Tourism Management 32 (2011) 1407–1413

Contents lists available at ScienceDirect

Tourism Management

journal homepage: www.elsevier.com/locate/tourman

Representing tourists' heterogeneous choices of destination and travel party with an integrated latent class and nested logit model

Lingling Wu [1], Junyi Zhang*, Akimasa Fujiwara [2]

Graduate School for International Development and Cooperation, Hiroshima University, 1-5-1 Kagamiyama, Higashi-Hiroshima City, 739-8529, Japan

ARTICLE INFO

Article history:
Received 11 April 2010
Accepted 24 January 2011

Keywords:
Destination
Travel party
Heterogeneity
Interdependency
Nested logit model
Latent class model

ABSTRACT

Aiming at a better understanding of heterogeneous interdependencies between destination and travel party choices in tourism, this study attempts to simultaneously represent these two choices by integrating the nested logit model with the latent class modeling approach to accommodate both types of nested model structures together. Empirical analysis confirmed the effectiveness of the developed model, using a data collected from more than 2000 tourists in Japan. It was observed that on average the two types of nested model structures are almost equally shared by samples and the model structures could significantly vary with income level and gender. Influential factors related to choices of destination and travel party were also explored. Concretely speaking, travel time, attractiveness of destination and number of tourism spots were found to be important influential factors in destination choice, and gender, age, marital status have important effects on travel party choice.

1. Introduction

Tourists' travel decisions usually involve a number of choices that are made over time and across space, including choices of destinations, composition of the travel party (with whom they travel with), dates of departure, budgets, choices of accommodation and travel modes, travel routes, activities, dining and retail shopping (Dellaert, Ettema, & Lindh, 1998; Woodside & MacDonald, 1993). Some of the choices are made before travel (e.g., destination and travel party) while others are made during travel (e.g., travel routes, shopping, and on-site activities). Although the above choices can be made at different timings, they may interact with each other. Outcomes of choices that are made first might influence the choices made sequentially. For example, a tourist first chooses a destination and then makes a choice of accommodation considering prices and available rooms of hotels at the destination. Therefore, tourists' choice behavior should be regarded as a multi-stage choice process that consists of a number of separate but interdependent choices. To represent such multi-stage choice behavior, it is important to specify the sequence in which tourism decisions are made regarding different choice dimensions (e.g., destination, composition of the travel party) (Dellaert et al., 1998). However, it is difficult to expect that there is a consistent sequence in which all tourists make such decisions. Existing studies suggest that the sequence of decision making varies among tourists and contexts (Bansal & Eiselt, 2004; Dellaert et al., 1998; Fesenmaier & Jeng, 2000; Hyde, 2004; Hyde & Lawson, 2003; Woodside & King, 2001). Furthermore, the above choices themselves might differ across tourists, i.e., heterogeneity might exist. For example, different tourists might show different responses to the same factor (e.g., the attractiveness of a destination), and this type of heterogeneity can be represented by segmenting the population based on some observed information (e.g., individual attributes like age and gender), or by assuming that parameter of the factor follows a certain probability distribution (e.g., the mixed logit model). In case of choosing two or more behavioral elements (e.g., destination, travel party, travel mode, and accommodation), the nested logit model is applicable; however, if different tourists show different nested choice structures, then it becomes problematic how to specify such nested model structure. Properly representing the behavioral interdependency and heterogeneity is essential to a better understanding of tourists' behavior and can be consequently expected to provide more appropriate insights into tourism marketing and policy decisions. Careful review however suggests a lack of such studies in literature (Zhang, 2010).

With this background, this study attempts to develop a model that incorporates the interdependency between choices of destination and travel party by reflecting heterogeneous choice model structures. Destination and travel party are two important

* Corresponding author. Tel./fax: +81 82 424 6919.
E-mail addresses: wuling1017@gmail.com (L. Wu), zjy@hiroshima-u.ac.jp (J. Zhang), afujiw@hiroshima-u.ac.jp (A. Fujiwara).
[1] Tel./fax: +81 82 424 6919.
[2] Tel./fax: +81 82 424 6921.

