Exploring the Influence of Multidimensional Tourist Satisfaction on Preferences for Wetland Ecotourism: A Case Study in Zhalong National Nature Reserve, China

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Abstract

Tourist satisfaction, as a principal element for sustainable development of wetland ecotourism and destination competitiveness, has received extensive attention in the research on its impact on behavioral intention. This paper employs choice experiment to study tourist satisfaction as an important motivation for behavioral intention of willingness to pay and preference on wetland ecotourism improvement policy, and explores the potential causal mechanism. A 15-item scale is designed to measure tourist satisfaction and four constructs are defined. Under the framework of discrete choice modeling, unidimensional and multidimensional data are incorporated as the standard for population segmentation and explanatory variables. The empirical results estimated by three methods basically confirms the proposed hypotheses and indicate that tourist satisfaction has a certain effect on tourist preference of wetland ecotourism and there is significant preference heterogeneity among groups with different satisfaction. Besides, different dimensions of satisfaction have a different effect on tourist preference of wetland ecotourism. This study enriches the studies on non-market value evaluation and preference motivation in the field of ecotourism, because tourist satisfaction may explain some unobserved preference heterogeneity. More effective wetland ecotourism policies can be designed when data on satisfaction are included.

1. Introduction

Ecotourism is a special form of tourism in which tourists visit relatively undisturbed areas in order to learn and enjoy the natural landscape, wildlife and culture of the destination, while bringing economic and social benefits to the local community and contributing to the conservation of natural resources (Ceballos-Lascuráin 1996; Higgins 1996; Orams 1995). The rising popularity of ecotourism has sustained in recent years and tourism demand has also grown (CREST 2020). Among them, wetland, as a crucial ecosystem, has gradually become an important ecotourism destination (Diaz-Christiansena et al. 2016).

The increasing number of ecotourists determines the long-term sustainability of the destination (Whitelaw et al. 2014), funding conservation efforts (Valdivieso et al. 2015) and boosting the local economy (Ardoin et al. 2015). In developing countries, it can also boost rural economies (Valdivieso et al. 2015) and work to reduce poverty (Snyman 2017). However, the rapid development of the industry has also brought great challenges to the sustainable development of wetland ecotourism, including the protection of wetland biodiversity and landscape, as well as the provision of a high level of satisfaction with the travel experience for tourists (Oviedo-García et al. 2019). Therefore, it is extremely important for the sustainability of wetland ecotourism that managers understand how to achieve tourism objectives, such as tourist satisfaction (Valdivieso et al. 2015). At the same time, tourist satisfaction is also one of the main factors that constitute the competitiveness of a destination (Sarra et al. 2015).

Tourist satisfaction has been defined and measured in different ways by numerous scholars in tourism literature (Oliver 1980, 1997). One of these definitions is a comprehensive evaluation of the difference between a tourist's prior expectation and post-visit experience (Chen and Chen 2010; Chi and Qu 2008). Some literature has explored the influence of previous expectations on satisfaction, including tourist

expectation (Aliman et al. 2016), destination image (Albaity and Melhem 2017; Chi and Qu 2008; Cong 2016; Prayag et al. 2015), travel motivation (Albayrak and Caber 2018; Berbel-Pineda et al. 2019; Medina-Viruel et al. 2019; Mutanga et al. 2017; Romão et al. 2014), perceived value (Chen and Chen 2010; Oviedo-García et al. 2019), costs and risks (Aliman et al. 2016; Huang et al. 2020; Mutanga et al. 2017), etc. Other empirical studies show that tourist satisfaction is also an important prerequisite for influencing tourists' behavioral intention, such as destination loyalty (Albaity and Melhem 2017; Berbel-Pineda et al. 2019; Chi and Qu 2008; Cong 2016; Romão et al. 2014), revisit intention and recommendation intention (Chen and Chen 2010; Oviedo-García et al. 2019; Park et al. 2019; Prayag et al. 2015), etc. This inference is consistent with the conclusion in the social psychology literature that tourist satisfaction is strongly linked to tourists' perception or subjective feeling (Manning 2003), and thus affects tourists' behavioral intention (Ajzen 1991).

Some studies have found that willingness to pay (WTP) is greatly affected by satisfaction (Kang et al. 2018), and its stated preference reveals a behavioral intention. This kind of behavioral intention can be reflected by discrete choice modeling, potentially revealing unobservable preference heterogeneity (McFadden and Train 2000). The estimated parameters and WTP estimates are both expressions of the respondents' intentions, one of which is the selection preference sensitivity under the framework of utility maximization and the other is expressed in the form of money. Therefore, tourist satisfaction can be used as a criterion for demographic segmentation and as an explanatory variable for economic models.

In terms of the measurement of tourist satisfaction, recent literature shows that there are two methods to measure satisfaction, unidimensional and multidimensional (Albayrak and Caber 2018). Researchers under a unidimensional framework usually employ Likert scale to determine overall satisfaction through single or several items, which reflect the accumulated experience of tourists due to the weight of various attributes (Pizam et al. 1978). Measuring destination satisfaction involves more than simply measuring the satisfaction of the services provided, but requires a broader and more comprehensive approach. In recent years, researchers have gradually begun to use the multidimensional approach, which can assess overall satisfaction with different aspects of a product or service. However, few scholars have measured satisfaction as a multidimensional construct in tourism literature (Castellano et al. 2020; Chi and Qu 2008), especially in ecotourism.

For different types of tourism, the multidimensional attributes for measuring satisfaction should also be changed accordingly. On the basis of referring to a large number of tourist satisfaction literature (Albaity and Melhem 2017; Aliman et al. 2016; Castellano et al. 2020; Chi and Qu 2008; Oviedo-García et al. 2019; Romão et al. 2014) combined with our previous research on wetland and ecotourism (Mao et al. 2020; Xu et al. 2020), as well as our research on the evaluation indicators of wetland ecotourism satisfaction by using online reviews mining approach (Sun et al. 2020), a multidimensional scale applicable to the evaluation of wetland ecotourism satisfaction was designed. According to the characteristics of wetland ecotourism, four constructs of tourist satisfaction were defined, including natural resource satisfaction (NRS), environmental governance satisfaction (EGS) facility satisfaction (FS) and travel experience

satisfaction (TES). Because of the commonality of ecotourism features, this scale can also be applied to other types of ecotourism.

This paper, in the context of the choice experiment (CE), examines the tourist satisfaction as an important motivation for the behavioral intention of stated preference and WTP on wetland ecotourism improvement policy, and explores the potential causal mechanism. Zhalong National Nature Reserve (ZNNR), a popular wetland ecotourism destination in northeast China, was chosen as the study area. Three management attributes of wetland ecotourism were selected, including natural resources and entertainment experience, as well as a price attribute. According to the literature review and the research objective of this paper, we put forward the following hypotheses:

H1: Tourist satisfaction has a significant effect on preference of wetland ecotourism.

H2: There is significant preference heterogeneity among groups with different satisfaction.

H3: Natural resource satisfaction (NRS) has a significant effect on preference of wetland ecotourism.

H4: Environmental governance satisfaction (EGS) has a significant effect on preference of wetland ecotourism.

H5: Facility satisfaction (FS) has a significant effect on preference of wetland ecotourism.

H6: Travel experience satisfaction (TES) has a significant effect on preference of wetland ecotourism.

To test all the above hypotheses, three methods are used in this paper. Tourist satisfaction was included in the evaluation model as unidimensional and multidimensional construct, respectively. First of all, as a single construct, a new method incorporated tourist satisfaction as the standard for population segmentation into discrete choice modeling of wetland ecotourism assessment. Then, the four constructs of tourist satisfaction were included in Random Parameter Logit (RPL) model and Latent Class (LC) model as explanatory variables, respectively. The research framework of this paper is shown in Fig. 1.

