This version is the accepted manuscript. The final version is available at:
https://doi.org/10.1177/13548166241301825

Citation: Gonzalez, R. M., Roman, C., Martin, J. C., & Nieto-Gonzalez, I. L. (2024). Tourist mobility packages in an island mass tourism destination: Exploring preferences heterogeneity and willingness-to-pay. Tourism Economics, 13548166241301825.

Tourist mobility packages in an island mass tourism destination: Exploring preferences heterogeneity and willingness-to-pay

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"Tourist mobility packages in an island mass tourism destination: Exploring preferences heterogeneity and willingness-to-pay"

Abstract:

Ensuring a sustainable and efficient transportation system meeting visitor mobility needs is paramount for mass tourist destinations. Recognising this challenge, some destinations are embracing Mobility as a Service (MaaS) solutions as a strategy to create a more sustainable transportation system for tourists. This study uses a discrete choice experiment to analyse tourists' preferences and willingness to pay for MaaS packages in two well-known municipalities of the Canary Islands, one of Europe's premier mass tourism destinations. The empirical evidence of taste heterogeneity revealed by the analysis indicates that a one-size-fits-all solution is inadequate. Therefore, the development of mobility packages must be tailored to the specific needs of distinct tourist segments. This approach caters to individual preferences and maximises the perceived value for each tourist segment, promoting the adoption of sustainable transportation options.

Keywords: *Mobility as a Service; Sustainable Mobility; Discrete Choice Experiment; Mixed Logit Model; Willingness to Pay; Preference Heterogeneity*

1 Introduction

In recent years, sustainability has become a foundational principle in the tourism sector, reflecting growing concerns about environmental preservation and community well-being. Moreover, as some authors suggest (see Bernini et al., 2021), transition management towards tourism sustainability is fundamental for mature and mass tourism destinations. However, an aspect of sustainable tourism related to tourist transport sustainability that has not received enough academic attention is the mobility of tourists at the destination in comparison with the transport to the destination that is mainly devoted to the analysis of the aviation industry, which significantly contributes to carbon emissions and ecological disruption (Peeters et al., 2019). Hence, coordinating sustainability efforts between the tourism and transportation sectors is vital for achieving sustainability. Mass tourism has generated adverse effects worldwide, particularly in the transportation domain. The surge in mass tourism correlates with increased car usage (Davenport & Davenport, 2006). Coastal destinations, like those examined in this paper, face immense pressure to develop transportation infrastructure due to tourism's substantial economic contribution. However, this development often results in negative consequences such as road deterioration, traffic congestion, pollution, and noise. Moreover, expanded traffic can degrade the destination's image in smaller-scale areas and foster resident intolerance towards tourists (Curtale et al., 2024).

Effective management of tourist mobility holds the key to averting environmental degradation, enhancing destination appeal, and shifting residents' attitudes towards tourism. Strategies such as Mobility as a Service (MaaS) have been proposed to achieve sustainable mobility in tourism destinations (Leung et al., 2023; Kim et al., 2021; Martinčević et al., 2022). MaaS, tailored to mass tourism destinations, aims to reduce reliance on private cars and promote a personalised mix of public and private transport options (Martinčević, 2022; Signorile et al., 2018). However, successful implementation hinges on technological advancements and a willingness to adopt change.

Several studies focus on mobility packages (Esztergár-Kiss & Kerényi, 2020; Matyas & Kamargianni, 2021). The packages are created from a combination of mobility modes (public transport, taxi, car sharing, bike sharing) and offerings related to each mode. However, the literature on analysing tourist preferences for implementing mobility packages is still scarce and requires a more detailed study (Kim et al., 2021). Thus, most of the studies related to MaaS have been carried out concerning individual local residents (Kriswardhana & Esztergár-Kiss, 2023). In the case of mass tourism destinations like the one analysed here, the lack of studies on the applicability of MaaS is even more significant, and the literature is still nonexistent. Therefore, although several papers have recently been published, including Discrete Choice Experiments (DCE) (Lyu, 2021; Boto-García et al., 2022; Suresh et al., 2022), further investigation is needed to glean insights into tourist preferences and behaviours (Viglia & Dolnicar, 2020).

Hensher (2022) acknowledges that MaaS has mainly been studied in metropolitan areas with regular travellers in specific locations. However, the prior knowledge of mobility alternatives might differ between the occasional (e.g., tourists) and regular users. Thus, while valuable, most of the existing evidence does not directly translate to the tourist context. Our study aims to address this gap, shedding light on how tourists respond to MaaS options and paving the way for developing attractive offerings that enhance both the visitor experience and sustainable mobility in tourism destinations.

This study employs a DCE to investigate tourists' preferences for mobility packages in the Canary Islands. The aim is to identify variations in preferences and willingness to pay for sustainable mobility options integrated within different mobility packages. The findings of our analysis indicate significant preference heterogeneity among tourists, suggesting the potential benefits of implementing a MaaS system tailored to specific tourist segments.

The rest of the paper is organised as follows. Section 2 presents the literature review. The next section describes materials and methods. Section 4 includes sample description and results. Section 5 summarises our main conclusions.

2 Literature review

Mobility as a Service (MaaS) offers flexible multimodal mobility through subscription or "pay-as-you-go" options (Kim et al., 2021; Kamargianni et al., 2019; Zhao et al., 2023). Initially proposed by Heikkilä (2014) and Hietanen (2014), MaaS has been considered a sustainable transport strategy (Sochor et al., 2018), aiming to reduce vehicles and promote sustainable transport modes (Jang et al., 2021). Alyavina et al. (2022) define MaaS as "a holistic transport provision mechanism that meets transport user needs by offering tailor-made mobility solutions enabled through access to and integration of a wide range of vehicle types, journey experiences and complementary services over a single digital interface" (p.1).

Similarly, Hensher (2024) contended that MaaS has triggered interest in improving mobility services because aggregating mobility suppliers has developed more alternative mobility choices. The aggregation can be made through diverse mobility suppliers such as public transport (buses, trams, trains), micro-mobility-sharing schemes based on bikes and/or scooters, car-sharing and car rental services, ride-hailing services (e.g., Uber, Lyft), and taxi services. Definitively, “MaaS is seen as an ecosystem that can, through appropriate incentive-based regulation, offer a way forward for government and other interested parties to achieve a wide range of sustainability objectives such as reducing transport emissions and traffic congestion through, in particular, reducing private car ownership which translates to less car use and less traffic congestion” (p.1).

In addition, Daou and Leurent (2024) defined MaaS as an economic system comprising four interacting demand and supply components: (1) Individual MaaS end-users who plan, book and purchase mobility services through the MaaS platform. There are different subscription plans based on a period of time and mobility services or pay-as-you-go (PAYG) options that charge users according to the effective use of each mobility mode; (2) The set of mobility service providers; (3) The MaaS operator that acts as the integrator of the whole set of mobility service providers; and (4) The public local, regional and national authorities which are a crucial component of the success of the MaaS implementation providing key performance targets in terms of the use public space and infrastructure, citizens’ mobility and accessibility needs, mobility service providers’ level of service and profits, and environmental emission levels.

Using the framework developed by Daou and Laurent (2024), the first component (end-users) will be mainly determined by the demarcation area and mobility needs. In this sense, there are significant differences between urban and rural areas, or even suburban areas, which might be underserved by public transport in frequency and access and highly mobility dependent on private cars. Butler et al. (2021) contended that important barriers exist for MaaS development in urban cities characterised by low-density and sprawl planning, ubiquitous in many cities in North America and Australia, where public transport systems lack sufficient service, and private

cars dominate mobility modal choice. Similar barriers exist in rural areas, and, in this case, subsidies are essential to the MaaS development. Eckhardt et al. (2018) found that the overall social welfare also depended on the local circumstances determined by the mobility needs of each area, in which the location of community transport hubs is an essential part of the MaaS solution.

Regarding the second component, the mobility service providers or MaaS packages, studies focus on package composition (Esztergár-Kiss & Kerényi, 2020; Matyas & Kamargianni, 2021) and factors influencing their acceptance and willingness to pay (WTP) (Bahamonde-Birke et al., 2023; Caiati et al., 2020; Fioreze et al., 2019; Ho et al., 2018; Ho et al., 2020; Matyas & Kamargianni, 2019; Tsouros et al., 2021; Polydoropoulou et al., 2020a). Notwithstanding, public transport is the backbone of each MaaS development, jointly with at least bicycle-sharing systems.

The third component, the integrator, encapsulates all the mobility service providers and usually takes the name of the MaaS solution. For example, the UbiGo MaaS developed in Gothenburg in 2014 gave the participants access to public transport, car sharing, rental cars, taxis and city bikes (Strömberg et al., 2018). Current real MaaS examples include Whim in Helsinki, Jelbi in Berlin, Moovel in Germany, Citymapper in London and Smile in Vienna. Optimistic narratives regarding user convenience, cost savings, mobility-accessibility efficiency, and environmental gains usually accompany these MaaS examples. However, according to Hensher (2024), with rare exceptions, evidence of social welfare gains achieved after MaaS implementations is quite limited.

