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Device effects:
Results from choice experiments in an agritourism context

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ABSTRACT: This study uses a questionnaire to examine device use effects in choice experiments and to estimate willingness to pay (WTP) values for agritourism-related activities. The results indicate that respondents using devices with large screens are more confident of their responses, dedicate more time to the valuation exercise, and select the status quo option less frequently. However, WTP for agritourism and perceived choice experiment complexity are invariant with regards to the device. Respondents' WTP for selected agritourism activities varies from $5 to $21 per visit.

Efecto dispositivo: Resultados de los experimentos de elección en un contexto de agroturismo

RESUMEN: Utilizamos un cuestionario para examinar los efectos del uso de dispositivos en los experimentos de elección y estimar la disposición a pagar (DAP) por actividades relacionadas con el agroturismo. Los resultados indican que los encuestados que utilizan dispositivos con pantallas grandes tienen más confianza en sus respuestas, dedican más tiempo al ejercicio de valoración y seleccionan con menos frecuencia la opción de *statu quo*. Sin embargo, la DAP por agroturismo y la percepción sobre la complejidad del experimento de elección son invariantes con respecto al dispositivo. La DAP por las actividades de agroturismo seleccionadas varía de $5 a $21 por visita.

KEYWORDS / PALABRAS CLAVE*:* Agritourism, choice experiments, device effects, Puerto Rico, willingness to pay / Agroturismo, experimentos de elección, efectos del dispositivo, Puerto Rico, disposición a pagar.

JEL classification / Clasificación JEL: N56, Z32.

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1. Introduction

Web surveys have become increasingly popular in survey-based research. Compared to in-person, telephone and mail interviews, web surveys may contain a different structure for presenting the information to survey respondents. As expected, online surveys have also been used for economic valuation methods, including the well-known choice experiment method. Prior studies have evaluated how the complexity of stated preference-based methods affects the decision-making process and willingness to pay (WTP) values. However, it is unclear how device use impacts choice experiment results. Depending on the screen size, choice set scenarios may not be fully seen by respondents, forcing respondents to navigate on the screen to compare choice set alternatives, which can increase the complexity of the choice experiments. This study seeks to examine how device use affects choice experiment data. The results of this study can be considered in future studies using web-based choice experiments.

Respondent choices are impacted by the information provided in choice experiments. Changes in the number of alternatives per choice set, attributes per alternative, levels per attribute, or choice sets per questionnaire can seriously affect the decision-making process (Hensher, 2006; Rose *et al.*, 2009; Dellaert *et al.*, 2012; Barreiro-Hurle *et al*., 2018). For example, some studies have shown that the inclusion of an additional attribute in choice experiments results in a greater tendency to select the status quo (SQ) option (Glenk & Colombo, 2011), whereas others have found that respondents select the SQ option less frequently when the number of attribute levels in the valuation exercise is increased (Meyerhoff & Liebe, 2009). Others have found choice inconsistencies and mixed results in terms of SQ selection when attributes are presented as intervals rather than a specific number (Wielgus *et al.*, 2009). Understanding the selection of SQ is particularly important because it is often attributed to SQ bias (Barreiro-Hurle *et al*., 2018), which represents a preference for the current situation or a preference for not taking action to change the current situation (Samuelson & Zeckhauser, 1988). SQ bias is consistent with the loss aversion concept, which postulates that the pain experienced upon a loss is greater than the satisfaction obtained from a gain of the same magnitude (Kahneman & Tversky, 1979).

Respondent choices are also affected by the type of device used for survey completion. Clement *et al.* (2020) evaluated device effects on survey response quality using cross-sectional data at the national level in Denmark. Respondents' self-evaluated engagement in survey completion did not differ across devices, and only small, non-systematic differences were identified between devices on satisficing indicators, such as the tendency to agree regardless of question content, non-substantive answers, selection of mid-point response options and primacy effects, and straightlining. Liebe

et al. (2015) studied whether the use of mobile devices, tablets or smartphones affects survey characteristics and stated preferences in a web-based choice experiment. The authors found that mobile device users spent more time than desktop/laptop users in answering the survey. For mobile device users only, the authors found a negative correlation between screen size and interview length and a positive correlation between screen size and acquiescence tendency. In terms of choice experiment results, the authors did not find significant differences in the tendency to choose the SQ option, but some of the WTP estimates differ in a bidirectional manner. Our study complements their research by examining the perceived complexity of the valuation exercise across devices. Additionally, our choice experiment design has fewer attributes, attribute levels and alternatives, reducing the choice experiment complexity. This last aspect enabled us to explore device effects in simpler designs, relative to Liebe *et al.* (2015). Also, we explored device effects in a different context: agritourism.

This study focuses on visitors' preferences and WTP for agritourism-related activities. Unfortunately, the commercialization of local agricultural products is often affected by foreign competitors, and agricultural production is disturbed by exogenous events, such as hurricanes, floods, and droughts. Agritourism represents an alternative to generate additional income at the farm level (Méndez-Toro, 2019), contributing to agricultural sustainability and resilience, and farmers' livelihood. Researchers around the globe have studied visitors' preferences or the value of multiple agritourism activities, including agricultural landscape (Rocchi *et al.*, 2022), pick your own fruit (Carpio *et al.*, 2008), tours (Kniceley, 2012; Wu *et al.*, 2020), horseback riding (Antoušková, 2014) and accommodation services (Torquati *et al.*, 2017). However, more research is needed to better understand visitor preferences for other activities oriented to families at farm level, like educational workshops and small parks for children, which can help attract visitors of all ages.