0261-5177/$ – see front matter © 2011 Elsevier Ltd. All rights reserved.
doi:10.1016/j.tourman.2011.01.017

elements of tourists' behavior (e.g., Dellaert et al., 1998). A destination choice (or choice of travel party) can be conceptualized as a tourist's selection of a destination (or a type of travel party: e.g., travel alone or travel with other persons) from a set of alternatives. Even though the destination choice (the choice of travel party) could be influenced by various factors (e.g., tourists' individual attributes and attributes of destinations), to represent such choice behavior, the principle of random utility maximization is usually adopted. In other words, it is usually assumed that the tourist chooses the destination (the travel party) that generates the highest level of utility. This study deals with the joint choice of destination and travel party. To represent such joint choice behavior, the nested logit (NL) model could be applied under the principle of random utility maximization, same as the above single-faceted choice behavior. The NL model first groups the choices of destination and travel party into two nests, e.g., the upper level describes the choice of destination and the lower level explains the choice of travel party. And then, the NL model incorporates the interdependency between destination choice and choice of travel party with the help of an inclusive value, which is, in fact, the maximal utility of the alternatives in the choice set of the lower level nest. In reality, there may be existing different nested choice structures among different tourists. To represent such heterogeneous nested choice structures, one could first segment the population into several groups and then build the NL model separately. However, it is difficult to decide what kinds of variables could be used to best segment the population, and the segmentation becomes more difficult if the same tourist shows different nested choice structures depending on choice situations (e.g., the length of holidays, domestic or international travel). In this sense, it is necessary to represent such heterogeneous nested choice structures in a more flexible and convincible way. To this end, this study attempts to integrate the latent class (LC) modeling approach with the NL model in the context of domestic tourism of Japan.

The rest of this paper is organized as follows. Section 2 gives a brief review of relevant existing studies. Section 3 describes how to combine the LC modeling approach with the NL model in order to represent tourists' heterogeneous nested choice structures. The developed model is estimated using a data collected in Japan and model estimation results are discussed in Section 4. Finally, conclusions are summarized along with a discussion about important future research issues in the last section.

2. Review

Tourists' destination choice behavior, one of the targets in this study, has been examined to be influenced by various factors. According to the existing research, these factors can be generally classified into three categories:

1) Decision maker-specific factors: Existing studies confirm that age, gender, marital status, income, education, car ownership and lifestyle have great effects on tourist's destination choice (Ankomah, Crompton, & Baker, 1996; Van Raaij & Francken, 1984). In addition to such objective factors, some studies show that personal values should be used to explain why consumers choose a particular location (Van Raaij & Francken, 1984), and other studies emphasize the importance of travel motivation on destination choice (Hsu, Cai, & Wong, 2007; Kim & Chalip, 2004).
2) Alternative-specific factors: These factors include the attributes of destinations (e.g. attractiveness of destination, tourism resource, facility fare, quality services) and the accessibility of destinations (e.g. available travel mode, travel distance, travel fare) (Ankomah et al., 1996; Awaritefe, 2004; Seddighi & Theocharous, 2002; Van Raaij & Francken, 1984).
3) Situational factors: These factors include weather situations: some studies included weather condition as a constraint factor to influence tourist behavior (Stemerding, Oppewal, & Timmermans, 1999); cultural situations: Kozak (2002) examined different behavior of tourists with different cultural background; social situations: studies conducted by Seddighi, Nuttall, and Theocharous (2001) investigated the impact of political instability on tourists' destination choice; and so on.