Finally, the literature on MaaS has also analysed the role of public authorities. Smith and Hensher (2020) found that “public agencies around the world have invested heavily in research (e.g., the EU-funded project MaaS4EU), trials (e.g., SMILE in Austria), collaboration programs (e.g., KOMPIS in Sweden), and service development (e.g., an innovation challenge hosted by the public transport authority in the Helsinki region, Finland)" (p. 55). Rotaris and Danielis (2018) also contended that MaaS development in less densely populated areas requires more innovative business models and greater public sector involvement.

Studies on MaaS adoption cover various countries (Ho et al., 2020; Kamargianni & Matyas, 2017; Sochor et al., 2016). For instance, Vij et al. (2020) found that 46% of Australians are willing to adopt MaaS, with willingness correlating negatively with age. Liljamo et al. (2020) found that 43% would pay for a mobility package covering all needs in Finland. Esztergár-Kiss and Kerényi (2020) created suitable mobility packages for 15 European cities.

Factors influencing MaaS adoption include socio-demographics, psychological factors, travel characteristics, and built environment factors (Kriswardhana & Esztergár-Kiss, 2023). Age and education are key factors favouring MaaS use, appealing more to the young and those with higher education (Bahamonde-Birke et al., 2023; Hoerler et al., 2020). Matyas and Kamargianni (2021) and Tsouros et al. (2021) found that age, gender, income, education, and travel behaviour impact MaaS package purchases. Recently, El Mustapha et al. (2024) conducted a systematic literature review of empirical studies and analysed the factors considered significant in MaaS acceptance

Recent studies explored tourists' preferences for mobility packages (Chen et al.,2023; Li et al., 2023; Wanying et al., 2022; Zhou et al., 2024), highlighting attributes like MaaS app features, social environment, and living location (Wanying et al., 2022). Chen et al. (2023) identified different tourist groups based on MaaS preferences. Zhou et al. (2024) found Comfort-Driven

and Economy-Driven segments in tourist cities, with factors like travel costs and environmental consciousness affecting MaaS development.

Experiment design is crucial in studying preferences, incorporating attributes like public transport, car-sharing, and add-ons such as attraction ticket discounts, parking, dining or guided tours (Matyas & Kamargianni, 2019; Polydoropoulou et al., 2020b; Chen et al., 2023; Polydoropoulou et al., 2020a; Galí, 2022). Local circumstances should inform add-on selection (Chen et al., 2023).

3 Materials and methods

3.1 Research context

The Canary Islands (Spain) are one of Europe's most important mass tourism destinations. The main tourist destinations are the municipalities of Adeje, in Tenerife, and San Bartolomé de Tirajana, in Gran Canaria. Figure 1 provides a map showing the geographical context under analysis.

Tourism has significantly impacted the Canary Islands' economy, generating nearly 40% of employment and 35% of the Canary Islands' GDP. Moreover, although these levels changed dramatically with the arrival of the pandemic, a new tourism record was reached in 2023 with the arrival of 14 million tourists (seven times the islands' population) (ISTAC, 2024). Of the one million tourists gained in 2023 compared to 2019, most chose Tenerife or Gran Canaria islands. Thus, 65% chose the island of Tenerife, which received 5.6 million tourists, and the island of Gran Canaria received 3.6 million visitors. Additionally, it is important to note that tourism in the Canary Islands does not have a strong seasonal pattern (Hernández-Martín, and León-González, 2023)

However, tourism has also generated significant negative effects, which require implementing management policies to achieve a more sustainable destination. Specifically, in relation to transport, the rates of motorisation reach the highest levels in the archipelago in the two tourist municipalities analysed in the study. It stands at 1211.5 vehicles per 1000 inhabitants in San Bartolomé de Tirajana and 864.4 vehicles per 1000 inhabitants in Adeje. The high motorisation rates lead to major congestion problems on the main roads of the two islands (Tenerife and Gran Canaria) and traffic problems that compromise the sustainability of the destination and the quality of the tourists' visit. In addition, the low prices of rental cars and the lack of restrictions on car access to any part of the islands mean that most tourists opt for a rental car. In 2023, 29% of registrations were rental vehicles (FREDICA, 2024). Additionally, data from the Tourist Expenditure Survey (ISTAC, 2024) suggests that approximately 35% of tourists rented vehicles during their visits in 2023 and the first two quarters of 2024). Given the circumstances, it is crucial to discover innovative means of transportation, and the choice experiment developed in the study will uncover the most effective mobility solutions.

3.2 Questionnaire, sample and data collection

Research data was gathered from a survey administered to tourists visiting Tenerife and Gran Canaria using a questionnaire structured into sections. These sections included a description of the trip to the island, habits related to sustainable mobility options such as bicycles, scooters, and electric cars, a choice experiment among different sustainable mobility packages to meet

tourists' mobility needs during their stay, an attitudinal questionnaire regarding environmental concerns and behaviour, and sociodemographic information[1].

The sample was designed to reflect the socio-demographic profile of the tourist population. Therefore, the survey was evenly disseminated among genders and based on the official nationality distribution of tourists in the surveyed destinations[2]. A preliminary pilot study provided valuable insights that enabled us to refine the wording of certain questions, better define the target group, and ultimately redefine the levels of attributes considered in the discrete choice experiment. As a result, the final survey was only aimed at tourists aged 18-75. It was observed that older people consistently declined to purchase mobility packages and use micro-mobility options, which resulted in their exclusion from the choice experiment. Additionally, island residents who are involved in tourism were not surveyed as they usually use their private vehicles.

Data were collected in April 2023 by a specialised company with experienced interviewers trained specifically for this type of survey. The research team supervised the interviewers' training to ensure data collection was carried out consistently and rigorously. Tourists were surveyed at the main tourist destinations in the municipalities of Adeje in Tenerife and San Bartolomé de Tirajana in Gran Canaria.

Regardless of the scenario presented in the experiment, individuals who consistently stated that they would not purchase a mobility package were excluded from the total number of surveys received. These tourists do not plan to travel and primarily seek rest and relaxation. In addition, 34.6% of the respondents did not declare their monthly household income. Therefore, an imputation of these data had to be made considering the declarations made by the tourists who responded to this question and the socio-economic variables of the respondents. In this way, a multinomial logit model was estimated to determine the probability that the individual's income was located in one of the six income brackets considered. For this purpose, the observations of the individuals who gave valid answers to the income question were used, and the following explanatory variables were used as explanatory variables: micro destination visited, country of origin, gender, age, educational level and number of household members. Upon completing a thorough data-cleaning process, 921 valid responses were retained for the final analysis. This represents a sampling error of less than 3.3%, assuming a population of approximately one million tourists visiting Gran Canaria and Tenerife during the data collection period.

3.3 The discrete choice experiment

To assess tourists' preferences for sustainable mobility options, a DCE was designed, where the context was tailored for a group of up to four individuals for a one-week stay. Eight hypothetical scenarios involving two distinct sustainable mobility packages were presented to participants, each accompanied by its corresponding price. The packages consider a range of services, including the use of personal mobility vehicles such as electric bikes, scooters, mechanical bikes, and electric motorcycles, as well as electric cars, public transport throughout the island and

[1] Previous studies related to the same research context, although focusing on a different subject of study, can be found in Moreira Gregori et al. (2022)

[2] According to the Tourist Accommodation Survey (ISTAC, 2023), the average tourist distribution in San Bartolomé de Tirajana (Gran Canaria) between 2018 and 2022 was 22.15% German, 19.92% Spanish, 15.97% English, with the remaining 41.96% originating from other countries. In Adeje (Tenerife), the distribution during the same period was 44.02% English, 11.96% German, 11.64% Spanish, and 32.38% from other countries.

taxis. Additionally, customers may receive potential advantages when booking excursions to various attractions on the island, such as discounts, hotel pick-up and use of low-emission vehicles. These packages could be easily integrated and managed through a free app, providing sustainable travel options at tourists' convenience and embodying the concept of mobility as a service (MaaS). The DCE also considered the option of not choosing any of the alternatives presented in the scenarios.