The general goal of this study is to contribute to the choice experiment and agritourism literature. Our specific objectives are to: (1) examine device effects in choice experiments, and (2) estimate visitors' WTP for agritourism-related activities in Puerto Rico, including attractions for families. The choice experiment is a commonly used method in the valuation literature to examine WTP values for multiple attributes that can be offered by a particular project. Conditional and mixed logit models are used to analyze choice experiment data.

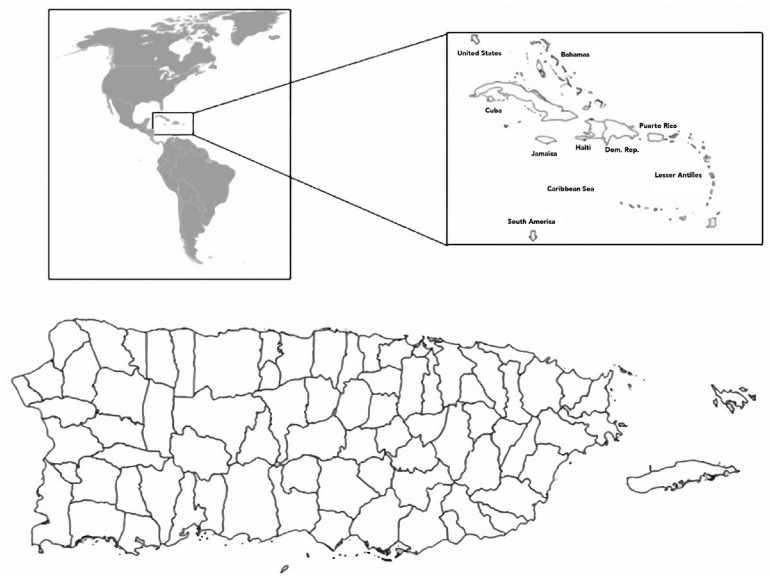
The rest of the article is structured as follows. Section 2 provides information about the study area. Section 3 offers details of the materials and methods used to fulfill the objectives, including the survey and study design, experimental design and estimation models. Section 4 describes the data. Section 5 explains the results. Section 6 presents a discussion based on the study results, followed by concluding remarks in Section 7.

2. Study area

Puerto Rico, an archipelago in the Caribbean region composed of a main island and various small islands (Figure 1), has a surface area of 9,104 square kilometers. In 2010, total population was 3.7 million inhabitants, but by 2020, population had declined to 3.2 million inhabitants (U.S. Census Bureau, 2021), a loss of 500,000 residents in 10 years, attributed in part to migration driven by economic crisis. Agriculture represents merely 0.6 % of the Gross Domestic Product, however, when considering the multiplier effect, the significance of agriculture to the Puerto Rican economy is greater as it contributes to other sectors, such as manufacturing and restaurants. In terms of Agricultural Gross Product, coffee ranks as a major sector in Puerto Rico (P.R. Department of Agriculture, 2021). Additionally, coffee plays an important role in the island's history and culture as well as the diet of residents.

FIGURE 1

Map of Puerto Rico by municipalities in the Caribbean region



Source: Own elaboration.

In Puerto Rico, coffee is produced mostly in regions far from the coast, particularly in the center-west of the main island. Local farmers are continuously impacted and threatened by natural hazards, including droughts, floods, and hurricanes, which alter their agricultural production. For example, in September 2017, Puerto Rico was first slammed by Hurricane Irma and two weeks later, by Hurricane Maria. Hurricane

intensity is expected to increase due to climate change (Knutson, 2022), impacting agricultural production in Puerto Rico. Unfortunately, the effects of such intensity on the coffee sector would be devastating, as coffee plants take longer than other crops to recover. Consequently, to complement their main revenue, farmers are seeking new strategies such as agritourism, which promotes coffee traditions and culture. Additional revenues at farm level can contribute to agricultural resilience to natural hazards and climate change.

3. Materials and methods

3.1. Survey and study design

The analysis is based on questionnaire data, which consisted of two main sections. The first included the choice experiment exercise and follow-up questions, while the second section collected information about respondents' sociodemographic characteristics (SDCs), such as age, income, gender, and educational level. We planned to distribute the questionnaires through in-person interviews. However, due to the covid-19 pandemic, lockdowns and lack of respondent interest to complete the questionnaires in person, we were forced to complete the data collection online. We used multiple approaches to recruit respondents, including social networks and mailing lists (anonymous). Residents over 21 years old participated in the study voluntarily using a webpage link that connected to the questionnaire[1]. According to the World Bank (2024), in Puerto Rico 85 % of individuals have access to the internet.