It has long been recognized that travel party has a strong influence on tourists' behavior (Chadwick, 1987; Christensen & Yoesting, 1973; Fisher; 2001; McIntosh & Goeldner, 1990; Stewart & Vogt, 1999). For example, Basala and Klenosky (2001) and Philipp (1994) found that there is an association between size of the travel party and content of the vacation plan and revealed that the single tourist has considerable freedom to choose where to travel and what to do, while the larger party, such as a family group, is more constrained in its vacation choices and vacation behavior. Crompton (1981) conducted an interview about tourist's interpersonal association in pleasure vacation, from which he derived four kinds of influence of travel party on individual's selection of a destination. March and Woodside (2005) studied the influence of travel party composition and size on tourist behavior. In their study ANOVA analysis was conducted to investigate the influence of travel party on destination choice, length of stay, spending. Basala and Klenosky (2001) pointed out that preference for choosing a destination could differ according to travel party composition. Presence of children in the travel party cannot be ignored in representing tourists' behavior (Thornton, Shaw, & Williams, 1997). In this sense, size of travel party is sometimes introduced as an explanatory variable into the destination choice model (e.g., Zhang, Qu, & Tang, 2004). Moreover, Woodside and MacDonald (1993), Woodside and Dubelaar (2002), and Beckena and Gnoth (2004) emphasize the interactions among members of a travel party, activities, and related decisions. Dellaert et al. (1998) proposed a conceptual framework to represent and understand multi-faceted tourist travel decisions that involve subsequent choices for different facets of a single trip as well as the constraints that may limit the number of feasible travel alternatives, and empirically identified some interdependencies in the following choice process after deciding to go travel: 1) pre-travel choices (destination, accommodation, travel party, travel mode, departure time for and duration of travel), and 2) during-travel choices (special attractions to visit, travel route to follow, day-to-day expenditure, and rest and food stop locations and timing).

Thus, tourists' behavior is seldom an isolated individual decision and properly representing the interaction between travel party choice and destination choice becomes important. However, existing studies have not presented a satisfactory way to model the above two choice aspects. This study attempts to fill in this gap.

3. Methodology

This study deals with two types of discrete choice behavior at a disaggregate level (i.e., each tourist is treated as the unit of analysis): destination and travel party. To represent such choice behavior, discrete choice models built under the principle of random utility maximization have been widely applied (e.g., Crouch & Louviere, 2004; Haider & Ewing, 1990; Huybers, 2003). To jointly describe the choices of two or more behavioral elements, the nested logit (NL) model (Ben-Akiva & Lerman, 1985) has been often applied to logically incorporate the interdependency among the behavioral elements with the help of expected maximal utility (also called logsum variable or inclusive value) (e.g., Eymann &

Ronning, 1992; Hong, Kim, Jang, & Lee, 2006; Seddighi & Theocharous, 2002). The NL model can be used to represent the choices of destination and travel party in two ways, depending on how to allocate the choice of travel party (or destination) to either upper or lower level. Equation (1) shows one type of the NL model, where destination choice is allocated at the upper level influenced by the choice of travel party, and Equation (2) shows the other NL model, which has an inverse model structure where travel party choice is assumed to be influenced by destination choice.

$$P_{njg} = P_n(j)P_n(g|j), \quad P_n(j) = \frac{\exp(V_{nj} + \theta_j \Gamma_{njg})}{\sum_{j'} \exp\left(V_{nj'} + \theta_{j'} \Gamma_{nj'g}\right)} \tag{1}$$

$$P_{ngj} = P_n(g)P_n(j|g), \quad P_n(g) = \frac{\exp(V_{ng} + \theta_g \Gamma_{ngj})}{\sum_{g'} \exp(V_{ng'} + \theta_{g'} \Gamma_{ng'j})} \tag{2}$$

$$\Gamma_{njg} = \sum_g \exp(V_{ng}) \tag{3}$$

$$\Gamma_{ngj} = \sum_j \exp(V_{nj}) \tag{4}$$

where n: a tourist, j (j'): an alternative of destination choice, g (g'): an alternative of travel party choice, V_{nj}: the utility of destination j for tourist n, V_{ng}: the utility of travel party g for tourist n, Γ_{njg}: the expected maximal utility of travel party choice (i.e., logsum variable), Γ_{ngj}: the expected maximal utility of destination choice (i.e., logsum variable), θ_j: a parameter to capture the expected influence of travel party choice on destination choice, θ_g: a parameter to capture the expected influence of destination choice on travel party choice.