Although demographic heterogeneity in terms of characteristics and preferences is one of the concern issues in the field of ecological and environmental decision making, previous literature has mostly used socioeconomic attributes or attitudes as explanatory variables to address the source of heterogeneity (Birol et al. 2006; Choi and Fielding 2013; Xu et al. 2020). There are few studies on the psychological factors such as tourist satisfaction, especially when it is measured as a multidimensional attribute. Kang et al. (2018) evaluated forest park attributes by considering the tourist satisfaction as a single dimension through 5 items. León et al. (2015) explored the effect on preferences among different groups by incorporating different aspects of satisfaction with national park in the choice modeling, but each aspect of satisfaction was measured by using a single item. Compared with previous studies, the contribution of this paper is to measure tourist satisfaction as a unidimensional and multidimensional construct respectively, and to include it in the discrete choice modeling as a criterion of population segmentation and explanatory variables. Although most previous studies have supported a significant relationship

between satisfaction and preference, the causal mechanism may different. This study also enriches the studies on non-market value evaluation and preference motivation in the field of ecotourism, because tourist satisfaction may explain some unobserved preference heterogeneity. In addition, the results of this study can provide more effective wetland ecotourism policies for sustainable development with the inclusion of satisfaction data, and also provide a reasonable path for improving the competitiveness of the destination.

The rest of this paper is structured as following. The second part briefly introduces the study area and elaborates the design of the satisfaction scale and the choice experiment, as well as the survey and data collection. The third section briefly describes the econometric model used in this paper to measure unobservable heterogeneity, which is RPL model and LC model. The fourth part reports the estimated results, including the measurement results of the satisfaction scale and the estimation results of testing the hypothetical relationships between tourist satisfaction and preferences using three methods respectively. The last part is the elaboration of the conclusion and the discussion of the results, as well as the deficiencies of this study and prospects of future study.

2. Questionnaire Design And Data Collection

2.1 Study area

Zhalong national nature reserve (ZNNR) with an area of 2,100 km^2 is a wetland ecosystem located in the west of Heilongjiang province as Fig. 2 shows (Riley and Riley 2005). It is the ideal habitat for many waterfowls, especially the rare waterfowl distribution area in China. As the world's largest breeding ground for red-crowned cranes, ZNNR was listed as International Importance of Ramsar Wetland (no. 549) in 1992 (Ramsar 2020). Zhalong lake bird-watching scenic spot, a national AAAA tourist attraction in ZNNR, covers an area of 15.5 km^2. Its beautiful natural scenery and rare waterfowls attracts a large number of tourists to visit. Therefore, the authorities must improve the level of ecotourism services to satisfy the demand of tourists.

2.2 Questionnaire design

According to our previous study on the research framework of CE (Xu et al. 2020), three parts of the final questionnaire were formulated. After a brief introduction to the study area and the survey purpose, the first part investigates tourist satisfaction with all aspects of the scenic area through the designed satisfaction scale. The second part is the most important choice experiment, in which respondents were asked to select the one they like best out of three options. The last is a survey of the socioeconomic status of respondents.

2.2.1 Satisfaction scale design

On the basis of our study on wetland and ecotourism (Mao et al. 2020; Xu et al. 2020), the assessment of wetland ecotourism satisfaction with online comment mining method (Sun et al. 2020) and other studies

on tourist satisfaction (Albaity and Melhem 2017; Aliman et al. 2016; Cong 2016; Oviedo-García et al. 2019; Romão et al. 2014), four constructs of tourist satisfaction were defined, including natural resource satisfaction (NRS), environmental governance satisfaction (EGS), facility satisfaction (FS) and travel experience satisfaction (TES). Then the initial investigation done by researchers and the interview with the managers and employees of ZNNR, item pool was formulated by using a combined approach, which combines inductive approach and deductive approach (Bennett and Robinson 2000). After preliminary screening items, Likert-type five-point scale was selected as the expressive form of the scale, which asks respondents to rate how much they agree with a statement (1 point strongly disagrees to 5 point strongly agrees). Through focus group discussion (including the researchers, the managers, employees and experts of ZNNR), item pool was reviewed to ensure the content validity of the measurement tool and the content of the scale was presented in an easily understood way. After many discussions and revisions, a small pilot study involving 50 tourists was conducted at ZNNR on July 4 of 2018. Based on analyzing the results of the reliability, validity and discrimination of the pilot survey, items that do not meet the criteria are deleted and a final version was formulated. Detailed information of total 15 questions involved in the questionnaire and their measurement indicators are shown in Table S1.

2.2.2 Choice experiment

The fundamental purpose of selecting the choice experiment is to explore the impact of tourist satisfaction on wetland ecotourism preferences. In order to understand each respondents' preferences on wetland ecotourism, the alternatives are described by four attributes. The determination of attributes and levels was based on previous research work, field research in ZNNR, focus group discussion (including managers, employees, specialists of ZNNR and local government officials) and a pilot survey. As seen in Table 1, they are biodiversity measured by the number and status of species in ZNNR (BIO), expected number of visitors expressed by the average number of visitors encountered during a 1 km walk (NUM), the establishment of environmental education facilities (EEF) and ticket price as payment vehicle (PRICE).

Table 1
The selected attributes and levels in choice experiment.

Attributes and description	Variables	Levels
Biodiversity: measured by the number and status of species of plants and birds	BIO	Decreases: a 10% decrease in populations of species Stays at the present state* Increases: a 10% increase in populations of species
Expected number of visitors: average number of visitors encountered during a 1 km walk	NUM	Decreases: a visitor encounters less than 10 people Stays at the present state *: a visitor encounters 10 to 20 people Increases a lot: a visitor encounters more than 20 people
Environmental education facilities	EEF	Stays at the present state*: no environmental education facilities Increase the environmental education information boards Increase plants and animals' specimen museums
Ticket price: for adult visitors only	PRICE	Stays at the present state*: 65 RMB/person/visit Increase 5 RMB /person/visit Increase 10 RMB /person/visit Increase 15 RMB /person/visit Increase 20 RMB /person/visit Increase 25 RMB /person/visit

Note: * indicates the status quo of each attribute.

For experimental design, different profiles were arranged by using D-efficient design (Hensher et al. 2015) and 8 choice sets were formulated. They were divided into four versions of the questionnaire and each containing two choice sets. As showed in Table 2, each choice set included three options, and option C stands for maintaining the status quo.

Table 2
An example of choice sets used in the final questionnaire.

Carefully consider each of the following three options for improving Zhalong national nature reserve. Suppose Options A, B, and C are the only ones available, please choose your preferred choice from three alternatives.			
	Option A ☐	Option B ☐	Option C ☐
Biodiversity: measured by the number and status of species of plants and birds	Decreases by 10%	Increases by 10%	Status quo
Expected number of visitors: average number of visitors encountered during a 1 km walk	more than 20 people	10 to 20 people	10 to 20 people
Environmental education facilities	Increases specimen museums	Increases information boards	Status quo
Ticket price: for adult/person/visit	Increases 15 RMB	Increases 20 RMB	Status quo

2.3 Survey and data collection

A one-week survey using random sampling was conducted during August of 2018 in the scenic area of ZNNR. Trained investigators handed out questionnaires to respondents and offered rewards worth about 1–2 RMB to motivate them to respond. A total of 287 questionnaires were collected and 574 observations were obtained[1]. Among the respondents, 154 (53.66%) were female. Age composition was generally normally distributed, and the sample was mainly distributed between the age of 19 and 59 (80.14%). 190 (66.20%) were married and 169 (58.89%) had children. For educational background, more than half (61.27%) of the sample were college graduates. 60.63% of respondents were employed and 68.3% earned less than 5,000 RMB a month.

[1] For detailed explanation and information about the selection of attributes and levels and data collection, see Xu et al. (2020).