3.2. WTP elicitation method

Revealed and stated preference-based approaches can be used to estimate the value of non-market goods and services, such as agritourism activities on coffee farms (Birol *et al.*, 2006; Johnston *et al.*, 2017). Revealed preference-based methods are based on observed (i.e., real) behavior, whereas stated preference-based methods are based on stated responses to hypothetical questions via questionnaires (Bateman *et al.*, 2002; Birol *et al.*, 2006; Johnston *et al.*, 2017). Unfortunately, the data needed for revealed preference methods are often unavailable, which impedes the use of these approaches. The stated preference methods allow examining WTP estimates for non-market goods or services when observed data is unavailable. However, due to the nature of the questions, stated preference-based methods suffer from multiple undesired effects, including the well-known hypothetical bias as well as interviewer, strategic response, SQ and starting point biases (Bateman *et al.*, 2002; Meyerhoff & Liebe, 2009; Hoyos, 2010; Johnston *et al.*, 2017), which can affect study results. Researchers have developed multiple strategies to reduce or eliminate these biases, which include training interviewers, focus group meetings, pre-testing, validity tests and cheap-talk scripts (Bateman *et al.*, 2002; Johnston *et al.*, 2017).

[1] The age of participants was recorded at the beginning of the questionnaire, and if they were under 21, they were not allowed to continue.

The most common stated preference-based methods are the contingent valuation and the choice experiments. We used the choice experiment method for two main reasons. First, the choice set structure is affected by the type of device used to complete the choice experiment in web-based surveys, allowing us to complete the primary objective of this study. Second, it helps to address some of the limitations of the contingent valuation method, including strategic response and starting point biases. The online survey distribution approach also helps to avoid interviewer bias, resulting in more reliable estimates. The choice experiment is a commonly used method for examining trade-offs between attributes of a particular project (Hoyos, 2010; Johnston *et al.*, 2017), such as multiple agritourism activities. The choice experiment method has been used worldwide for estimating WTP for public as well as private goods, including recreational opportunities in outdoor settings (Hearne & Salinas, 2002; Rosenberger *et al*., 2012; Tavárez & Elbakidze, 2019).

In choice experiments, respondents receive multiple choice sets (i.e., tables) composed of two or more alternatives and are asked to select the preferred option, given the attributes that describe each alternative. Table 1 shows the agritourism activities (attributes) used for the choice experiment, including guided tours, coffee courses, on-farm camping, and attractions for children. A cost attribute was also included to facilitate the estimation of WTP values for each agritourism activity (Hoyos, 2010). The choice experiment attributes and levels were selected based on meetings with stakeholders and a literature review (Cafiesencia, 2016; Tavárez & Elbakidze, 2019), which were validated in focus group meetings.

Two focus group meetings, each composed of 8 participants, were used to test the questionnaire. Participants from different age groups, educational backgrounds and gender attended the meetings to account for preference heterogeneity across potential visitors. Focus group meetings were particularly helpful in exploring the questionnaire design, such as overall understanding of the valuation exercise, vocabulary, survey length, relevance of attributes and cost levels. At the end of the meeting, participants were allowed to provide comments or recommendations regarding the questionnaire or study. The questionnaire was modified after focus group meetings.

In terms of the experimental design, a full factorial design would include too many choices sets per respondent ($2^4 * 5^1 = 80$), causing respondent fatigue and affecting data quality. Thus, we used a fractional factorial design, which has been commonly used in the choice experiments literature (Malone & Lusk, 2018a; Malone & Lusk, 2018b; Wuepper *et al.*, 2019; Tavárez *et al*., 2020; Tavárez *et al.*, 2021b). This design is used to identify a subset of choice sets without losing relevant information (Louviere *et al.*, 2000). Each respondent was presented with twelve choice sets from a predetermined list of choice sets. It is worth noting that we anticipated a relatively low participation rate because of the covid-19 pandemic; therefore, presenting twelve choice sets per respondent allowed us to obtain more information (observations) per participant than usual. Figure 2 shows an example of a choice set.

TABLE 1

Attributes and levels used in the choice experiment

Attributes	Definitions	Attribute levels
Guided tours	Tour of the farm facilities. A guide will take you and explain the areas designated for the production of the plants, explaining how the coffee is grown, picked, stored and processed, and if it is in season there will be coffee picked. In addition, you can enjoy a video where you will learn how coffee is roasted and processed (torrefaction).	Tours not available Tours available
Coffee courses	Coffee cupping and barista classes. In addition, educational classes will be offered on the history of coffee and how it can be made into a cup of coffee.	Courses not available Courses available
On-farm camping	Overnight accommodation at the facilities of the farm. Visitors will have the option of camping overnight at the farm's facilities.	Camping not allowed Camping allowed
Attractions for children	Availability of games for children inside the farm. There will be availability of small playgrounds that include swings, see-saws, slides, and a tree house.	Attractions included Attractions not included
Cost per visit	The cost that you would pay per person for visiting the farm with the characteristics established in each option. The cost per person would be for visitors over 12 years old.	$0 $5 $10 $20 $30 $40

Source: Own elaboration.