The eight choice scenarios constituting the experiment were generated using the Ngene software (Choicemetrics, 2018) from an efficient design that minimised the D-error (Bliemer & Rose, 2006). This approach necessitates that the analyst provides information on prior parameters alongside the specific model to be estimated. In this case, considering the panel structure of the data set, the experiment was designed for an Error Component Panel Mixed Logit (ECPML) model, which allows for correlation among observations of the same respondent (Bliemer & Rose, 2010). The attribute levels and associated a priori parameter information are presented in Table 1. The definition of the attributes' levels in a choice experiment is of critical importance as this is fundamental to ensuring that the hypothetical scenarios are aligned with the respondent experience. In this particular case, some of the options investigated in the mobility package are not yet available in the touristic areas. Therefore, we had to conduct a comprehensive analysis of sustainable mobility options in comparable markets (e.g., the Island's capital city for shared personal mobility vehicles or other cities for shared electric cars) in order to set appropriate pricing levels of the package. Furthermore, the results of a pilot survey enabled us to redefine some attribute levels and priors, which were then used to generate the choice scenarios. The attribute coefficients were calibrated to align the willingness to pay (WTP) values with the respective market prices of the available options.

Before starting the experiment, the interviewee was provided with an explanation of the choice context with the help of graphic elements, as well as the management and contracting conditions of the mobility package. Figure A.1 in Annex A depicts the screens that were displayed to the respondent prior to the presentation of the choice scenarios. To mitigate the potential impact of fatigue bias, the order of presentation of the scenarios was randomised to avoid any systematic patterns that could influence the participants' responses. Figure 2 shows an example of the first choice scenario of the design, in which the interviewee had to choose between one of the two options shown or none of them. After completing the choice tasks, respondents were invited to rate the overall importance of each attribute of the mobility package in shaping their decisions during the experiment.

3.4 Model specification

The random utility theory developed by Domencich and McFadden (1975) represents the appropriate theoretical framework for analysing decision-making in the context of discrete choices. This theory postulates that rational decision-makers, when faced with a choice among a finite set of mutually exclusive alternatives, consistently select the option that maximises their perceived utility. Thus, considering the analyst cannot fully observe all the factors influencing decision-makers, a stochastic error term is added to the measurable or systematic component of the utility to account for unobserved effects.

Discrete Choice Experiments (DCEs) offer an efficient method for eliciting individual preferences. Participants make repeated choices between hypothetical alternatives presented in the experiment's scenarios, resulting in data with a pseudo-panel structure. Thus, each individual contributes multiple observations where their preferences are assumed to be stable within their

own choices, although potentially differing between individuals. This implies a correlation among the errors associated with an individual's choices, which require models that explicitly account for this dependence (Train, 2009; Bliemer & Rose, 2010; Ortúzar & Willumsen, 2011). Furthermore, the nature of heterogeneity in individuals' preferences can vary. Whereas systematic heterogeneity assumes that preferences differ based on observable characteristics of the individual, random heterogeneity suggests that preferences are represented by model coefficients following a certain probability distribution.

This paper considers an ECPML specification with random coefficients to model individuals' preferences. Thus, the utility U_{iqs} of alternative *i* for individual *q* in choice scenario *s* is expressed as:

$$U_{iqs} = V_{iqs} + \xi_{iq} + \varepsilon_{iqs}$$

Where ε_{iqs} represents the effect of unobserved factors and distributes iid type I extreme value; ξ_{iq} is the error component accounting for the correlation among choices made by the same respondent. This error component follows the Normal distribution $N(0, \sigma)$, where the unknown parameter σ represents the degree of such correlation. V_{iqs} is the systematic component of the utility, which is represented by a linear-in-the-parameters function as:

$$V_{iqs} = \alpha_i + \sum_k \beta_i^k X_{iqs}^k$$

Where X_{iqs}^k denotes the value of the explanatory variable *k* in alternative *i* to individual *q* in choice scenario *s.* The marginal utilities associated with these variables are represented by the coefficients β_i^k, which are assumed to follow a Normal distribution $N(\tau_k, \sigma_k)$ with mean τ_k, and standard deviation σ_k. These coefficients can be specified in terms of the standard Normal distribution as $\beta_i^k = \tau_k + \sigma_k \eta_k$, where η_k distributes $N(0,1)$. Both τ_k and σ_k are unknown parameters to be estimated along with the alternative specific constants α_i .

The model also examines the systematic heterogeneity in the mean by exploring the possibility that the mean of the random coefficients τ_k varies with the socioeconomic profile of individuals. In this case, τ_k is specified as:

$$\tau_k = \mu_k + \sum_r \mu_{kS_{qr}} S_{qr}$$

The parameters μ_k and $\mu_{kS_{qr}}$ are to be estimated, and S_{qr} represents the socioeconomic characteristic *r* of individual *q*. Therefore, the marginal utilities in our model represent random Normal variables, with their population means exhibiting potential variation across different socioeconomic groups.

Incorporating heterogeneity through random parameter specifications can enhance model flexibility, but it also introduces analytical complexity. As a result, closed-form solutions for choice probabilities cannot be derived, and the maximum simulated likelihood (MSL) method must be used for parameter estimation.

After estimating the (unconditional) distribution of model coefficients, we can exploit Bayes' rule to infer individual preferences more accurately by obtaining the individual-specific distribution of these coefficients, conditional on their choices. Simulation techniques are then applied to obtain the conditional expectation of these distributions, resulting in individual-

specific parameter estimates (Train, 2009). The same method can be applied to any function of the parameters, such as willingness to pay, to obtain individual-level estimates.

4 Results

4.1 Sample description

Following the outlined sampling criteria, a survey was conducted on 1218 tourists in San Bartolomé de Tirajana (Gran Canaria) and Adeje (Tenerife), with a balanced distribution (49.26% and 50.74%, respectively). After processing, a final sample of 921 tourists was obtained, with 54.9% in San Bartolomé de Tirajana and 45.1% in Adeje. Gender representation was equally split, with 50.49% men and 49.51% women (See Table 2).

The origin of respondents in Gran Canaria was primarily from Germany (22.13%), the UK (17.39%), and Italy (11.26%), while in Tenerife, it was mainly from the UK (42.65%) and Germany (13.73%). National tourism accounted for around 19% in Gran Canaria and 17.83% in Tenerife, with an overall origin from the UK (28.77%) and Germany (18.35%). Additionally, considering the age restrictions imposed on potential respondents, the average age of surveyed tourists in both destinations was 41 years.

Most respondents travelled with one accompanying person (42.17% in Tenerife and 36.17% in Gran Canaria), with 57.83% in Tenerife and 67% in Gran Canaria having at least one or two drivers in their group. Overall, 89.14% did not travel with more than two drivers.

The most frequently used transportation modes during their stay were regular buses (28.66%), taxis (17.05%), and hired car drivers (13.46%).

Regarding net monthly household income, 85.54% in Gran Canaria and 68.77% in Tenerife were above 1500 euros. High importance attached to environmental impact was more frequent in higher income brackets. Specifically, over 50% of those with medium-high incomes considered environmental impact to be very important.

The majority of respondents place great importance on environmental impact (43.86% in Gran Canaria and 40.71% in Tenerife). However, in contrast to Gran Canaria, 18.38% of respondents in Tenerife do not consider environmental impact important at all.

Respondents rated the overall importance given to each attribute in the choice experiment using a Likert scale ranging from 1 (not at all important) to 5 (very important). In this case, respondents indicated that electric car sharing and the price of the mobility package were the most important factor (average score of 4.04 and 4.01), followed by the public transport offer (average score of 3.98). Other attributes received similar scores.

The distribution of respondent scores showed differences in category concentrations. For example, nearly half considered the price of the mobility package very important, while responses were more evenly spread for the availability of personal mobility vehicles, with a slight emphasis on "very important." Similarly, responses were evenly distributed across categories of importance for shared electric cars. Furthermore, the analysis of respondent scores allowed for the detection of differences in the concentration of responses in certain categories of the scale (Figure 3). For example, almost half of the respondents considered the attribute referring to the price of the mobility package to be "very important." However, for the attribute referring to the availability of personal mobility vehicles, a fairly similar percentage was found among the five categories of importance.

4.2 Estimation results

During the estimation phase, various model specifications were evaluated. The best results were obtained using a model in which the utility was explained by the attributes of the mobility package, weighed by respondents' stated importance during the experiment. To clearly identify weighted attributes, they are denoted in capital letters throughout the text. For example, the weighted price PR was calculated as $PR = pr * I_{pr}$, where pr is the price of the package and I_{pr} the importance rating provided by each respondent. Table 3 shows the information on the explanatory variables used in the analysis, including their descriptions, model specification names and codification in the data set.

Some preliminary models were estimated prior to the final specification. These models provided us with intriguing insights into the decision-making process, confirming the panel correlation effect between choices made by the same respondent and the presence of heterogeneity in the perception of attributes investigated in the experiment. Annex B presents the estimation results from these preliminary models. The first model, which uses an ECPML specification with fixed coefficients, verifies the existence of panel correlation based on the magnitude and high significance of the standard deviation of the error component (Table B.1). Furthermore, the second model shown in Table B.2 considers the specification of random coefficients. In this case, the high significance of the standard deviations of the random coefficients corroborates the existence of random heterogeneity in individuals' preferences for the attributes included in the mobility packages.