3. Econometric Models

Discrete choice experiment is based on the random utility model (McFadden 1974) and Lancaster's theory (Lancaster 1976), and asks respondents to weigh different scenarios with a set of attributes and levels to analyze preference heterogeneity. Preference heterogeneity is a key factor in elucidating individual or group behavior or socioeconomic drivers, especially in policy formulation (Andreopoulos et al. 2015). It can be explored by socioeconomic status and attitudinal factors, i.e. observed variables, as our previous research (Xu et al. 2020). However, due to the inherent randomness of selection behavior, preference heterogeneity associated with observed variables may not always be explained (Hess et al. 2007). There are some modeling methods that can model the unobservable heterogeneity using

continuous or discrete distribution, such as Random Parameters Logit (RPL) model and Latent Class (LC) model (Varela et al. 2014). A continuous representation of preferences in RPL model brings random changes by supposing every members of the sample with various utility parameters (Revelt and Train 1998). It ensures that individual preferences for each attribute follow deviations from the population mean to explain heterogeneity (McFadden and Train 2000). On the contrary, LC model provides another perspective, replacing continuous distribution with discrete distribution (Greene and Hensher 2013). In addition, it is a semi-parametric model, which makes no pre-assumptions about the distribution of parameters between individuals (Greene and Hensher 2003). It captures variations of preferences by classifying respondents into unobservable endogenetic segments (Nylund et al. 2007). Some studies made a comparation with the performance between RPL and LC model and the results showed that the models' goodness may be data-dependent (Birol et al. 2006; Boxall and Adamowicz 2002; Colombo et al. 2009; Kosenius 2010). Some of them supported the use of the LC model because it provided the best fit (Andreopoulos et al. 2015; Bujosa et al. 2010; Greene and Hensher 2013; Xu et al. 2020).

In this study, both RPL and LC model is employed to model the unobserved heterogeneity. On the basis of socioeconomic and attitude variables included in the previous study, latent variables of tourist satisfaction were added into the model to explore the unobserved heterogeneity and the influence on preferences. The heterogeneity within and between groups and variation in parameter vectors within and between classes was allowed in the LC model. The detailed explanations and formulas of RPL and LC model can be found in Xu et al. (2020).

4. Results

4.1 Satisfaction measurement

The frequency distribution of the 15 satisfaction items was tested and the results show that the respondents are generally satisfied (see Table S1), but not all of the items have overwhelmingly positive responses. Among them, three items receive more than 80% agreement, including item 2 ('The air in the scenic area is fresh and the environment is very good'), item 3 ('The quality of water resources in the scenic area is very good') and item 4 ('The scenic ecological landscape is beautiful and I am satisfied with the overall natural environment of the scenic area'). Other three statements of satisfaction receive slightly less support with just over 50% agreement, such as item 1 ('The scenic area is rich and varied in animal and plant species'), item 11 ('The environmental education facilities of the scenic area are complete and introduced in detail') and item 12 ('The planning of the scenic area is reasonable and the service of the staff is satisfactory'). Interestingly, the respondents have expressed a very high level of satisfaction with the natural environment of ZNNR, but relatively low with biodiversity, facilities and services.

As a single scale, the Cronbach's α coefficient (0.906) shows that the measured items have good internal consistency. The value for Kaiser-Meyer-Olkin (KMO) and Bartlett's test of sphericity (0.916) ($p = 0.000 <$

0.01) shows that the existing of common factors between variables, and the items in the scale are fit for factor analysis.

The inappropriate items were deleted by using the factor analysis. The final list of indicators expressing four constructs is presented in Table 3. The factor loadings of each single item are significant and greater than 0.6, indicating that the measurement indicators have good validity evidence. The results of Cronbach's α coefficients (all over 0.5), the average variance extracted (AVE) (all over 0.5) and composite reliability (CR) (all over 0.7) suggest an acceptable internal consistency and a good convergent validity (Hair et al. 2010). In addition, the correlations calculated between two constructs were compared as showed in Table S2, showing an acceptable discriminant validity (between 0.5 and 0.8).

Table 3
Items of improved scale and measures of reliability.

Constructs	Indicators	Items	Mean	SD	FL	α	AVE	CR
Natural resource satisfaction (NRS)	NRS1	Item 2	4.43	0.688	0.618	0.561	0.540	0.702
	NRS2	Item 3	4.18	0.800	0.638			
Environmental governance satisfaction (EGS)	EGS1	Item 5	3.96	0.922	0.684	0.767	0.593	0.812
	EGS2	Item 6	3.83	0.877	0.651			
	EGS3	Item 7	3.94	0.816	0.838			
Facility satisfaction (FS)	FS1	Item 9	3.86	0.976	0.805	0.780	0.549	0.784
	FS2	Item 10	3.90	0.957	0.677			
	FS3	Item 11	3.58	1.012	0.716			
Travel experience satisfaction (TES)	TES1	Item 13	3.75	0.995	0.739	0.780	0.576	0.803
	TES2	Item 14	3.77	0.927	0.728			
	TES3	Item 15	4.07	0.889	0.747			

Note: SD stands for standard deviation; FL stands for factor loading; α stands for Cronbach's α coefficient; AVE stands for average variance extracted; CR stands for composite reliability.

4.2 Tourist satisfaction and preferences

Hypothetical relationships between tourist satisfaction and preferences were tested by three methods. First of all, the whole sample was subdivided according to a single scale of tourist satisfaction, and each segment was estimated by using the RPL model. Secondly, the four constructs of tourist satisfaction were incorporated into the evaluation model by calculating their score, as well as the socioeconomic characteristics. Finally, the LC model was employed to explore the preference heterogeneity among groups after the inclusion of latent variables of tourist satisfaction.

For the first method, this paper used tourist satisfaction as the standard for population segmentation to test the relationship between satisfaction and preferences in H1 and H2. Here the 15-item satisfaction scale in Table S1 was explored as a single construct. The mean satisfaction score of samples is 58.81 (standard error 0.214). In this paper, a three-segment equal size method (Choi and Fielding 2013) was used to divide the respondents into three groups of low, medium and high degree of satisfaction, and each group included about a third of respondents. ‘Low’ respondents had a satisfaction score of 54 or lower; ‘medium’ respondents scored above 55 and below 63; ‘high’ respondents scored higher than 64. The three groups have 89, 105 and 93 respondents, and 178, 210 and 186 observations respectively, with mean satisfaction score of 48.77, 58.23 and 69.09.

To test the impact of tourist satisfaction segmentation on each attribute, a RPL model was established to analyze each segment and all respondents independently. As showed by the statistical results in Table 4, the fit of the four models is significant according to the Chi-square statistics. The estimates for medium satisfaction group are broadly consistent with those for the full sample, while the estimates for the low and high satisfaction groups show significant differences. To be more specific, for the medium satisfaction group, the alternative specific constant (ASC) is significantly positive. The BIO and EEF of management attributes are significantly positive, NUM is not significant, and the PRICE attribute is significantly negative. These results indicate that the respondents in the medium group would like to improve the status quo in biodiversity and environmental education facilities, but at the same time, the high entrance fee would bring disutility. For the low satisfaction group, ASC and management attributes are not significant, and only the price attribute is significantly negative, which indicates that the respondents in the low satisfaction group are not willing to change the status quo and are only sensitive to price. For the high satisfaction group, only ASC and BIO are significantly positive, indicating that respondents in this group are only prone to improve biodiversity. The great difference of parameter estimates in different segments of Table 4 indicates that the groups with different satisfaction have significant preference heterogeneity, which supports the hypothesis H2.

Table 4
Estimation results from random parameter logit model of three satisfaction segments.

Attributes	All respondents	Low	Medium	High
ASC	4.786***	3.232	5.105**	3.539**
BIO	0.563***	0.586	0.527**	0.516*
NUM	-0.111	-0.742	-0.072	-0.031
EEF	0.401***	0.571	0.413*	0.049
PRICE	-0.236***	-0.681**	-0.229*	-0.021
Summary statistics				
LL	-630.60	-195.55	-230.71	-204.34
Chi-squared	45.65***	26.22***	12.53*	17.46**
Observations	574	178	210	186

Note: ***, **, * ==> Significance at 1%, 5%, 10% level. ASC stands for alternative specific constant.