FIGURE 2

An example of a choice set for the choice experiment[a]

In-farm activities	Option A	Option B	Option C
Guided tours	Tours available	Tours not available	Tours not available
Coffee courses	Courses not available	Courses available	Courses not available
On-farm camping	Camping not allowed	Camping allowed	Camping not allowed
Attractions for children	Attractions included	Attractions not included	Attractions not included
Cost per visit	$10	$20	$0
	□	□	□

[a] *Adapted from Spanish version.*

Source: Own elaboration.

3.3. Theoretical framework and estimation models

In the choice experiments it is assumed that people derive utility from the characteristics of a product and not from the product itself, which is consistent with the Lancaster Consumer Theory (Lancaster, 1966). Respondents analyze and compare available alternatives in each choice set and select the one that provides the highest utility. One of the most frequently used models for data analysis in choice experiments is the mixed logit model (MLM), also known as the random parameters logit model, because its specification is flexible enough to allow a better understanding of respondents' choices and preferences. The model formulation is based on the conditional logit model (CLM), in which the utility of individual n to select the alternative j in a choice situation t described by k observable attributes $X_{njt} = \{X_{njt}^1 \dots X_{njt}^K\}$ can be presented as (McFadden, 1974):

$$U_{njt} = \alpha_j + \beta' X_{njt} + \varepsilon_{njt} \quad [1]$$

where α_j is an alternative specific constant (ASC), β are coefficients, and ε_{njt} is the error term with an independent and identically distributed extreme value. The probability of selecting a specific alternative is given by:

$$Pr(y_{nt} = j) = exp\,(\alpha_j + \beta' X_{njt}) \,/\, \sum_{q=1}^{j} exp\,(\alpha_q + X_{nqt}) \quad [2]$$

In MLM, β varies among individuals with a specified density f. This specification represents a variation in population preferences. The probability that person n chooses a sequence of alternatives $j = (j_1 \dots j_T)$ is given by:

$$P_{nj} = \int \prod_{t=1}^{T} (\exp(\beta' X_{njt}) / \sum_{j=1}^{J} exp\,(\beta' X_{njt}))\, f(\beta)\, d\beta \quad [3]$$

This probability cannot be obtained analytically, and it must be obtained by approximation using simulation methods (Train, 2003). We used Halton draws with 500 repetitions to estimate the maximum simulated likelihood (Hole, 2007). Respondent SDCs can be interacted with attribute-specific variables to explore the effects of participant profiles on preferences for certain attributes. Respondent specific variables can also be interacted with the ASC to examine the effect of participant profile on their interest in participating in agritourism (Train, 2009).

Respondents' WTP for agritourism activities is given by the negative ratio of the coefficient of the attribute of interest and the cost coefficient (Hoyos, 2010). Therefore, WTP for attribute k is obtained as follows:

$$WTP = -\beta_k / \beta_{cost} \quad [4]$$

We used conditional and mixed logit models for analyzing choice experiment data. The CLM provides an initial assessment of the overall preference for agritourism attributes. However, the CLM relies on the Independence of Irrelevant Alternatives (IIA) property, which is often violated in choice experiments. To address this limitation, we used multiple MLMs, which relaxes the IIA property and accounts for heterogeneous preferences for choice experiment attributes. Both models include an ASC that takes the value of one if respondent selected an agritourism project, i.e., a non-status quo option, and zero otherwise. Specifically, we estimated a CLM (model 1) and a MLM with main effects only (model 2). We also estimated a MLM with interaction between respondent SDCs and the ASC to evaluate the effect of participant profiles on their interest in agritourism (model 3). A screen size indicator variable (e.g., iPads, tablets, MacBook, PC or iMac) was included into this model as an interaction with the ASC. We also estimated an additional MLM that includes interaction between respondent SDCs and attribute-specific variables, and respondents SDCs and the ASC[2] (model 4).

The agritourism-related attributes were binary coded, while the cost attribute was continuous in all models. All non-monetary attributes were specified as random parameters, while the cost attribute was specified as a non-random parameter (see Revelt & Train (2000) for details on the limitations of defining the cost attribute as a random parameter). In addition, all non-monetary attributes were specified with a normal distribution.

4. Data

A total of 211 persons filled out the questionnaire between April and July 2021. However, only 140 surveys were useful because 71 respondents partially completed the questionnaire. Data from incomplete surveys were removed from the econometric analysis. We conducted a power analysis following the procedure outlined by de Bekker-Grob *et al*. (2015) and found that the minimum sample size needed for a statistical power of 80 % at a 95 % confidence interval is 246. Considering the sample size of this study, the resulting statistical power was 60 %, indicating that the study (when conducted repeatedly over time) is likely to produce a statistically significant result six times out of ten (de Bekker-Grob *et al*., 2015).