To ascertain whether some of the heterogeneity identified in the previous analysis was attributable to non-random factors, the final model specification also examined the systematic heterogeneity in the mean of the random coefficients. Table 3 shows the socioeconomic variables used to define this heterogeneity. Annex C presents the mathematical expression for the model's utility function.

All coefficients were assumed to be normally distributed, except the price and the alternative specific constant of the non-choice option, which were treated as fixed. The MSL parameter estimates, obtained using the Nlogit6 software package (Greene, 2016), are presented in Table 4. All estimated parameters were statistically significant at the 95% confidence level except for the base coefficient associated with the mean of the electric car (*EC*), which had a p-value=0.12.

The standard deviations of the random coefficients were highly significant, supporting the hypothesis of random taste heterogeneity in the preferences for the mobility options included in the experiment. Furthermore, the significant interactions of the attributes and some socioeconomic variables prove evidence of systematic taste heterogeneity in the mean of the random coefficients. Thus, on the population mean, individuals under 40, with a university education, higher income, and visiting Tenerife significantly prefer personal mobility vehicles (*PMV*). For all other individuals, this service may result in disutility, as indicated by the negative sign of the base coefficient (μ_{PMV}). The *EC* is preferred by those with at least one person in the group with a driving licence and those over 40. As in the previous case, others may perceive this attribute negatively due to the negative sign of the base parameter (μ_{EC}). Those who do not use (or do not intend to use) a car during their stay, those with a higher income and visitors to Tenerife exhibit a higher preference for public transport (*PT*). Finally, tourists from Tenerife show a greater preference for the taxi service (*TX*) than those from Gran Canaria. Obtaining benefits when booking excursions (*EX*) as part of the mobility package generates a positive utility for all individuals (in the population mean), regardless of their socioeconomic group.

Regarding fixed parameters, the model estimated a negative coefficient for price (PR), which aligns with the microeconomic theory of discrete choices (McFadden, 1981). This indicates that higher prices reduce the preference for the alternative, as expected. Additionally, the non-choice option exhibited a negative constant, suggesting a general preference for alternatives representing mobility packages when the effect of the attributes is negligible. This preference was particularly strong for Gran Canaria tourists.

The analysis also reveals a high significance of the standard deviation of the error component ξ_{iq}, indicating the existence of a correlation among choices made by the same respondent due to unobserved factors.

In order to ascertain whether the payment vehicle exerts a greater influence on the perception of the attributes, the model was re-estimated, excluding individuals who stated that the price was "very important" when answering the scenarios of the choice experiment. A comprehensive examination of the results was undertaken, with particular attention paid to the magnitude of the population mean coefficient estimates and their associated significance level. With regard to preferences for the *EC*, no significant changes were observed. Therefore, this attribute is still preferred by those with at least one person in the group with a driving license and those over 40. However, some interaction terms with other attributes were found to be non-significant in the model estimated with the reduced sample. In this case, no significant differences were confirmed in the perception of: (i) the personal mobility vehicle (*PMV*) with respect to age and education level; (ii) the public transport (*PT*) for those using or intending to use the car during the stay; and (iii) the taxi (*TX*) for Tenerife tourists. The findings of this analysis suggest that the payment vehicle may play a moderate role in the perception of the attributes for certain groups of individuals.

4.3 Willingness to pay for MaaS options

Willingness-to-pay (WTP) estimates derived from discrete choice models quantify the monetary value individuals assign to changes in specific attributes. More precisely, WTP is calculated as the negative ratio of the marginal utility associated with the attribute of interest to the marginal utility of the monetary cost (price). When dealing with discrete explanatory variables, as in this study, marginal utility is replaced by the finite difference in utility between two states of the variable (e.g., presence vs. absence of the mobility service in the package). In our case, as the attributes are weighed by the importance assigned, the WTP for including a particular service $\left(X_i^k = 1\right)$in the utility of alternative *i* is expressed as:

$$WTP_k = -\frac{V_{i|X_i^k=1} - \quad V_{i|X_i^k=0}}{\frac{\partial V_i}{Price_i}} = -\frac{\beta_i^k}{\beta_i^{Price}} \cdot \frac{I_k}{I_{Price}}$$

When incorporating random coefficients, the WTP often becomes a random variable with an unknown probability distribution (Sillano & Ortúzar, 2005). One approach to address this problem involves obtaining individual-level estimates based on the information revealed through individual choices, employing a method similar to that used for obtaining individual-specific coefficients (Train, 2009). Therefore, individual-level estimates are calculated for the ratio $-\frac{\beta_i^k}{\beta_i^{Price}}$ and then weighed by respondents' reported importance levels $\left(\frac{I_k}{I_{Price}}\right)$ to obtain the individual-specific WTP figures. It is worth noting that, in our case, β_i^{Price} is fixed and negative, so the ratio of the coefficients follows a Normal distribution.

It is important to point out that our experiment does not include questions in the willingness to accept (WTA) format. Furthermore, it is not a pivot design that permits a reference dependence specification to account for asymmetric preferences, as seen in Masiero and Hensher (2010). Therefore, we will not be able to obtain WTP and WTA figures for the same individual. Our model specification implicitly assumes symmetry in preferences, whereby an increase (or decrease) in the quantity of a given attribute produces variations in the utility of the same magnitude, which are equally valued. In this context, a positive coefficient indicates an increase in utility associated with the inclusion of the attribute in the package, while a negative coefficient represents a corresponding utility decrease. This yields positive and negative willingness to pay, respectively.

Figure 4 depicts the probability density functions of the WTP for the attributes considered in the mobility packages obtained from kernel density estimation. The WTP for *EC* and *PMV* has a significantly higher probability of being negative. Additionally, the WTP distribution for these attributes is more dispersed, indicating a greater heterogeneity of preferences among consumers. These results differ from the willingness to pay for *EX*, which is defined only for positive values. Similarly, we can see the probability of obtaining a negative willingness to pay for *PT* and *TX* is rather low.

Negative WTP is interpreted as the minimum amount an individual is willing to accept to consume a good or service. It represents the trade-off that makes consumers indifferent between having or not having it. This scenario arises when individuals negatively perceive the supply, attributing undesirable characteristics to it. Understanding negative and positive WTP is crucial for economists as it provides essential information for evaluating public policy decisions regarding specific goods or services. In this particular case, the negative WTP is interpreted as the monetary compensation, in the form of a price discount, that the individual would require if an undesired service were to be offered in the package.

Although the sample enumeration method may appear to be a convenient way to obtain representative WTP figures, it is inappropriate in this case. Negative values inherent to this approach distort the arithmetic mean, leading to biased estimates. Therefore, a more robust approach is adopted here by averaging each attribute's positive and negative WTP figures separately.

Table 5 presents the WTP for the various services included in the MaaS bundle. The figures in the table represent the average WTP of individuals willing to pay for each service, i.e. those exhibiting a positive value. Thus, most individuals are willing to pay for *PT*, *TX* and *EX*, with the latter reaching 100%. In contrast, only 45.17% and 65.26% of individuals are willing to pay for *EC* and *PMV,* respectively. The table also reveals distinct socioeconomic patterns among those willing to pay for the mobility options. Among the most remarkable characteristics, we found that tourists from Tenerife, predominantly females under 40 with higher education and income, were more likely to favour PMV. Conversely, those opting for other services were more often from Gran Canaria, males, over 40, with less education and lower income.

On average, *PT* is the most highly valued attribute at €42.19, followed by *EC* and *PMV* at €40 and €39.6, respectively. Individuals are willing to pay less for *TX* (€29.39) and *EX* (€27.26). Regarding the socioeconomic group, Gran Canaria tourists are only willing to pay more for *EC* and *EX*. Females are only willing to pay more for *PT*, and those under 40 are only willing to pay more for *PMV*. Germans and British generally exhibit the highest WTP, except for the *EC,* where Spanish tourists are willing to pay more than UK tourists. Finally, Individuals intending to use a car during their stay and those with drivers in their group display a significantly higher willingness to pay

for *EC*. In contrast, those who do not plan to use a car strongly prefer *PT*. It is noteworthy that even in the absence of drivers in the group, individuals are willing to pay €22.17 for the inclusion of an electric car in the package. This result could provide an approximation of the non-use value of the service in question. Alternatively, it could also be interpreted as an option value for a potential future scenario in which some members of the travel group may possess driver licenses. In this context, it is important to note that the total economic value can be classified into three categories: use value, option value, and non-use value. The use value of transport is derived from the direct consumption of the service. In contrast, the option value is based on the future potential to utilise a travel service. This value reflects the willingness to preserve a trip-making option for potential future needs. Meanwhile, non-use value is obtained from travel resources that will never be used. This value is thus independent of any present or future usage (Chang et al., 2012).