To further demonstrate the hypotheses of H1 and H2, the mean WTP of three attributes across different satisfaction segments was estimated as Fig. 3 shows. To calculate the WTP, the formula is $WTP_m = -\beta_m/\beta_p$, where *WTP* stands for the willingness to pay of each attribute, β_m is the parameter of management attribute *m* and β_p is the parameter of price attribute *p*. The estimates of WTP for different satisfaction groups show significant differences. Except for the NUM attribute, the higher the tourist satisfaction, the higher the WTP, especially for the BIO attribute. This result partly supports the hypothesis H1 and fully supports H2, which indicates that tourists with higher satisfaction are more inclined to pay more for improving wetland ecotourism than tourists with lower satisfaction (Kang et al. 2018).

Tourist satisfaction continued to be incorporated into the RPL model as a single construct, and the results are shown in Model 1 of Table 5. Chi-square statistics show that the model fits well and are improved to some extent. However, this result shows that the interaction term of satisfaction is not significant and does not support H1.

Table 5
Estimation results from random parameter logit models.

Attributes	Model 1	Model 2	Model 3	Model 4
ASC	0.717*	0.812*	1.024*	1.233**
BIO	0.565***	0.571***	0.571***	0.561***
NUM	-0.103	-0.090	-0.095	-0.086
EEF	0.401***	0.392***	0.396***	0.373***
PRICE	-0.230***	-0.218***	-0.227***	-0.206***
Satisfaction[1]	-0.142			
Gender[1]		0.778***		0.804***
Age[1]		-0.099		-0.151*
Education[1]		-0.144		-0.147
Income[1]		0.242		0.254*
Job[1]		-0.504***		-0.417
NRS[1]			-0.522**	-0.520**
EGS[1]			-0.464**	-0.465**
FS[1]			-0.238	-0.257
TES[1]			0.609***	0.602***
Summary statistics				
LL	-607.71	-601.24	-598.74	-589.18
Chi-squared	45.79***	58.72***	63.72***	82.83***

[1] They are all interaction terms between alternative specific constant and latent variables.

To further test the hypotheses, tourist satisfaction continued to be included into the RPL model as a multidimensional construct in the second approach. The weight of tourist satisfaction evaluation indicators was constructed and the score of each respondent on the four constructs reflecting satisfaction was calculated based on the estimated results of Table 3. The formula for calculating the weight is $W_{ic} = \frac{F_{ic}}{\sum_{i=1}^{I} F_{ic}} \quad i = 1,2,\cdots,I$, where W_{ic} and F_{ic} are the weight and factor loading of the indicator *i* with construct *c*, respectively. The calculation results of the indicator weight of four constructs of tourist

satisfaction are presented in Table S3. According to the indicator weight, the score of each construct was calculated.

Socioeconomic attributes and the score of the four constructs were respectively included in the RPL model, and Model 2, Model 3 and Model 4 in Table 5 were obtained. The results show that the model fits are significant according to the Chi-squared statistics and are improving gradually. Model 4 has the best fitting result. Same with previous literature (Andreopoulos et al. 2015; Birol et al. 2006; Xu et al. 2020), the interaction terms between ASC and socioeconomic profiles show that gender and income are significantly positive, and age is significantly negative, indicating women, young people, and high-income respondents are more willing to change the status quo. Among the interaction terms between ASC and the four constructs of tourist satisfaction, NRS and EGS are significantly negative, FS is not significant, and TES is significantly positive. This indicates that the respondents with low satisfaction on natural resource and environmental governance and high satisfaction on travel experience prefer to improve the status of wetland ecotourism. Therefore, the results support the hypothesis of H3, H4 and H6, but not H5.

To explore the preference heterogeneity among groups after the inclusion of latent variables of tourist satisfaction, in the third method, the LC model was employed. Using the same three-segment equal size method as Method 1, the score of four constructs calculated in Method 2 was assigned as 1, 2, and 3, respectively, on behalf of low, medium and high level. The assigned values of four constructs were incorporated into the LC model.

In order to determine the number of classifications, we compared the information criteria statistics of different segmentations in Table S4, including Bayesian information criteria (BIC), Akaike's information criteria (AIC), AIC with a penalty factor of 3 (AIC3) and consistent AIC (CAIC) (Boxall and Adamowicz 2002; Shoji and Tsuge 2015). Although BIC, AIC3, and CAIC decline until the inclusion of two classes, then increase as more classes are added, the AIC criteria identify the three-class model as the best (lowest AIC). Notice also that the R^2 increases from 0.02 for the standard aggregate (one-class) model to 0.47 for the three-class model, which assesses the percentage variance explained in the dependent variable. Therefore, the three-class model is recommended for analysis.

Figure 4 shows the relative importance of attributes in the three-class model. Of all the respondents, 43.31% are classified as Class 1, 33.68% as Class 2, and 23.01% as Class 3. Class 1 includes the majority of respondents who consider environmental entertainment facility as the preferred attribute, while other attributes are of less relative importance, so named as "entertainment-preferred". Members of Class 2 have a particularly high preference for price attribute, hence called "price-sensitive". In addition, Class 3 members show a higher preference for biodiversity attribute and lower preference for other improvement attributes, thus named as "eco-friendly".

Table 6 reports the estimated results for the three-class model. The utility function of wetland ecotourism management attributes and the class membership function of socioeconomic profile and four latent variables of tourist satisfaction was estimated. The results show considerable heterogeneity in

preferences between groups of wetland ecotourism improvement policies, which supports the hypothesis H2. From the perspective of utility function, only EEF attribute is significantly positive in Class 1, indicating that the members of Class 1 only have a positive tendency to improve environmental education facilities. Only the BIO attribute is significantly positive in Class 3, meaning that the respondents in Class 3 are only willing to improve biodiversity. In Class 2, the price attribute is significantly negative at the 1% level, the NUM attribute is significantly negative at the 5% level, and the EEF attribute is significantly positive at the 10% level. The result indicates that the members of Class 2 have negative expectations of the number of visitors besides price, but at the same time, surprisingly, they are willing to change the status quo of environmental education facilities.

Table 6
Estimation results of latent class model.

Variable	Class 1 Entertainment- preferred	Class 2 Price-sensitive	Class 3 Eco-friendly
Utility function: ecotourism management attributes			
BIO	0.326	-0.141	4.453*
NUM	0.176	-1.057**	0.745
EEF	0.496**	0.633*	2.950
PRICE	-0.111	-1.636***	-0.299
Class membership function: socioeconomic profile and multidimensional tourist satisfaction			
Intercept	-2.531	-0.653	3.183***
Gender	1.065**	-0.217	-0.848*
Age	0.224	0.205**	-0.428***
Education	-0.234	0.107	0.127
Income	0.317	-0.134	-0.183
Job	-0.024	-0.040	-0.016
NRS	-0.032	0.071	-0.039
EGS	-0.547**	0.273	0.274
FS	0.029	-0.211	0.183
TES	0.807***	0.088	-0.895***

Note: ***, **, * ==> Significance at 1%, 5%, 10% level.

The results of the class membership function reflect the individual sources of preference heterogeneity from the aspects of socioeconomic attributes and multidimensional tourist satisfaction. For Class 1, the

statistically significant class membership coefficients indicate that being female, having a lower level of environmental governance satisfaction and a higher level of travel experience satisfaction increase the possibility that the respondents are more inclined to pay attention to the improvement of recreational facilities related to wetland ecotourism. In Class 2, only age is significantly positive, revealing that older respondents are more likely to become members of Class 2. For Class 3, the significantly negative parameters of gender, age and TES indicate that male, young people and respondents with lower level of travel experience satisfaction increase the possibility of becoming members of Class 3 and are more willing to improve the biodiversity attribute related to wetland ecotourism.