The average age of all respondents is 37.4 (Table 2). The average number of dependents is 0.6 per household. Fifty-eight percent of the residents in this study have a bachelor's degree (not shown), which is higher than the percentage of bachelor's degree holders (26 %) in Puerto Rico (Puerto Rico Planning Board, 2017). Median household income for the population of Puerto Rico is $21,058/year

[2] We thank the anonymous reviewer for encouraging us to include this model.

or $1,755/month. According to the results from Likert-scale questions, the median household income of the sample is $2,501 – $3,500/month. Forty-seven percent of the population in Puerto Rico are male, compared to 48 % in our sample. The median age of respondents is 32, which is lower than the median age of the population (42). Overall, respondents surveyed have fewer dependents, and are younger, more educated, and wealthier than the population of Puerto Rico. In this regard, we mention two details. First, although our sample diverges from the overall population, the profile of the population interested in agritourism is unclear. Second, some degree of self-selection bias may be present. Self-selection bias has been reported in online survey studies (Bethlehem, 2010; Greenacre, 2016).

TABLE 2

Sociodemographic characteristics of surveyed respondents

Sociodemographic characteristics	Definitions	Average (SD)
Age	Age of respondents	37.35 (13.88)
Gender	Gender of respondent (0 = male, 1 = female)	0.48 (0.50)
Income	Net household income per month (1 = less than $500, 7 = more than $7,000)	4[m]
Education	Education of respondent (1 = none, 5 = graduate school)	4.18 (0.72)
Dependents	Number of dependents	0.59 (0.88)
Outdoor	Number of days per month that respondents do outdoor recreation (1 = 0 days, 4 more than 10 days)	2.09 (1.07)
Demand	Number of days per year that respondents would visit the farm for agritourism	3.92 (2.21)
Screen	If respondent completed the questionnaire using a large screen via tablet, iPad, PC or iMac (1 = yes, 0 = no)	0.21 (0.45)

m: median.

Source: Own elaboration.

5. Results

5.1. Use of device

The questionnaires were conducted online due to the covid-19 pandemic. To analyze the results, respondents were asked to indicate the device used to complete the questionnaire. Seventy-nine percent of respondents completed the questionnaire using their cellphones, fourteen percent completed the questionnaire with a laptop or MacBook, six percent completed the questionnaire using a PC or iMac, and three

respondents completed the questionnaire with either a tablet or iPad. Therefore, the results show that 21 % of respondents used larger screens to complete the questionnaire, compared to 79 % using cellphones.

TABLE 3

Device used to complete the questionnaire

Device	Frequency	Percentage (%)	Accumulated (%)
Cellphone	110	78.57	78.57
Tablet or iPad	3	2.14	80.71
Laptop or MacBook	19	13.57	94.28
Desktop or iMac	8	5.71	100
Total	140	100	

Source: Own elaboration.

Survey respondents using cellphones, i.e., small screens in this study, may have dedicated more time to the questionnaire, as they need to navigate more on the screen to make trade-offs between alternatives. We used a Kruskal-Wallis test, with Chi-squared statistic corrected for ties, to test whether screen size affects the time dedicated to completing the questionnaire in the valuation exercise. Surprisingly, the time spent on the questionnaire by respondents using large screens is greater (mean = 962 sec; N = 30; S.D. = 1409) than by respondents completing the questionnaire using small screens (mean = 659 sec; N = 110; S.D. = 417; Kruskal-Wallis Chi2 = 2.77; D.F. = 1; P = 0.09). It may be possible that, on average, respondents using tablets, iPads, PC or iMacs may have completed the questionnaire from the comfort of their home, giving them more time to dedicate to the survey instrument, relative to respondents using small screens via cellphones. The results differ from Liebe *et al.* (2015) who found that mobile device users spent more time than desktop/laptop users to answer a survey. Their study included more alternatives, attributes and attribute levels than our study, increasing the complexity and choice set structure in the valuation exercise, which may explain the discrepancy.

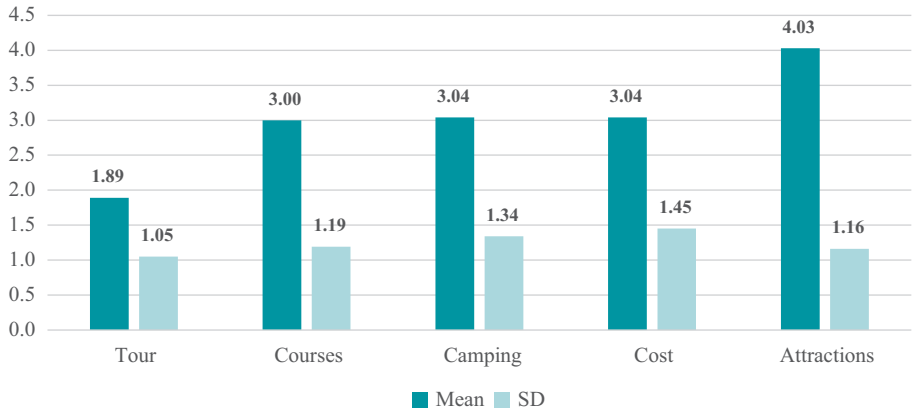
We used a t-test to check for differences in the reported complexity of the valuation exercise among the two groups of respondents. Posing Likert-type questions using a scale from 1 to 5 (1 = very difficult, 5 = very easy), we asked respondents to state how complex was the choice experiment exercise. We found no difference in the complexity reported between respondents using large screens (N = 30, mean = 3.61, SE = 0.09) and respondents using small screens (N = 110, mean 3.71, SE = 0.19, P = 0.63). Thus, time dedicated to the valuation exercise is not related to the choice set complexity reported.