Table 6 shows the average figures for individuals who exhibited negative WTP for the service. This indicates that they are willing to accept a discounted price compensation if the mobility package included services that individuals will no use because they will cause a reduction in their overall utility. Interestingly, only *PMV* and *EC* had notable proportions of individuals that would require compensations, at €19.26 and €27.61, respectively. Socioeconomic factors are crucial in identifying these individuals. Specifically, Gran Canaria tourists, males over 40 without a university degree and with lower incomes, are not willing to pay for *PMV*. Conversely, Tenerife tourists, females under 40 with similar levels of education but higher income, exhibited negative WTP for *EC*. Furthermore, Gran Canaria tourists, males, and Germans generally claim higher compensation for both *PMV* and *EC*. However, those without a university degree and drivers in the group are willing to accept a higher compensation for including the EC. In comparison, those with a university degree and drivers in the group preferred higher compensation for *PMV*.

Regarding the differences in WTP between Gran Canaria and Tenerife, no significant contextual island differences (such as local road networks, availability of public services, or types of tourist attractions) were identified that could fully explain these variations. However, these results may be linked to the importance that respondents from each island place on the attributes in the choice experiment. As indicated in Table 1, tourists from Gran Canaria place higher importance on Electric Car Sharing and benefits booking excursions, while tourists from Tenerife value public transport more highly.

4.4 Discussion and managerial implications

The findings outlined in previous sections unveil valuable insights for designing a compelling mobility offer for Canary Islands tourists. The observed heterogeneity in preferences and willingness to pay for sustainable mobility options opens the door to designing customised packages that effectively cater to the diverse needs of different visitor segments. Moreover, by offering flexibility within these packages, we can allow tourists to receive compensation or discounts for opting out of certain included services, thereby accommodating individual preferences and maximising value. This idea has also been supported by Džupka et al. (2024) in a more general context, suggesting that tailored MaaS strategies are necessary for different target groups to maximise the efficiency of the service and integrate it into the regional or national public transportation network.

However, implementing MaaS solutions is not exempt from complexity and involves multiple layers of technology, infrastructure, and stakeholder collaboration. Data must flow seamlessly between public transport authorities, private mobility providers, and technology platforms,

creating challenges in infrastructure integration and data privacy. User adoption depends on building trust and overcoming concerns about technology dependence and service reliability. Also, pricing models must balance affordability with profitability while accounting for diverse usage patterns and preferences. Collaboration, innovation and a willingness to learn from evolving user needs and technological advances will be required to navigate these complexities successfully.

The development and implementation of MaaS initiatives within the tourism sector remain limited and context-dependent. While Leung et al. (2023) offer a valuable review of recent advancements and applications in regional cities, focusing on Finland, Japan, and Taiwan, the broader landscape of MaaS in tourism remains largely unexplored. These authors highlight the potential of MaaS to enhance the tourist experience significantly. By offering convenient, efficient, and sustainable travel options, MaaS empowers visitors, improves overall satisfaction, and contributes to the economic well-being of destinations. However, further research is crucial to understand the wider applicability of MaaS across diverse tourism contexts, addressing potential challenges and maximising the positive impacts on tourists and destinations.

Direct comparison of our findings with existing literature proves challenging, as no previous research has specifically investigated MaaS implementation within mass tourism destinations like the Canary Islands. Nevertheless, interesting parallels emerge regarding the transportation services included in MaaS bundles. Notably, Zhao et al. (2023) explored MaaS acceptance through a two-stage stated preference survey within the context of the Hangzhou 2022 Asian Games, a mega-event. Their study identified public transport, ride-sharing, bike-sharing, and taxi services as potential bundle components. Furthermore, they analysed the influence of sociodemographic factors on MaaS subscriptions and discussed its potential for mega-event mobility management. Leung et al. (2023) further illustrate the diverse applications of tourism MaaS in regional cities, showcasing varied service combinations across different contexts.-Other researchers explore MaaS initiatives designed for visitors, drawing inspiration from existing platforms like Google Maps (Li et al., 2023).

To the authors' knowledge, no prior research has investigated tourists' willingness to pay for MaaS options. Existing case studies, primarily focused on urban contexts, emphasise the need to identify and quantify additional factors influencing individuals' adoption of MaaS, particularly during the initial persuasion stage of innovation diffusion (Polydoropoulou et al., 2020a). Other recent studies offer insights into MaaS adoption and pricing strategies. Bahamonde-Birke et al. (2023) indicate that individuals' willingness to pay for MaaS services typically falls below current individual service prices. Similarly, Liljamo et al. (2020) found that in Finland, 43% of respondents were willing to subscribe to MaaS packages, with an average willingness to pay representing roughly 64% of their current mobility costs. Furthermore, Tsouros et al. (2021) identified a correlation between individuals' preference for multimodal travel and their willingness to pay for diverse mobility options within MaaS plans in Greater Manchester (UK).

5 Conclusions

A well-planned and efficient transportation system is crucial for any mass tourist destination to minimise environmental impact and preserve natural beauty for future generations. Many tourist destinations worldwide are challenged to create sustainable transportation systems that cater to locals and visitors alike.

This study examines tourists' behaviour towards the development of MaaS systems in two key municipalities in the Canary Islands. Using a DCE, tourists' preferences for sustainable mobility options are assessed. Participants evaluated eight hypothetical scenarios with different sustainable mobility packages, including electric bikes, scooters, public transport, and taxis, tailored for groups of up to four individuals on a week-long stay. The study aims to fill a gap in research by investigating tourists' willingness to pay for MaaS options and how they respond to them, leading to the development of tailored offerings that enhance the visitor experience and sustainable mobility.

The study reveals the heterogeneity of visitor preferences and willingness to pay for sustainable mobility options, emphasising the need for tailored mobility packages to meet diverse visitor needs. Offering flexibility within these packages, such as compensation or discounts for opting out of certain services, can increase the adoption of sustainable MaaS alternatives, reducing tourism's environmental impact.

While the DCE offers a strong representation of tourist mobility preferences, the study is not exempt from limitations that open new lines for future research. The study focuses on only two municipalities on separate islands, limiting generalisability. Future research should replicate this approach across various destinations. It is clear that the findings may not be applicable to other tourist destinations where travellers use their own cars to get there, such as certain locations along the Mediterranean coast of Spain during the summer. Furthermore, analysing MaaS development from the supply side is crucial, considering potential hindrances due to differences in organisational cultures among involved firms.

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Tables and figures

Table 1. Attributes and levels

Attributes of the sustainable mobility package	Priors	Levels			
		Level 0	**Level 1**	**Level 2**	**Level 3**
Price of the package	-0.0196	30 €	50 €	80 €	100 €
Use of personal mobility vehicles: (Electric bike/Electric scooter/Mechanical bike/Electric motorbike)	0.3136	Not included	Unlimited number of rentals. First 30 minutes per rental are free of charge	-	-
Use of 4-seater electric car sharing	0.49	Not included	45 min of free use per week	-	-
Use of public transport throughout the island	0.392	8-trip voucher	Unlimited number of trips by public transport	-	-
Taxi	0.4312	Not included	20 Km voucher	-	-
Benefits when booking excursions to points of interest on the island	0.294	Not included	Included	-	-

Table 2. Summary the sample characteristics (%)

	Adeje	San Bartolomé de Tirajana	Total
Island			
Gran Canaria			54.90
Tenerife			45.10
Gender			
Female	50.84	48.42	49.51
Male	49.16	51.58	50.49
Age < 40			
No	52.05	50.00	50.92
Yes	47.95	50.00	49.08
Average Age	41.49	41.03	41.24
University education			
No	44.34	64.03	55.16
Yes	55.66	35.97	44.84
Net monthly household income			
Less than 1,500€	14.46	31.23	23.67
Between 1,500€ and 3,500€	45.78	40.32	42.78
More than 3,500€	39.76	28.46	33.55
Residence			
Spanish mainland/Balearic Islands	11.08	18.97	15.42
Germany	13.73	22.13	18.35
United Kingdom	42.65	17.39	28.77
Other countries	32.53	41.50	37.46
Group size (excluding respondent)			
Alone	21.45	20.36	20.85
With one	42.17	36.17	38.87
With two	15.90	20.75	18.57
With three or more	20.48	22.73	21.72
Driver license in the group			
None	34.46	19.57	26.28
One	30.60	32.81	31.81
Two	27.23	34.19	31.05
More than two	7.71	13.44	10.86
Mode of transport during stay			
Regular bus	39.52	19.76	28.66
Taxi	6.75	25.49	17.05
Hire car	18.31	24.51	21.72
Private car	15.18	6.72	10.53
Others	20.24	23.52	22.04
Importance environmental impact			
Not important	0.00	18.38	10.10
Slightly important	1.69	8.10	5.21
Fairly important	13.49	18.38	16.18
Quite important	40.96	14.43	26.38
Very important	43.86	40.71	42.13
Attributes importance (average)			
Price of the package	4.21	3.85	4.01
Personal mobility vehicles	3.15	3.42	3.30
Electric car sharing	2.51	3.48	4.04
Public transport	4.18	3.81	3.98
Taxi	3.80	3.80	3.80
Benefits booking excursions	3.45	3.97	3.74