Figure 5 depicts a ternary phase diagram of probability means of the three-class model that can be used to locate each class in an informative 2-dimensional barycentric coordinate display. Each vertex of a ternary phase diagram corresponds to a class. The level assignments of each variable in Fig. 5 are described in Table S5. Figure 5 provides more specific information on preference heterogeneity and class membership characteristics between different classes. As showed in the figure, Class 1 respondents wish to add the environmental education information boards and the payment level is high. Female respondents, those over 30 years old, those with a monthly income of more than 5000 RMB, and those who have jobs are more likely to fall into Class 1, as well as those who are more satisfied with the facilities and travel experience. Class 2 members have no desire for improvement other than a decrease in the number of visitors and their WTP is relatively low. Male, respondents with high satisfaction of environmental governance and low satisfaction of facilities have more probability to become the members of Class 2. For Class 3 members, they prefer the option of increasing the number of species by 10%, increasing the number of visitors, and increasing the plants and animals' specimen museums, with the medium payment level. Respondents younger than 30 years old, earning less than 3,000 RMB a month, not working, and having lower satisfaction with natural resources are more likely to fall into Class 3. Unlike the previous results (Birol et al. 2006), education is not clearly differentiated here, so it is not included in the figure. The above results support the hypotheses of H3, H4, H5 and H6, and the four constructs have an influence on the preference heterogeneity among different classes.

Figure 6 shows the marginal WTP of attributes related to wetland ecotourism improvement policies for different classes as calculated by the LC model. The estimates of marginal WTP provide us with the implicit benefits of various variations at the attribute level (Hoyos et al. 2015). The figure turns out that WTP varies a lot from class to class, which also confirms the hypothesis of H2. Eco-friendly members are most willing to pay for wetland ecotourism policy improvements, followed by entertainment-preferred respondents, while price-sensitive respondents are almost unwilling to pay anything for improvements.

5. Discussion And Conclusion

It is theoretically assumed that tourist satisfaction serves as an important motive for the behavioral intention of environmental motivation, such as stated preference and WTP, different findings had been found in the literature. Harrison (1992) believes that the visitors' expressions of natural resources or tourism activities in WTP indicating that they get satisfaction from spending money on entertainment.

The study of Kang et al. (2018) offers proof for a significant relationship between satisfaction and WTP and concludes that the higher the satisfaction, the higher the WTP. However, this finding was not replicated in our previous study (Xu et al. 2020). Therefore, we employed the discrete choice modeling to explore this unobserved preference heterogeneity by digging deeply into the internal causal mechanism. The empirical results confirm the finding that tourist satisfaction is an important motive for improving wetland ecotourism policies. In comparation with the previous studies, this paper is to measure tourist satisfaction as a unidimensional and multidimensional construct respectively, and include it as a standard for population segmentation and latent variables into the evaluation model. The current study not only extends the previous researches on non-market value evaluation and preference motivation in the field of ecotourism, but also proves that adding satisfaction data can provide more effective policies for sustainable development of ecotourism.

A multidimensional scale was designed for wetland ecotourism satisfaction evaluation, which can be applicable to all types of ecotourism. The measurement results of satisfaction show that respondents expressed a high degree of satisfaction with the natural environment of the study area, but relatively low satisfaction with the biodiversity, facilities and services of the scenic spot. The results show that improving biodiversity, recreational facilities and services in ecotourism destination is more likely to meet visitors' expectations (Deng et al. 2002). Therefore, related management attributes and levels are designed to explore tourists' preferences for wetland ecotourism improvement policies.

When the whole sample was segmented according to satisfaction, there was significant preference heterogeneity between groups, and the WTP estimates showed a clear trend that tourists with higher satisfaction are more willing to pay for wetland ecotourism improvement than tourists with lower satisfaction. It confirms the significant effect of satisfaction on the improvement of ecotourism in the choice model research. Consistent with the results of other empirical studies (Kang et al. 2018), it supports the important role of the satisfaction variable as a segmentation criterion and explanatory variable of the choice modeling.

The results of the RPL and LC model further shed light on this inherent causal mechanism, capturing this unobservable preference heterogeneity. When multidimensional satisfaction as latent variable is included in the choice modeling together with socioeconomic attributes, the model fit has been significantly improved. The results show respondents with lower satisfaction on natural resources and environmental governance and those with higher satisfaction on travel experience prefer to improve the present state of wetland ecotourism. It suggests that, unlike previous researches (Kang et al. 2018; León et al. 2015), there is an underlying causal mechanism by which satisfaction affects behavioral intention. Different dimensions of satisfaction have different effects on tourist preferences. The satisfaction with the natural environment and with the travel experience have different effects on the behavioral intention of tourists.

Different with our previous study (Xu et al. 2020), because of the incorporation of multidimensional satisfaction, three endogenous groups with significant preference heterogeneity were obtained in this paper, which was entertainment-preferred, price-sensitive and eco-friendly. Entertainment-preferred

respondents are more willing to increase environmental education information board at a higher level of payment. Female, over 30 years old, with a monthly income of more than 5000 RMB, and employed respondents increase the possibility becoming this type, and they also have a lower level of satisfaction with environmental governance and a higher level of satisfaction with facilities and travel experience. Price-sensitive respondents have negative expectations for ticket prices and the number of tourists, but they had certain expectations for improving environmental education facilities at a relatively lower WTP. Men, elders, and those with higher satisfaction with environmental governance and lower satisfaction with facilities are more likely to fall into this class. Eco-friendly respondents prefer the option of increasing the number of species by 10%, increasing the number of visitors, and increasing the plants and animals' specimen museums, with the medium payment level. Men, young people under the age of 30 years old, those with a monthly income of less than 3,000 RMB and those without a job are more likely to be in this class, and they have a lower level of satisfaction with natural resources and travel experience. Thus, we can conclude that with the incorporation of the latent variables of multidimensional satisfaction, the intra-group and inter-group heterogeneity also increases.

The research results of this paper have vital practical significance for ecotourism industry and public organizations such as protected areas and national parks. Firstly, national and local stakeholders can improve ecotourism products and services to increase the satisfaction of future tourists. This will not only increase the willingness of tourists to pay to improve the status quo of ecotourism, but also increase the loyalty of tourists, such as the willingness to carry out positive word-of-mouth communication and increase the intention of tourists to revisit (Cong 2016). Increasing different aspects of satisfaction also can boost the attractiveness and competitiveness of the destination, including natural resources (biodiversity, air quality, water quality and natural landscape), environmental governance (the local government, the scenic area authority and tourist), infrastructure (roads, traffic, sanitation and entertainment) and tourism experience (the scenic area planning, service, price, economy and experience). Secondly, through the analysis of this paper, the results of the influence of multidimensional satisfaction on preferences also provide ecotourism managers with more comprehensive and specific group member portraits, and more effective information to meet the differentiated needs of tourists. Such preference information could be incorporated into the conceptual framework of ecotourism management strategies and sustainable development strategies.

The research results of this paper provide mixed signals about the practical impact of benefit transfer research. On the one hand, tourist satisfaction, as an important factor affecting preferences and WTP, may play a vital function in including unobservable factors into the evaluation model (McFadden and Train 2000). On the other hand, due to the complexity of the causal mechanism of this effect, it may hinder the simple and effective method of using tourist satisfaction as part of the benefit transfer function during the practice.

The results of this study have new significance for investigating the sources of the significant relationship of satisfaction and preferences and provide a new perspective for future research. More unobservable psychological factors that have not been discussed should be investigated further. In

addition, as visitor preferences may change over time, the cross-sectional data analysis may present problems of heteroscedasticity and consistency. How to solve the limitations of time factors to propose an adaptive ecotourism policy is also a question worth studying.

Declarations

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Conflicts of interest: The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Ethics approval: The field study of this paper has been approved by Zhalong National Nature Reserve Authority of Heilongjiang, and the author is very grateful to them for their help and support in the field study.

Consent to participate: The questionnaire survey was conducted anonymously and the consent of respondents was obtained before the survey.

Consent to publication: Before participating in the survey, all respondents were informed that the survey was for public welfare and the data was only used for scientific research, so the consent of publication was obtained.

Availability of data and material: The datasets used and analyzed during the current study are available from the corresponding author on reasonable request.