5.2. Preferences and willingness to pay for agritourism activities

Figure 3 shows the order of importance of agrotourism activities (1 = most important, 5 = least important) using a ranking question. A tour of the farm ranks as the most important attribute, followed by coffee courses, on-farm camping, and cost. However, coffee courses and on-farm camping received almost the same score. Attractions for children were perceived as least important, which is not surprising given that 61.5 % of respondents surveyed have no dependents.

FIGURE 3

Importance of choice experiment attributes using ranking questions



Source: Own elaboration.

The SQ alternative was selected 468 times out of a total of 1,680 choice sets, representing 28 % of respondents' choices, which may be considered slightly high for choice experiments. Prior studies on outdoor recreation valuation have reported a lower percentage in terms of SQ selection. For example, Tavárez & Elbakidze (2019) reported an SQ selection rate of 11 %, while Wielgus *et al*. (2009) indicated a rate of 15 %. However, Czajkowski *et al*. (2016) reported significantly higher rates of SQ selection, with percentages close to 40 %. We were particularly interested in evaluating how SQ selection may vary depending on the device used for the valuation exercise. For instance, the SQ alternative was selected 384 times out of a total of 1,320 choice sets by cellphone users completing the choice experiment, representing 29 % of respondents' choices. In comparison, the SQ alternative was selected 84 times out of a total of 360 choice sets, accounting for 23 % of respondents' choices of the group who completed the valuation exercise using large screens via tablets, iPads, laptops or desktops.

We evaluated the reported level of confidence (certainty) of respondents in completing the choice experiments by type of device used for the questionnaire. Posing Likert-type questions using a scale from 1 to 10 (1 = very unconfident, 10 = very confident), we asked respondents to indicate their level of confidence in their responses. The result from a t-test shows that respondents using small screens are less confident of their responses (N = 110, mean = 7.66, SE = 0.14) than respondents using large screens (N = 30, mean = 9.07, SE = 0.18, $p < 0.10$). These results indicate that the choice set structure on small screens affects respondents' confidence, which influences their decision-making process in choice experiments using software for data collection, including the SQ option selection.

Table 4 shows regression results for the choice experiment. According to the Akaike Information Criterion (AIC) and the Swartz Criterion (BIC), the MLM with an expanded set of interaction effects (model 4) performed the best. Except for the children attractions attribute in model 4, all agritourism-related coefficients were significant and positive in all regression models, indicating that these attributes increase the probability of choosing an alternative. The cost coefficient was significant and negative in all models, indicating that the higher the cost the lower the probability of selecting an alternative. Standard deviation coefficients in the MLMs indicate preference heterogeneity for coffee courses, on-farm camping and attractions for children, but not for guided tours.

The following results pertain to model 3, which is not influenced by additional variables included in the model. The interaction effect between the ASC and income was significant and positive, indicating that households with higher incomes are more likely to support agritourism projects. This finding is expected as it is consistent with economic theory. The interaction effect between the ASC and age was significant and negative, indicating that younger individuals are more likely to support agritourism activities. Similar results are reported in prior stated preference-based studies on outdoor recreation (Carlsson *et al.*, 2003), including Puerto Rico (Rivera-Acosta & González-Martínez, 2020). Overall, young people suffer from fewer health conditions than the elderly and, perhaps, are more willing to be exposed to sunlight and participate in outdoor recreation.

The interaction effect between the ASC and gender is significant and negative, indicating that female respondents are less likely to support agritourism on coffee farms. In Puerto Rico, agriculture is dominated mostly by men, meaning that men are more exposed to farm management, and this may also explain the results of this study. The screen coefficient is significant and positive, suggesting that individuals who completed the valuation exercise on large screens are more likely to support agritourism. This study demonstrates that choice experiment data is affected by the way information is presented visually to survey respondents. Choice sets can be seen fully on large screens, but partially seen on cellphone screens, forcing cellphone respondents to navigate on the screen to compare choice set alternatives.

TABLE 4

Regression Results from Conditional and Mixed Logit Models[a]