Table 3. Explanatory variables

Attributes included in the choice experiment		
Variable description	**Name**	**Codification**
Price of the package	pr	Price in euros
Personal mobility vehicle	pmv	1 if the this service is included in the package 0 otherwise
Electric car	ec	1 if the this service is included in the package 0 otherwise
Public transport	pt	1 if the package includes unlimited trips by public transport 0 if the package includes 8 trips by public transport
Taxi	tx	1 if the package includes 20 km taxi voucher 0 otherwise
Excursions	ex	1 if the package includes benefits when booking excursions 0 otherwise
Attributes weighted by the importance (I_k) given in the choice scenarios		
Price of the pacakage (weighted)	PR	$PR=pr*I_{pr}$
Personal mobility vehicle (weighted)	PMV	$PMV=pmv*I_{pmv}$
Electric car (weighted)	EC	$EC=ec*I_{ec}$
Public transport (weighted)	PT	$PT=pt*I_{pt}$
Taxi (weighted)	TX	$TX=TX*I_{tx}$
Excursions (weighted)	EX	$EX=ex*I_{ex}$
Socioeconomic variables		
Tenerife tourist	TF	1 if the individual is visiting Tenerife 0 if the individual is visiting Gran Canaria
Males	MALE	1 if the individual is a male 0 otherwise
Age < 40	AGE40	1 if the individual is younger than 40 years 0 otherwise
University education	UEDU	1 if the individual has university education 0 otherwise
Driver license in the group	DL	1 if there is at least one driver license in the group 0 otherwise
Use of car during stay	UCAR	1 if the individual uses the car during the stay 0 otherwise
Income	INC	Monthly family income in thousands

Table 4. Estimation results

Parameter	Attribute	Coefficient	t-ratio	p-value	Lower C.I.	Upper C.I.
		Fixed parameters				
α_{ASC3}	Asc None	-2.398	-12.62	0.000	-2.770	-2.025
$\alpha_{ASC3*TF}$	Asc None * Tenerife tourist (TF)	0.726	3.26	0.001	0.289	1.162
μ_{PR}	Price (PR)	-0.007	-22.37	0.000	-0.008	-0.007
		Random parameters (estimated mean base coefficient)				
μ_{PMV}	Personal mobility vehicle (PMV)	-0.193	-3.88	0.000	-0.291	-0.096
μ_{EC}	Electric car (EC)	-0.085	-1.55	0.121	-0.192	0.022
μ_{PT}	Public Transport (PT)	0.206	6.00	0.000	0.139	0.274
μ_{TX}	Taxi (TX)	0.181	8.67	0.000	0.140	0.222
μ_{EX}	Excursions (EX)	0.200	12.15	0.000	0.168	0.232
		Random parameters (estimated standard deviation)				
σ_{PMV}	Personal mobility vehicle (PMV)	0.371	18.01	0.000	0.331	0.411
σ_{EC}	Electric car (EC)	0.468	18.44	0.000	0.418	0.517
σ_{PT}	Public Transport (PT)	0.218	12.70	0.000	0.184	0.252
σ_{TX}	Taxi (TX)	0.186	8.85	0.000	0.145	0.228
σ_{EX}	Excursions (EX)	0.141	5.72	0.000	0.092	0.189
		Systematic heterogeneity in mean (interactions with the mean of random parameters)				
$\mu_{PMV*AGE40}$	PMV*Age < 40 (AGE40)	0.099	2.81	0.005	0.030	0.169
$\mu_{PMV*UEDU}$	PMV*Univ. Education (UEDU)	0.077	2.01	0.045	0.002	0.152
$\mu_{PMV*INC}$	PMV*Income (INC)	0.062	4.50	0.000	0.035	0.090
μ_{PMV*TF}	PMV*Tenerife tourist (TF)	0.132	3.55	0.000	0.059	0.205
μ_{EC*DL}	EC*Driver License (DL)	0.169	3.50	0.000	0.074	0.263
$\mu_{EC*AGE40}$	EC*Age < 40 (AGE40)	-0.168	-3.92	0.000	-0.253	-0.084
$\mu_{PT*UCAR}$	PT*Use of car (UCAR)	-0.095	-3.69	0.000	-0.145	-0.044
μ_{PT*INC}	PT*Income (INC)	0.017	1.98	0.047	0.000	0.033
μ_{PT*TF}	PT*Tenerife tourist (TF)	0.164	6.24	0.000	0.112	0.215
μ_{TX*TF}	TX*Tenerife tourist (TF)	0.075	2.45	0.014	0.015	0.134
		Error component for panel correlation				
Σ	Sigma	2.488	16.73	0.000	2.197	2.780
$l^*(0)$	-8094.575					
$l^*(\theta)$	-5984.128					
ρ^2	0.261					
Individuals	921					
Observations	7368					

Table 5. Willingness to pay for the services included in the MaaS bundle

	Personal mobility vehicle	Electric car	Public transport	Taxi	Excursions
Number of individuals	601	416	898	910	921
% with respect to total	65.26%	45.17%	97.50%	98.81%	100.00%
WTP for the service (€) *(average with respect to the number of individuals who are willing to pay for the service)*	39.64	40.00	42.19	29.39	27.26
WTP for socioeconomic group (€) *(average with respect to the number of individuals who are willing to pay for the service)*					
Island					
Gran Canaria tourist	31.68	49.61	30.36	25.73	29.58
Tenerife tourist	47.28	24.46	55.96	33.75	24.44
Gender					
Female	36.28	38.22	44.66	29.17	27.03
Male	43.18	41.56	39.74	29.61	27.48
Age < 40					
No	35.69	40.40	44.18	30.64	28.21
Yes	43.36	39.40	40.13	28.10	26.27
University education					
No	30.93	35.88	37.99	27.83	26.57
Yes	46.95	45.15	47.26	31.30	28.11
Residence					
Spanish mainland/Balearic Islands	27.10	41.92	34.84	25.85	26.13
Germany	43.66	42.68	41.94	29.28	28.34
United Kingdom	46.11	35.29	49.49	33.28	27.97
Other countries	35.80	41.16	39.24	27.78	26.62
Driver license in the group					
No	31.08	22.17	42.13	29.98	23.38
Yes	42.15	44.31	42.21	29.18	28.64
Use of car during stay					
No	40.67	25.40	52.02	28.42	26.74
Yes	38.51	49.31	31.68	30.38	27.80
Socioeconomic profile *(% or average with respect to the number of individuals who are willing to pay for the service)*					
Tenerife tourist	51.08%	38.22%	46.21%	45.60%	45.06%
Males	48.75%	53.13%	50.22%	50.33%	50.49%
Age < 40	51.58%	40.14%	49.11%	49.12%	49.08%
University education	54.41%	44.47%	45.32%	44.95%	44.84%
Spanish mainland/Balearic Islands residents	9.48%	11.06%	11.25%	11.32%	11.51%
German residents	20.13%	21.15%	18.60%	18.57%	18.35%
United Kingdom residents	29.95%	26.68%	28.73%	28.35%	28.23%
Other countries residents	40.43%	41.11%	41.43%	41.76%	41.91%
Driver license in the group	77.37%	80.53%	73.50%	73.52%	73.72%
Use of car during stay	47.59%	61.06%	48.33%	49.56%	49.29%
Age (average)	41.10	44.17	41.20	41.20	41.24
Income (average €)	3163.19	2958.17	2876.48	2856.46	2853.88

Table 6. Willingness to accept a discounted price compensation if the services are included in the MaaS bundle