Code Availability: The code used in the research are available from the corresponding author on reasonable request.

Author's contribution: In this study, LX proposed the research topic, designed the research methodology and framework, and made the data analysis. She was the major contributor in writing the manuscript. CA contributed to the design of the whole paper, including the research topic and methodology, and also participated in the writing and revision of the manuscript. BL and ZC participated in the preliminary research work, including the issuance and collection of questionnaires, as well as data sorting and analysis. All authors read and approved the final manuscript.

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Figures

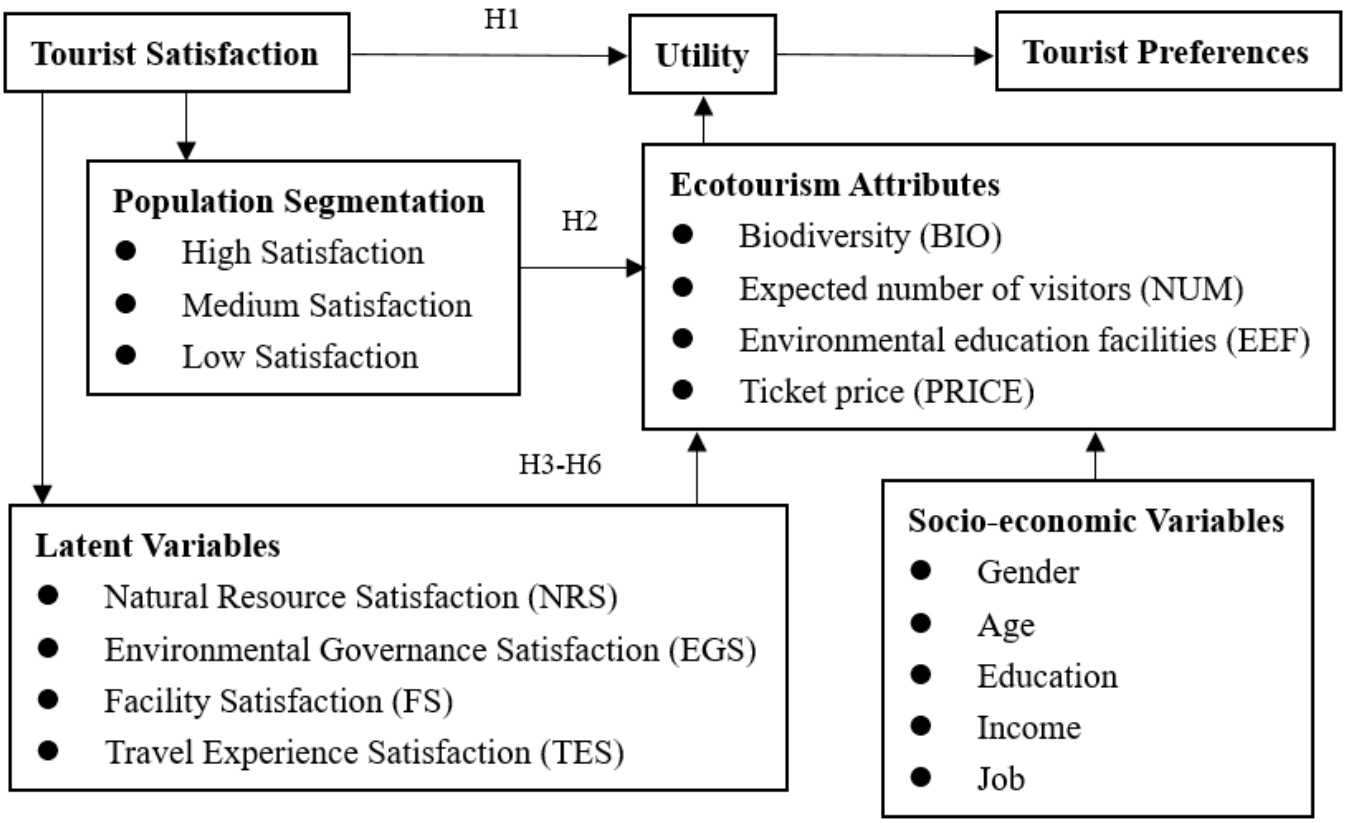

Figure 1

Research framework of discrete choice modeling.

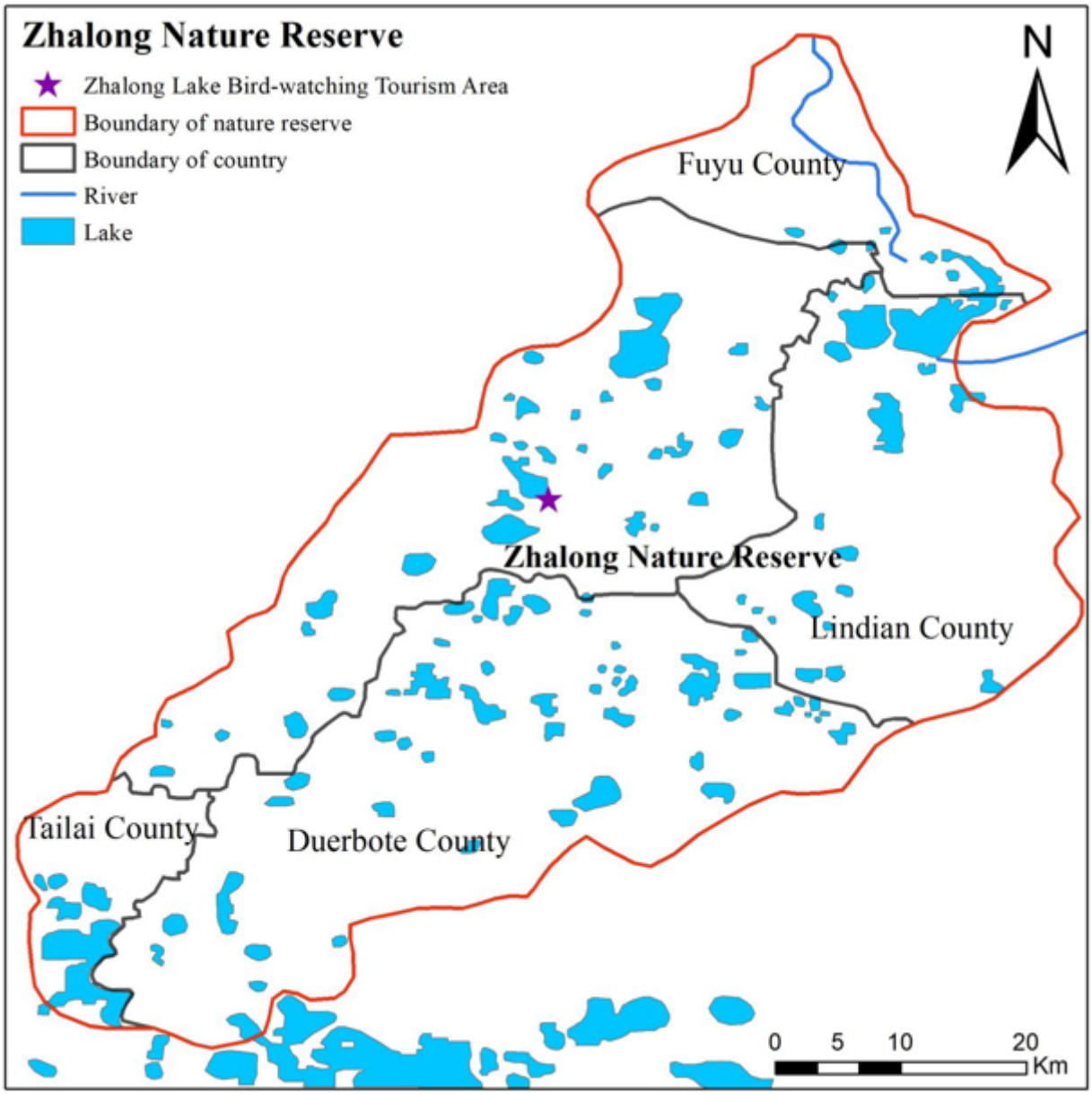

Figure 2

Map of Zhalong National Nature Reserve.