Variables	CLM (model 1)	MLM (model 2)	MLM with interactions (model 3)	MLM (with expanded set of interactions) (model 4)
Variables (random parameters in the MLM)				
Guided tour	1.097 (0.074)***	1.758 (0.266)***	1.741 (0.267)***	1.425 (0.438)***
Coffee courses	0.717 (0.073)***	1.141 (0.199)***	1.121 (0.199)***	1.773 (0.479)***
On-farm camping	0.838 (0.072)***	1.326 (0.216)***	1.322 (0.221)***	2.673 (0.562)***
Attractions for children	0.282 (0.071)***	0.405 (0.123)***	0.434 (0.126)***	0.083 (0.378)
ASC	–0.174 (0.065)***	–0.328 (0.116)**	0.353 (0.346)	–0.013 (0.362)
Standard deviations for random parameters				
Guided tour	–	0.862 (0.551)	0.854 (0.565)	0.655 (0.649)
Coffee courses	–	1.937 (0.467)***	1.846 (0.467)***	1.784 (0.488)***
On-farm camping	–	1.780 (0.460)***	1.822 (0.467)***	1.428 (0.488)***
Attractions for children	–	0.985 (0.478)**	0.995 (0.423)**	0.821 (0.516)
Non-random parameters				
Cost	–0.050 (0.003)***	–0.082 (0.012)***	–0.082 (0.012)***	0.077 (0.013)***
ASC x Income	–	–	0.122 (0.061)**	0.043 (0.061)
ASC x Age	–	–	–0.030 (0.009)***	–0.010 (0.008)
ASC x Gender	–	–	–0.358 (0.198)*	–0.399 (0.211)**
ASC x Screen	–	–	0.417 (0.240)*	0.319 (0.248)
Guided tour x Income	–	–	–	0.066 (0.062)
x Age	–	–	–	–0.001 (0.008)
x Gender	–	–	–	0.036 (0.206)
x Screen	–	–	–	–0.194 (0.257)
Coffee courses x Income	–	–	–	0.097 (0.072)
x Age	–	–	–	–0.029 (0.010)***
x Gender	–	–	–	–0.099 (0.226)
x Screen	–	–	–	0.109 (0.284)
On-farm camping x Income	–	–	–	0.013 (0.065)
x Age	–	–	–	–0.046 (0.011)***
x Gender	–	–	–	0.549 (0.228)**
x Screen	–	–	–	–0.130 (0.270)
Attractions for children x Income	–	–	–	0.065 (0.065)
x Age	–	–	–	0.002 (0.009)
x Gender	–	–	–	–0.166 (0.214)
x Screen	–	–	–	0.344 (0.266)

TABLE 4 (cont.)

Regression Results from Conditional and Mixed Logit Models[a]

Variables	CLM (model 1)	MLM (model 2)	MLM with interactions (model 3)	MLM (with expanded set of interactions) (model 4)
Observations	5220	5220	5220	5220
AIC	2907.55	2895.26	2882.13	2846.45
BIC	2946.53	2960.22	2973.08	3041.33

CML – Conditional Logit Model; MLM – Mixed Logit Model; ASC – Alternative Specific Constant
*** Significant at 0.01; ** Significant at 0.05; * Significant at 0.10
[a] All SDCs and the variable screen were specified as interaction effects with the ASC. The variable screen takes the value of one if the questionnaire was completed using large screens and zero otherwise.
As requested by a reviewer, the fourth model explores the effect of SDCs on preferences for certain attributes.

Source: Own elaboration.

We examined the effect of gender, age, and income of individuals on preferences for specific attributes, which provides useful insights for marketing strategies. The last column of Table 4 shows the results from the MLMs with interaction effects between attributes and SDCs. The results show that female respondents are more likely to support camping opportunities relative to male respondents but are indifferent to the other agritourism activities. The results also show that younger respondents are more likely to support camping opportunities and coffee courses but are indifferent to the guided tours and attractions for children. Income and screen size do not affect respondent choices of specific agritourism activities.

WTP estimates can be obtained by the negative ratio of the coefficient of the attribute of interest and the cost coefficient (Eq. 4). Table 5 shows WTP estimates for the agritourism-related activities evaluated in this study. The results from model 2 (MLM with main effects only) indicate that visitors are willing to pay $21, $14, $16 and $5 per visit for guided tours, coffee courses, on-farm camping and attractions for children, respectively. Models 1 and 3 provide similar results. Consistent with the reported preference order in the ranking question, a guided tour is the preferred activity and attractions for children, the least preferred. Furthermore, according to the non-overlapping confidence intervals method (Park *et al.*, 1991), WTP for guided tours is significatively higher than WTP for coffee courses and attractions for children. Choice experiment results revealed that while on-farm camping is preferred over coffee courses, the difference is not significant, which is also consistent with the ranking question. Consistency across questions may be used as a validity test. The results from model 4 show that residents are willing to pay more for on-farm camping, compared to the rest of the agritourism activities. The results from this model suggest that residents are willing to pay between $18 and

$35 for the agritourism activities. The interaction effects between screen size and attribute-specific variables were statistically insignificant (see Table 4).

TABLE 5

Willingness to pay (US dollar) for agritourism-related activities

Activities	CLM (model 1)	MLM (model 2)	MLM with interactions (model 3)	MLM (with expanded set of interactions) (model 4)
Guided tours	21.85 (18.76 – 24.95)	21.33 (18.44 – 24.22)	21.21 (18.31 – 24.10)	18.41 (8.90 – 27.93)
Coffee courses	14.28 (11.41 – 17.15)	13.84 (10.89 – 16.80)	13.65 (10.71 – 16.59)	22.91 (12.52 – 33.30)
On-farm camping	16.70 (13.84 – 19.56)	16.09 (13.22 – 18.96)	16.10 (13.21 – 18.99)	34.54 (24.36 – 44.72)
Attractions for children	5.62 (2.89 – 8.35)	4.92 (2.19 – 7.64)	5.28 (2.55 – 8.02)	–

Confidence intervals, provided in parentheses, are calculated using the Krinsky & Robb (1986; 1990) procedure.

Source: Own elaboration.

