the hypothetical market such as: (i) substitute goods (Loomis et al., 1994; Whitehead and Blomquist, 1999; Rolfe et al., 2002; Baskaran et al., 2013); (ii) the respondents' budget constraint (Loomis et al., 1994; Whitehead and Blomquist, 1999); (iii) the description of the attributes defining the good to be valued (Hallahan, 1999; Kragt and Bennett, 2012; Czajkowski et al., 2016); (iv) the choice of attribute levels (Hanley et al., 2005; Mørkbak et al., 2010; Kragt, 2013); (v) the attribute level range (Luisetti et al., 2011; Oehlmann et al., 2017); and (vi) the complexity of the choice tasks including the number of choices, the number

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of alternatives, the similarity between alternatives, the number of attributes, etc. (see, for instance, Ohler et al., 2000; DeShazo and Fermo, 2002; Verlegh et al., 2002; Hensher, 2006; Luisetti et al., 2011; Oehlmann et al., 2017).

This paper extends this literature on framing effects by testing and measuring the effects on the Willingness-To-Pay (WTP) from varying information about the degree of uncertainty inherent in the valuation context that frames the hypothetical market. In particular, the paper examines, through a Choice Experiment (CE), how changing information about the magnitude and the probability of occurrence of an expected global warming-derived increase in the temperature can affect tourist preferences for a set of pro-environmental policies. To test for it, we conducted a CE with tourists visiting the Mediterranean island of Mallorca.

Tourists have been chosen as target population because it has been proved that temperature affects their preferences (De Freitas et al., 2008; Gómez-Martín, 2006; Maddison, 2001; Perch-Nielsen et al., 2010; Scott et al., 2004), even beyond other demand function determinants, such as price or other weather variables (humidity, precipitation, wind, etc.). This is especially true for sun and beach destinations where most of the tourist arrivals are mainly motivated by outdoor recreation, which results in a strong seasonal pattern (IET, 2005). We choose Mallorca as study area, not only because it represents one of the most important summer holiday destinations in Europe, but also because the expected global warming-derived increase in the island's temperature might alter its attractiveness and competitiveness (Magnan et al., 2012; Rutty and Scott, 2010).

The remaining of the paper is structured as follows. The next section presents the study design and the survey administrated to outline the main features of the CE implemented to estimate tourists' preferences for a set of pro-environmental policies. The third section describes the modelling approach used to test the existence of framing effects and calculate their impact on welfare measures. The fourth section reports the estimated results for the Random Parameter Logit (RPL) model and the WTP for different policy programs under different framings. Finally, the fifth section presents the conclusions of the paper.

## 2. Study Design and Survey

### 2.1. Global Warming and the Climatic Suitability of Tourism Destinations

Many tourism destinations are expected to be negatively affected by global warming (UNWTO, UNEP, WMO, 2008), which represents one of the most challenging global environmental problems today. This is especially true when it comes to sun and beach tourism regions which comprise coastal areas and many small islands attracting high numbers of visitors due to their summer climatic conditions. Indeed, Amelung and Viner (2006) state that such regions are highly vulnerable to global warming impacts such as climate variation and the occurrence of more frequent and severe extreme events (e.g. heat waves, hurricanes). In this context, the literature shows that global warming may cause the weather conditions of lower altitude and latitude to be less attractive to tourists (Amelung et al., 2007; Bigano et al., 2005; Lise and Tol, 2002). Some authors (Bujosa and Rosselló, 2011, 2013; Bujosa et al., 2015) identify how increases in the temperature might lead not only to a geographical redistribution of tourist flows in Spain but also to changes of tourist seasonal patterns. Considering the non-negligible weight of the tourism segment on the Spanish GDP (14.20% in 2016; WTTC, 2017), global warming might lead to a loss of competitiveness if no action is undertaken.

The identification of the elements that may counteract the potential loss of competitiveness caused by global warming in a given destination forces to focus on the substitutability relationships between the temperature and other factors influencing tourism demand. This is because nature (including weather conditions), culture and infrastructure assets determine destination's market share and, hence, offer to stakeholders

**Table 1**  
Choice experiment attributes and their levels.

Attribute	Levels	Level description
Creation of shadow areas	- Green environments <sup>a</sup>	1 = Green environments
	- Plus urban sponge	2 = (1) + Urban sponge
	- Plus thermal refrigeration	3 = (2) + Thermal refrigeration
Strengthen the tourism product	- More nature conservation <sup>a</sup>	1 = More nature conservation
	- Plus more diverse cultural offer	2 = (1) + More diverse cultural offer
	- Plus more local cuisine offer	3 = (2) + More local cuisine offer
Reduce the carbon footprint	- Green purchasing <sup>a</sup>	1 = Green purchasing
	- Plus recycling and reuse	2 = (1) + Recycling and reuse
	- Plus energy efficiency	3 = (2) + Energy efficiency
Temperature	4 °C, 8 °C, 12 °C	
Probability	30%, 60%, 90%	
Cost	1, 2, 3, 4, 5, 6	Daily extra cost (€)

<sup>a</sup> Key: reference attribute levels.

the opportunity to *act* on the regional or local level. Indeed, the fact that climatic conditions can also vary at a microscale level due to the existence of microclimates resulting from heat accumulation favoured by human developments and/or tourism infrastructures (O'Brien, 2000) allows the *creation of shadow areas* which can improve climate tourist comfort. Additionally, there is the possibility to implement policies oriented to *strengthen the tourism product* by enforcing less climate-dependent activities, and/or to be engaged in environmentally friendly practices to *reduce the carbon footprint* of tourism activities.

### 2.2. The Choice Experiment

The CE design included six attributes, each with three possible levels except the *cost* attribute that had six levels. Three of the non-cost attributes were related to policies oriented to improve the climatic suitability of Mallorca in the face of global warming. In addition to these three policy attributes, two other non-cost attributes were considered to introduce the uncertainty characterizing the expected global warming scenario. Table 1 gives an overview of these two framing attributes and their levels together with the remaining attributes.

The first policy attribute, concerning the *creation of shadow areas*, included three progressively intense actions oriented to counteract the tourists' thermal discomfort which might be derived from the expected increase in the temperature. Specifically, the first action involved efforts into the designing of green environments surrounding the buildings (*Green environments*). The second one implied increasing such efforts and hence add urban sponge plans into built-up areas (*Plus urban sponge*). A third action intensifies efforts introducing thermal refrigeration with re-used waste waters besides the two previous actions (*Plus thermal refrigeration*).

The second policy attribute refers to actions oriented to *strengthen the tourism product* by diversifying the tourism product in favour of less climate-dependent activities. More precisely, three different cumulative actions were considered: the first action involved efforts on conservation strategies of Mallorca's natural assets (*More nature conservation*); the second one also considered devoting efforts to improve the cultural offer of the island (*Plus more diverse cultural offer*); and, finally, the third action adds to the above efforts promoting the local gastronomy (*Plus more local cuisine offer*).

The last policy attribute considered suggests three environmentally-friendly actions adopted by the tourism industry to *reduce the carbon footprint* as: green purchasing programs (*Green purchasing*), recycling and reuse schemes (*Plus recycling and re-use*) and energy efficiency plans (*Plus energy efficiency*).

Regarding the two framing attributes, the first one is based on an

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