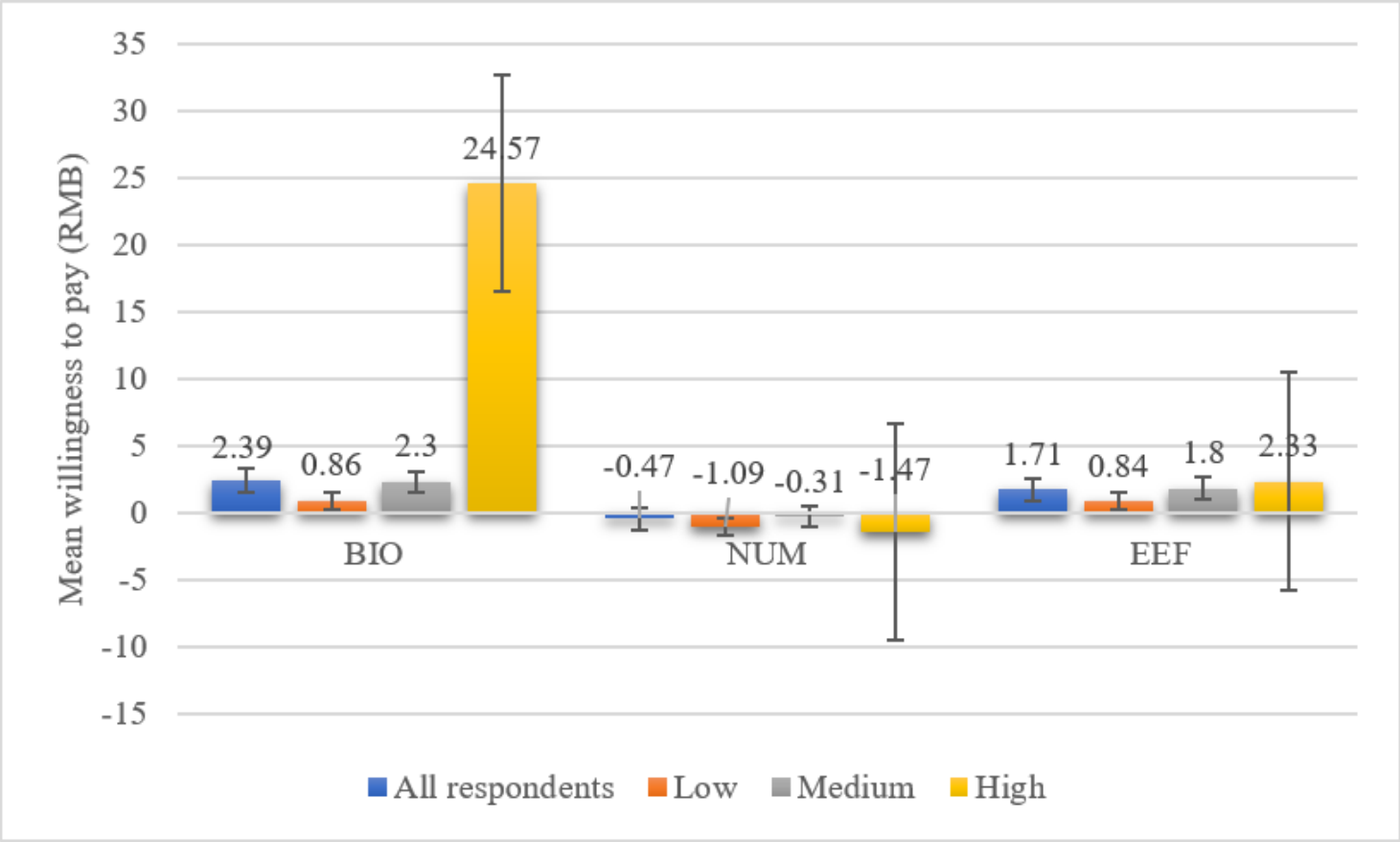

Figure 3

Estimates of mean willingness to pay of three attributes across satisfaction segments.

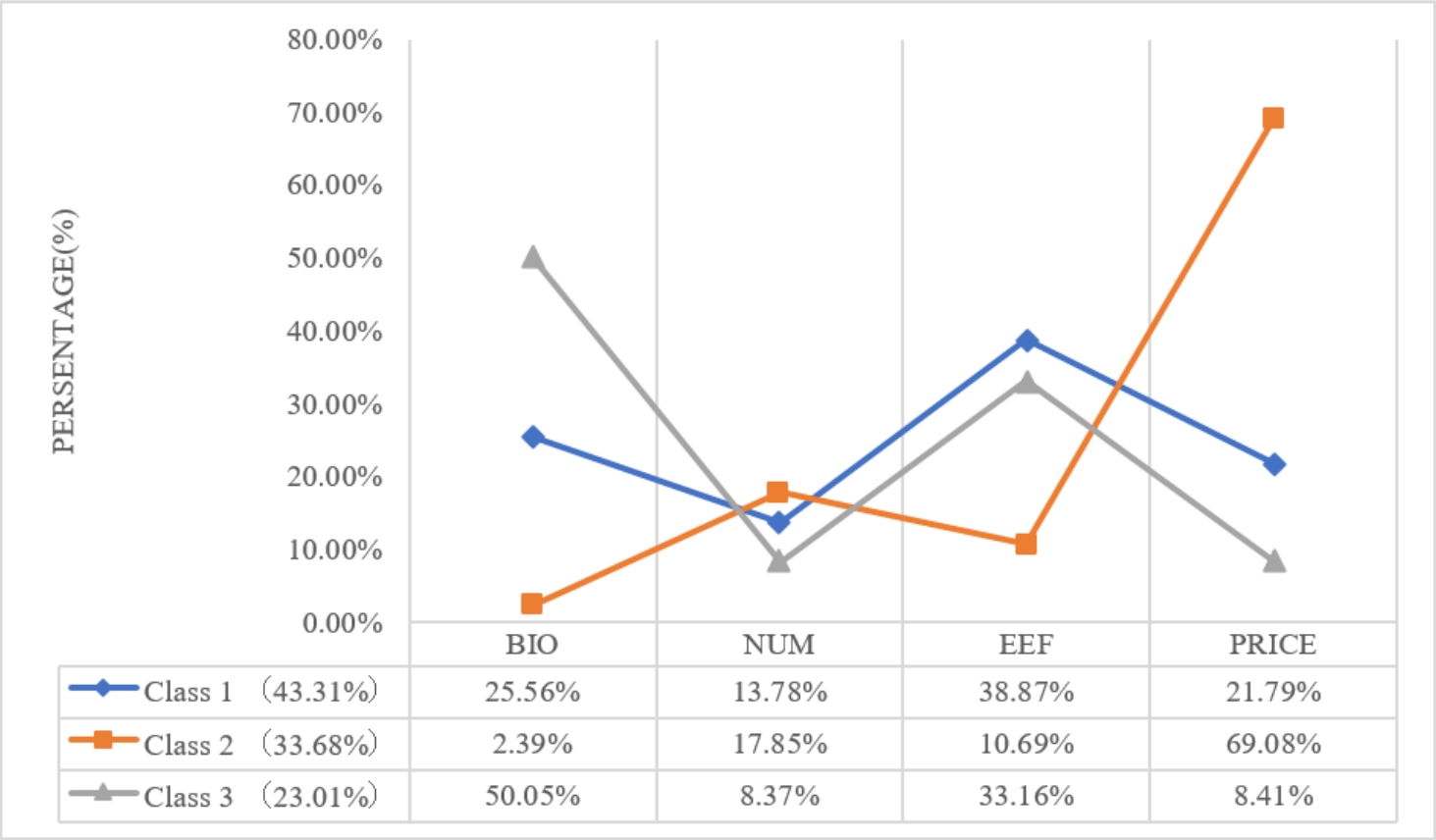

Figure 4

The relative importance of the attributes in three-class model.