It is usually suggested to check whether the parameter θ_j or θ_g is located in the interval (0, 1) or not in order to meet the principle of random utility maximization. However, in reality, specifying the destination choice as upper level and the travel party choice as lower level might be suitable for some tourists while the opposite model structure might be more appropriate for the other tourists. To explicitly accommodate such heterogeneous interdependency between travel party choice and destination choice, we propose to apply latent class modeling approach (e.g., Swait & Sweeney, 2000; Zenor & Srivastava, 1993) to simultaneously represent the above two types of nested logit structure within the same modeling framework.

For choices of destination and travel party, there are only two possible nested logit model structures, one in Equation (1) and the other in Equation (2). Assume the probability that each tourist n belongs to each type of nested logit structure is equal to H_{ns}. Here, each type of model structure corresponds to each latent class. Since the probability of a certain alternative (either destination or travel party) for each latent class can be defined as L_{n1} and L_{n2}, respectively, it is straightforward that the resulting log-likelihood function can be represented like the way in Equation (5). Here, the probability of a certain alternative for each latent class is defined in the way of likelihood (see Equation (6)) because it is unknown to analysts which alternative will be chosen or not in advance.

$$LnL = \sum_n \ln(H_{n1}L_{n1} + H_{n2}L_{n2}) \tag{5}$$

$$L_{n1} = \prod\nolimits_{j,g} (P_{njg})^{\delta_{njg}}, \quad L_{n2} = \prod\nolimits_{g,j} (P_{ngj})^{\delta_{ngj}} \tag{6}$$

$$H_{n1} = 1 \Big/ \left(1 + \exp\left(\sum_k \gamma_k z_{nk}\right)\right), \quad H_{n2} = 1 - H_{n1} \tag{7}$$

where, H_{ns} is the membership probability that individual n belongs to latent class s (s = 1, 2), and each latent class corresponds to a specific nested choice structure; z_{nk} denotes the kth observed attribute to explain each class with parameterγ_{sk}; P_{nig} and P_{ngj} correspond to Equation (1) and Equation (2) respectively; δ_{njg} and δ_{ngj} are dummy variables being equal to 1 when the combination of alternative g or j is chosen, and 0 otherwise.

The above latent class model with destination choice and travel party choice can be estimated using the Expectation–Maximum (EM) algorithm and the Bayes' Theorem. The Expectation–Maximization (EM) algorithm is a method for getting maximum likelihood estimates of parameters in models which include unobserved latent variables. EM algorithm comprises two steps: the expectation (E) step computes the expectation of the log-likelihood evaluated using the current estimate for the latent variables; and the maximization (M) step computes parameters maximizing the expected log-likelihood found on the (E) step. Both the (E) step and (M) step are repeated until convergence. Let $R_{ns} = 1$ if tourist n belongs to latent class s, and $R_{ns} = 0$ otherwise. The following log-likelihood function is used to estimate the model.

$$\ln L(t) = \sum_n \sum_s R_{ns}(t) \ln H_{ns}(t) + \sum_n \sum_s R_{ns}(t) \ln(L_{ns}(t)) \tag{8}$$

Using Bayes' Theorem, the $R_{ns}(t)$ at the tth iteration is calculated using the postetior probability $r_{ns}(t{-}1)$:

$$R_{ns}(t) = \begin{cases} 1 & r_{ns}(t-1) \geq \max(r_{ns}(t-1)| \; s' \neq s) \\ 0 & \text{otherwise} \end{cases} \tag{9}$$

$$r_{nq}(t-1) = \frac{\widehat{H}_{ns}(t-1)\widehat{L}_{ns}(t-1)}{\sum_{s'} \widehat{H}_{ns'}(t-1)\widehat{L}_{ns'}(t-1)} \tag{10}$$

where $H_{ns}(t{-}1)$, $L_{ns}(t{-}1)$ are the latent class membership probability and the likelihood under class s, estimated using the parameters at the t-1th iteration.