	Personal mobility vehicle	Electric car	Public transport	Taxi	Excursions
Number of individuals	320	505	23	11	0
% with respect to total	34.74%	54.83%	2.50%	1.19%	0.00%
WTA a discounted price compensation for including the service (€) *(average with respect to the number of individuals who are not willing to pay for the service)*	19.26	27.61	9.23	3.72	-
WTA a compensation for socioeconomic group (€) *(average with respect to the number of individuals who are not willing to pay for the service)*					
Island					
Gran Canaria tourist	22.24	38.41	9.23	3.72	-
Tenerife tourist	13.41	17.11	-	-	-
Gender					
Female	18.71	26.57	7.87	5.08	-
Male	19.73	28.73	10.10	2.94	-
Age < 40					
No	19.32	22.05	11.20	4.94	-
Yes	19.18	31.90	7.08	2.25	-
University education					
No	18.49	28.96	9.58	2.13	-
Yes	21.36	25.97	8.22	6.49	-
Residence					
Spanish mainland/Balearic Islands	15.86	28.20	10.69	5.26	-
Germany	21.77	41.79	5.61	-	-
United Kingdom	19.94	20.22	9.65	1.96	-
Other countries	19.13	27.23	9.16	3.53	-
Driver license in the group					
No	14.36	30.31	5.95	1.33	-
Yes	21.69	26.35	9.92	3.96	-
Use of car during stay					
No	19.22	27.75	10.61	3.07	-
Yes	19.30	27.40	9.02	5.45	-
Socioeconomic profile *(% or average with respect to the number of individuals who are not willing to pay for the service)*					
Tenerife tourist	33.75%	50.69%	0.00%	0.00%	-
Males	53.75%	48.32%	60.87%	63.64%	-
Age < 40	44.38%	56.44%	47.83%	45.45%	-
University education	26.88%	45.15%	26.09%	36.36%	-
Spanish mainland/Balearic Islands residents	15.31%	11.88%	21.74%	27.27%	-
German residents	15.00%	16.04%	8.70%	0.00%	-
United Kingdom residents	25.00%	29.50%	8.70%	18.18%	-
Other countries residents	44.69%	42.57%	60.87%	54.55%	-
Driver license in the group	66.88%	68.12%	82.61%	90.91%	-
Use of car during stay	52.50%	39.60%	86.96%	27.27%	-
Age (average)	41.51	38.83	42.70	44.82	-
Income (average €)	2272.97	2767.97	1971.74	2640.91	-

Figure 1: The Canary Islands map

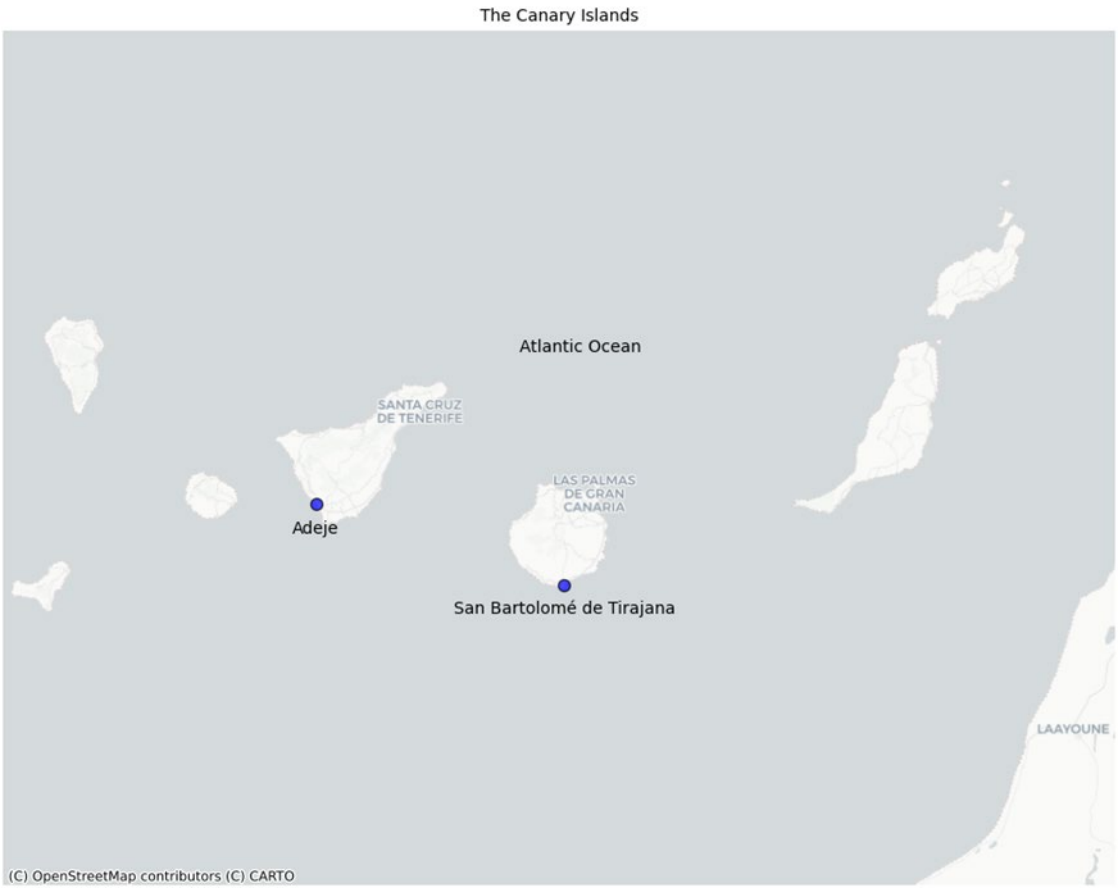


Figure 2. Example of choice scenario

Scenario 1		
Sustainable Mobility Package Attributes	**Option 1**	**Option 2**
Price of the package	100 €	30 €
Use of personal mobility vehicles: (Electric bike/Electric scooter/Mechanical bike/Electric motorbike)	-	Unlimited number of rentals First 30 minutes per rental are free of charge
Use of 4-seater electric car sharing	45 min of free use per week	-
Use of public transport throughout the island	Unlimited number of trips by public transport	8-trip voucher
Taxi	20 Km voucher	-
Benefits when booking excursions to points of interest on the island	Included	Included
Which option would you prefer?		

☐ **Option 1**

☐ **Option 2**

☐ **Neither of the two mobility packages interests me**

Figure 3: Importance given to each of the attributes of the choice experiments (%)