6. Discussion

Tavárez & Elbakidze (2019) used choice experiments to assess WTP for ecotourism-related activities in a forest ecosystem of Puerto Rico and found that residents are willing to pay $15 – $39, in terms of a one-time payment for the projects. Given that our results are on a per visit basis and respondents surveyed indicated a willingness to visit the coffee farms 3 times a year on average, the WTP amounts in this study are higher than those reported by Tavárez & Elbakidze (2019). Additionally, they found that income is positively correlated with the probability of selecting ecotourism-related alternatives. That is, the probability of selecting an alternative increases as income increases, which is consistent with economic theory. We reported similar results, which can be used as a validity test.

SQ bias describes a preference for maintaining the current situation or a preference for not undertaking any action that would change the current situation. This study shows interesting findings in terms of potential SQ bias. Respondents using tablets, iPads, laptops and desktops were not only more confident of their responses in the valuation exercise and dedicated more time to the choice experiment, but they also selected the SQ option less frequently than respondents using cellphones. Thus, having a complete picture of choice sets may reduce SQ bias, leading to more accurate estimates.

Although this study found no evidence that WTP values depend on screen size, future studies may reveal discrepancies in WTP estimates if choices vary considerably across devices. For example, this study found that respondents using large screens select the SQ options less frequently and are more likely to participate in agritourism (see model 3 in Table 4). Differences in WTP estimates can have significant implications for choice experiments results. Future studies employing choice experiments should address this potential bias during the design phase, as it can impact economic viability studies, such as cost-benefit analyses. One approach would be to include questions about the device used (e.g., cellphone or tablet), enabling researchers to explore whether device effect is present. Other strategies could involve forcing respondents to use a specific device, which can be easily implemented by using "skip logic" type questions in online surveys.

Studies on agritourism have shown that there is a need to educate the population to generate more interest in these activities. A study on agritourism carried out in Puerto Rico by Cafiesencia (2016) shows that 56 % of respondents surveyed did not know about the subject, but they wanted to learn more. Helping local farmers and interested consumers to understand the benefits of agritourism could increase visitors' WTP for these activities, which could lead to increased income for farmers who want to launch agritourism initiatives (Méndez-Toro, 2019). Thus, encouraging agritourism through the design of agricultural and environmental education-related policies could contribute to sustainable agriculture.

This study found that female respondents are less likely to support agritourism on coffee farms than are male respondents. Women respondents seem to prioritize other aspects affecting their daily lives. However, it is unclear whether females would support agritourism in other contexts. Future studies can explore women's perceptions and attitudes toward agritourism in other sectors, including dairy farming.

There are two main limitations that we would like to discuss. First, since March 2020, Puerto Rico has been affected by covid-19, which also affected this study. Due to lockdowns and the lack of consumer interest in answering the surveys in person, we had to use the online modality, losing control of the device used. The pandemic also delayed the study, which was carried out with a relatively small number of participants. Future studies may expand on this research by having more balanced observations between treatments, i.e., large versus small screens. Second, this study found that 58 % of respondents have a bachelor's degree. In this sense, the results are not aligned with the sociodemographic profile of the general population of Puerto Rico. However, it is unclear what the educational level of the population interested in agritourism is. For example, it has been found that 77 % of consumers in coffee shops of Puerto Rico have a bachelor's degree or higher (own calculation from the Tavárez *et al.* (2021a) database), and 58 % of coffee shop owners have a bachelor's degree (Flores-Collazo, 2022), suggesting that residents interested in "special" coffees are more highly educated than the rest of the population of Puerto Rico. Our results are consistent with these findings regarding educational level.

7. Conclusions

This study used choice experiments to examine how device use influences preferences for agritourism in Puerto Rico. In addition to respondents' SDCs, we found that respondents using large screens via tablets, iPads, laptops, PC or iMacs are more likely to support agritourism activities, compared to respondents using small screens via cellphones. Respondents using large screens were more confident of their responses in the valuation exercise, selected the SQ option less frequently, and spent more time on the valuation exercise. These findings suggest that having a complete picture of choice sets in web-based surveys can reduce SQ bias, leading to more accurate estimates. Research on cost-benefit analysis may consider this caveat in future web-survey studies.

The results of this study indicate that small screens can affect the choice set structure and choice experiment responses. However, it is unclear whether respondents using cellphones hurriedly completed the questionnaire, which would probably influence choice experiment results. It may be possible that respondents using tablets, iPads, laptops, PC or iMacs completed the questionnaire from the comfort of their home, suggesting that they had more time to dedicate to the survey, compared to respondents using small screens via cellphones. Future studies can explore how hurrying affects choice experiment data.

Previous studies have found that visitors and tourists are often interested in conserving ecosystem services. Coffee farms could include land management like tree planting, live fences, water protection initiatives and other conservation strategies that would enhance scenic beauty and expand ecosystem services on guided tours. Future studies can examine whether increasing ecosystem services would increase visits to coffee farms and, consequently, improve farmers' revenues.

We have calculated a statistical power of 60 % given the sample size. In this regard, this study does not possess a sufficiently large sample size to conclusively address the research question. Therefore, we recommend increasing the sample size before drawing final conclusions.

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