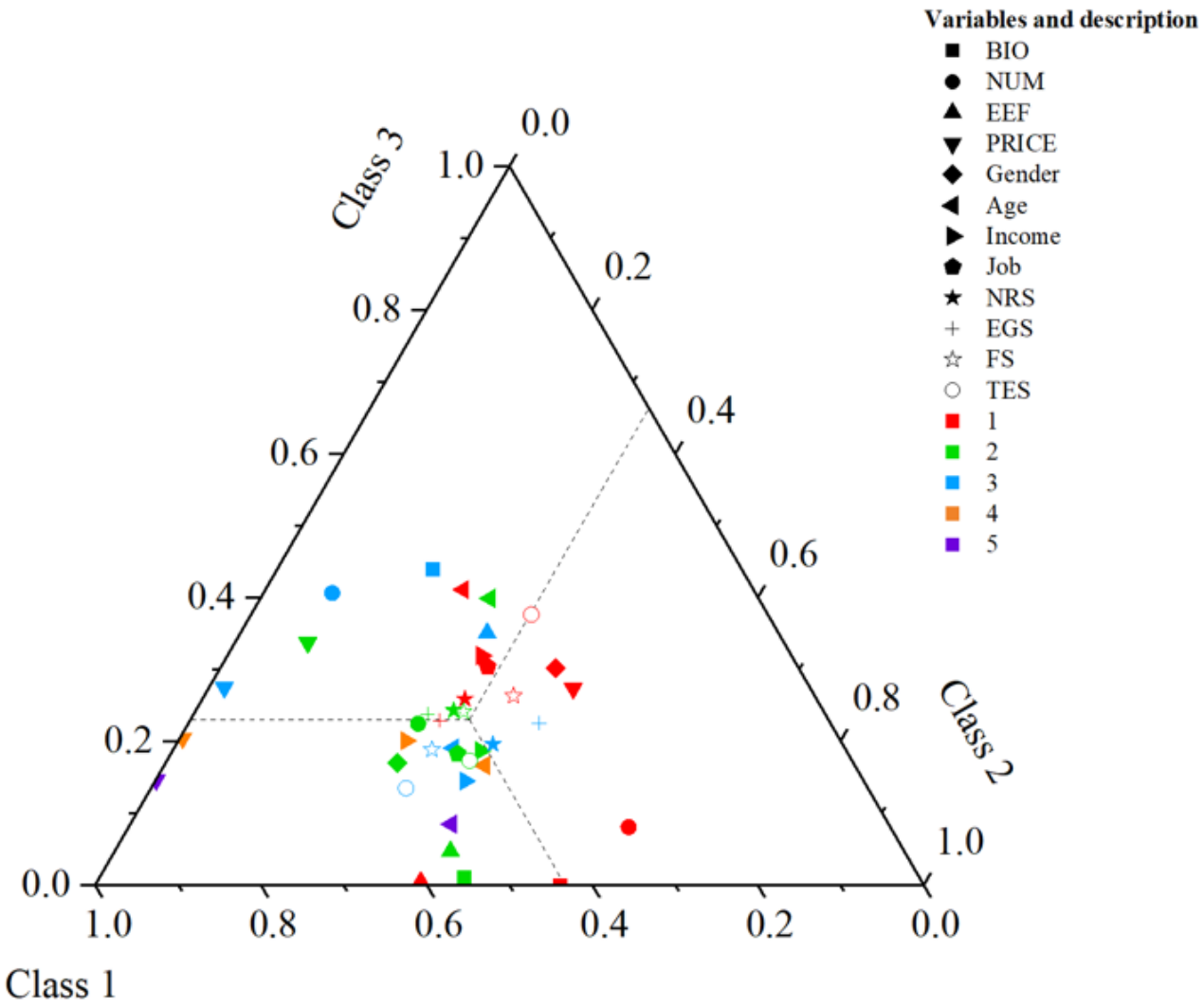

Figure 5

The ternary phase diagram of probability means of three-class model.

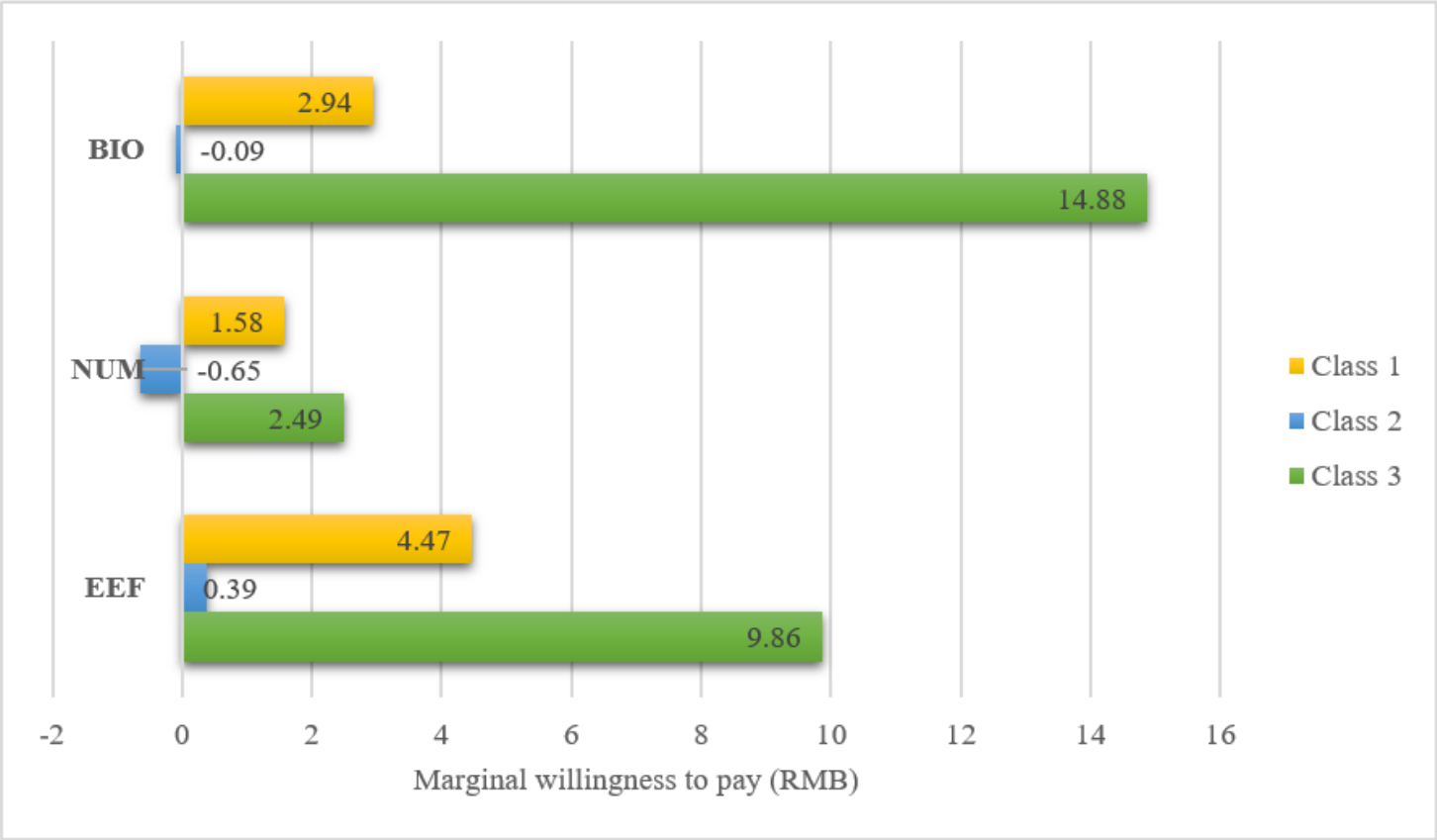

Figure 6

Estimates of marginal willingness to pay of three classes.

Supplementary Files

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