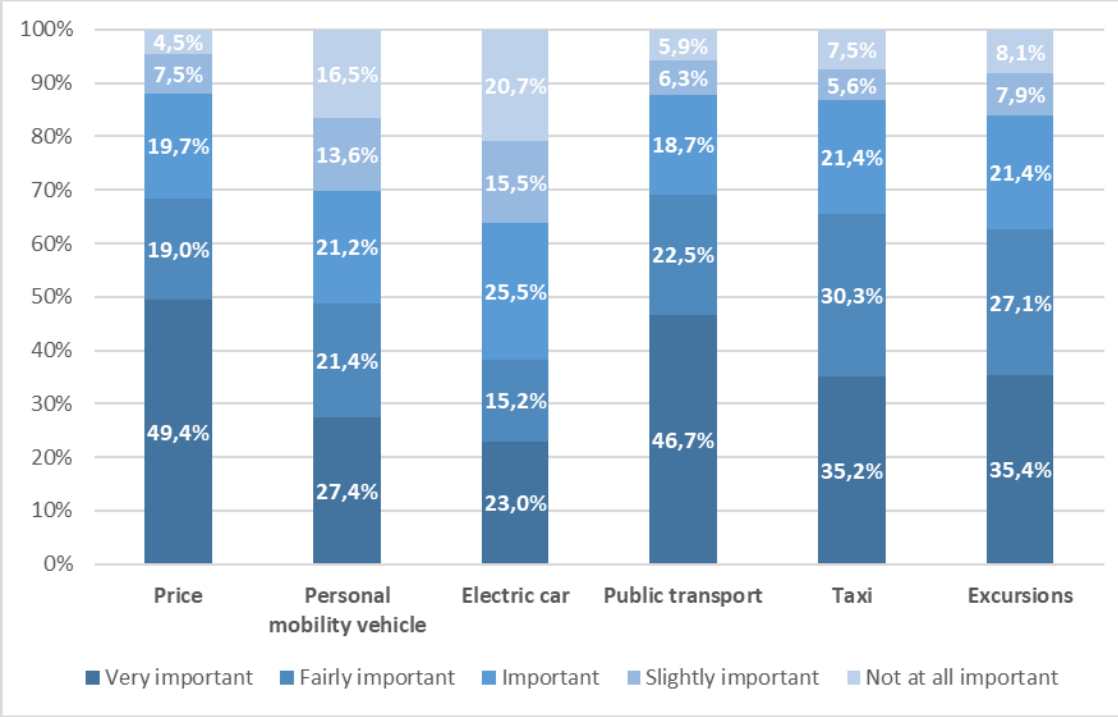
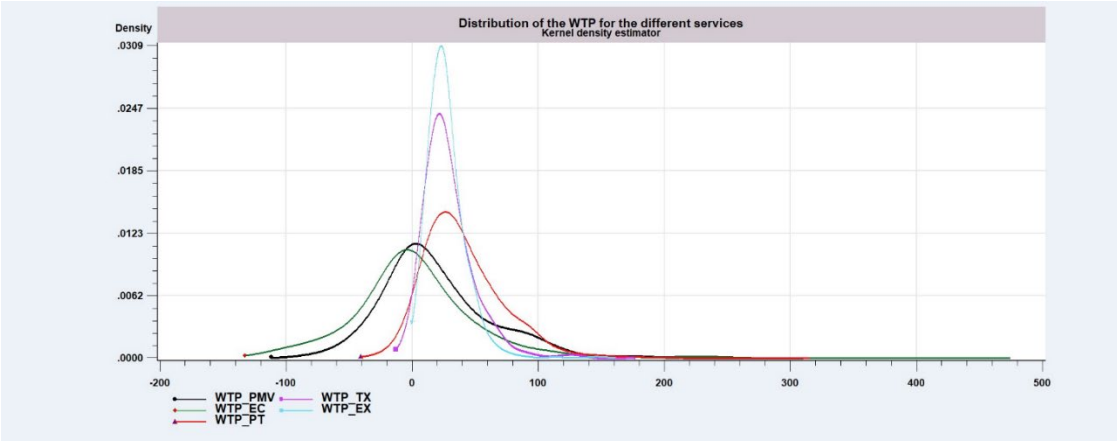
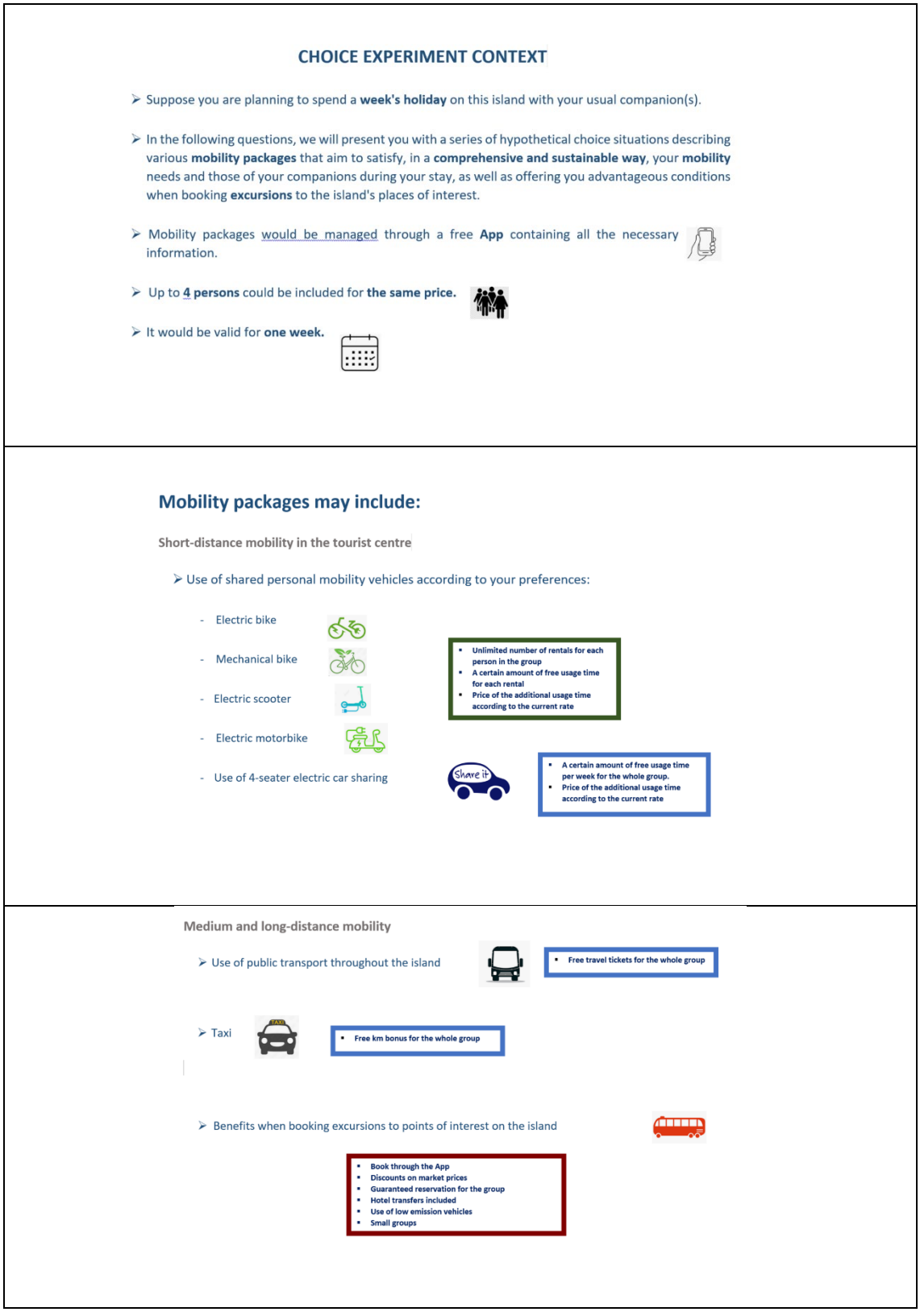


Figure 4. WTP for the different services. Kernel density estimates



Annex A. Context of the choice experiment

Figure A.1. Context of the choice experiment



Annex B. Preliminary models

Table B.1. Error component panel mixed logit with fixed coefficients

Parameter	Attribute	Coefficient	t - ratio	P - value	Lower C.I.	Upper C.I.
		Fixed parameters				
α_{ASC3}	Asc None	-1.935	-12.42	0.000	-2.240	-1.630
μ_{PR}	Price (PR)	-0.006	-23.37	0.000	-0.007	-0.006
μ_{PMV}	Personal mobility vehicle (PMV)	0.167	17.11	0.000	0.148	0.187
μ_{EC}	Electric car (EC)	0.119	10.86	0.000	0.098	0.141
μ_{PT}	Public Transport (PT)	0.230	26.08	0.000	0.213	0.247
μ_{TX}	Taxi (TX)	0.151	11.32	0.000	0.125	0.177
μ_{EX}	Excursions (EX)	0.189	15.74	0.000	0.166	0.213
		Error component for panel correlation.				
Σ	Sigma	2.707	13.75	0.000	2.321	3.092
$l^*(0)$	-8094.575					
$l^*(\theta)$	-6407.926					
ρ^2	0.208					
Observations	7368					

Table B.2. Error component panel mixed logit with random Normal coefficients

Parameter	Attribute	Coefficient	t - ratio	P - value	Lower C.I.	Upper C.I.
		Fixed parameters				
α_{ASC3}	Asc None	-1.981	-14.03	0.000	-2.257	-1.704
μ_{PR}	Price (PR)	-0.008	-22.79	0.000	-0.008	-0.007
		Random parameters (estimated mean)				
μ_{PMV}	Personal mobility vehicle (PMV)	0.125	5.70	0.000	0.082	0.168
μ_{EC}	Electric car (EC)	-0.032	-1.15	0.250	-0.086	0.022
μ_{PT}	Public Transport (PT)	0.286	18.27	0.000	0.255	0.317
μ_{TX}	Taxi (TX)	0.197	10.67	0.000	0.160	0.233
μ_{EX}	Excursions (EX)	0.212	12.92	0.000	0.180	0.245
		Random parameters (estimated standard deviation)				
σ_{PMV}	Personal mobility vehicle (PMV)	0.380	20.15	0.000	0.343	0.417
σ_{EC}	Electric car (EC)	0.491	19.74	0.000	0.443	0.540
σ_{PT}	Public Transport (PT)	0.226	14.53	0.000	0.196	0.257
σ_{TX}	Taxi (TX)	0.191	9.39	0.000	0.151	0.231
σ_{EX}	Excursions (EX)	0.149	6.86	0.000	0.107	0.192
		Error component for panel correlation				
Σ	Sigma	2.476	15.93	0.000	2.172	2.781
$l^*(0)$	-8094.575					
$l^*(\theta)$	-6407.926					
ρ^2	0.252					
Observations	7368					

Annex C. Specification of the utility function

Following the variables' description in sections 3.4 and 4.2, the specification of the utility of alternative *i* for individual *q* in choice scenario *s* is expressed as:

$$
\begin{aligned}
&U_{iqs} = \mu_{PR} PR_{iqs} + \\
&\left(\mu_{PMV} + \mu_{PMV*AGE40} AGE40_q + \mu_{PMV*UEDU} UEDU_q + \mu_{PMV*INC} INC_q + \mu_{PMV*TF} TF_Q + \sigma_{PMV}\eta_{PMV}\right) PMV_{iqs} + \\
&\left(\mu_{EC} + \mu_{EC*DL} DL_Q + \mu_{EC*AGE40} AGE40_Q + \sigma_{EC}\eta_{EC}\right) EC_{iqs} + \\
&\left(\mu_{PT} + \mu_{PT*UCAR} UCAR_q + \mu_{PT*INC} INC_q + \mu_{PT*TF} TF_Q + \sigma_{PT}\eta_{PT}\right) PT_{iqs} + \\
&\left(\mu_{TX} + \mu_{TX*TF} TF_Q + \sigma_{TX}\eta_{TX}\right) TX_{iqs} + \\
&\left(\mu_{EX} + \sigma_{EX}\eta_{EX}\right) EX_{iqs} + \varepsilon_{iqs} \qquad i = 1, 2
\end{aligned}
$$

$$
U_{iqs} = ASC_i + \xi_{iq} + \varepsilon_{iqs} \qquad i = 3
$$