4. Model estimation and results

4.1. Data

The data used in this study was collected at 29 major tourism destinations in Kyusyu, Chugoku and Shikoku regions of Japan in the summer of 2002 based on a face-to-face interview. To guarantee the population representative of the collected samples, respondents were randomly selected at each destination in proportion to the number of visitors during the survey season at each destination zone, reported by official governmental information sources. Since each respondent had to answer the detailed travel activity information (e.g., travel mode, accommodation, time use and expenditure, etc.), subjective evaluations of several destinations, as well as personal travel preference and experience and the other individual attributes, questionnaire sheet became lengthy. To encourage the participation, 1000 Japanese Yen was provided to each respondent as incentive. As a result, about 2500 questionnaires were obtained, including the data of individual characteristics and travel-related attributes. Individual characteristics include gender, age, occupation, annual income, and marital status, etc. while travel-related attributes include destination, travel party, travel mode, and duration of stay, etc. Eliminating missing data, 2050 questionnaires were used in this study. In this study a destination refers to the main destination that a tourist chooses to visit during a single travel. In total, the choice set of destinations consists of 14 zones, where each zone includes one or two prefectures. Travel party is divided into three categories: travel alone, travel with family members, and travel with friends and others. The data characteristics are summarized in Table 1. It is observed that "travel alone" accounted for 15.1%, "travel with family members" 53.0%, and "travel with friends and others" 31.9%. The top three of the most visited destinations were zone 8 (Fukuoka: 15.4%), zone1 0 (Nagasaki: 12.4%), and zone 11 (Kumamoto: 10.7%), which are all located in Kyusyu region. And, 66.9% of tourists traveled by car.

4.2. Selection of explanatory variables and model performance

Based on a preliminary correlation analysis, travel time from home to destination, attractiveness of destination (number of visitors per year), and number of tourist spots were selected as the explanatory variables to describe the choices of the 14 zones. Gender, age, and marital status were selected to explain the choice of travel party. Since existing studies show that individuals' socio-demographic attributes are influential to latent class membership probability (Bucklin & Gupta, 1992; Gupta & Chintagunta, 1994), this study adopts gender, age, income and marital status to define the latent class membership probability using the above-mentioned correlation analysis (see Table 2).

Estimation results of the developed model are presented in Table 3. One can see that parameters of most of the explanatory variables are statistically significant at 90% or 95% level (practically, 95% level is often adopted; however, since this is a case study and we want to find more potentially significant factors, 90% level is also used in this study). Model accuracy (i.e., McFadden's Rho-squared is 0.102) is not so high but good enough to show the effectiveness of the proposed model.

4.3. Membership probabilities

Income and gender have a significant effect on the membership probability at 90% and 95% level, respectively. The negative sign of parameter for income level indicates that tourists with higher income level tend to decide their destination by considering the existence of travel party (latent class 1) while the low-income tourists tend to decide their travel parties conditional on the destination choice (latent class 2). The positive sign of parameter for gender indicates that female tourists are more likely to belong to class 2. Thus, the statistical significances of these parameters suggest that there are surely two types of the nested choice structures between the choices of destination and travel party.

In order to estimate the membership probabilities, it is necessary to fix all the parameters (γ_{sk}) to zero for a pre-specified latent class (class 1 in this case: see Equation (7)). It is shown that on average 49% of the samples have higher membership probabilities belonging to latent class 1 (upper level: destination; lower level: travel party) and 51% have higher membership probabilities belonging to latent class 2 (upper level: travel party, lower level: destination). This confirms heterogeneous nested choice structures among different tourists. In other words, it is inappropriate to apply one structure to the whole population. Fig. 1 gives the distribution of membership probabilities belonging to latent class 1, where two types of distributions are shown together for ease of understanding: original membership probabilities and sample shares. For membership probabilities belonging to latent class 1, 10% of samples have the values of 30%–40%, 40% of samples have the values of 40%–50%, 31% of samples have the values of 50%–60%, and 19% of samples have the values of 60%–70%. Note that membership probabilities less than 30% or larger than 70% are not observed in samples. This may be because they do not have extreme tendency towards each latent class (i.e. they do not belong to each latent class at very high probability), which can further confirm the necessity to adopt the proposed model in this case.

Table 1
Summary of data characteristics.

	Percentage
Individual characteristic	
Gender	
Male	51.4
Female	48.6
Age	
Young (<30)	33.7
Middle (30–50)	46.1
Old (>50)	20.2
Occupation	
Employee	62.9
Student	12.5
Housewife	18.2
Other	6.4
Household composition	
Single	35.7
Married and without child	16.9
Married and with child	47.4
Annual income	
<4 million yen	58.6
4–10 million yen	25.1
>10 million yen	16.3
Trip characteristic	
Travel mode	
Public transportation	33.1
Private car	66.9
Travel party	
Alone	15.1
With family members	53.0
With friends and others	31.9
Destination	
Zone 1 (Okayama Prefecture)	3.6
Zone 2 (Hiroshima Prefecture)	7.2
Zone 3 (Tottori and Shimane Prefectures)	5.1
Zone 4 (Yamaguchi Prefecture)	5.8
Zone 5 (Kagawa & Tokushima Prefectures)	5.5
Zone 6 (Ehime Prefecture)	5.7
Zone 7 (Kochi Prefecture)	5.1
Zone 8 (Fukuoka Prefecture)	15.4
Zone 9 (Saga Prefecture)	4.7
Zone 10 (Nagasaki Prefecture)	12.4
Zone 11 (Kumamoto Prefecture)	10.7
Zone 12 (Kagoshima Prefecture)	4.6
Zone 13 (Miyazaki Prefecture)	5.5
Zone 14 (Oita Prefecture)	8.7

Table 2
Explanatory variables.

Explanatory variables	Description
Individual and household socio–demographics	
Gender (dummy variable)	1 if an individual is female, 0 otherwise
Age (dummy variable)	1 if an individual is younger than 30, 0 otherwise
Income (million yen)	Annual income (not categorized)
Marital status (dummy variable)	1 if married, 0 otherwise
Travel-related attributes (all the continuous variable)	
Travel time (minutes)	Travel time from home to destination
Attractiveness of destination	Number of tourists to destination per year (million/year)
Number of tourist spots	Number of tourism spots in destination

Table 3
Model estimation results.

Explanatory variable	Latent class 1		Latent class 2	
	Parameter		Parameter	
Variable for membership probability: Equation (5)				
Income (million yen)			−0.041	*
Age (1, <30; 0, otherwise)			−0.051	
Gender (male = 0,female = 1)			0.215	**
Marital status (single = 0, married = 1)			0.013	
Destination Choice				
Travel time (minute)	−0.005	**	−0.005	**
Attractiveness of destination (tourists/year)	0.122	**	0.136	**
Number of tourism spots	0.164	**	0.109	**
Inclusive value for destination choice (Zone 1 "Okayama" serves as a reference)				
Zone 2 (Hiroshima Prefecture)	0.168	* (**)		
Zone 3 (Tottori and Shimane Prefectures)	0.037	(**)		
Zone 4 (Yamaguchi Prefecture)	0.209	**(**)		
Zone 5 (Kagawa & Tokushima Prefectures)	0.159	* (**)		
Zone 6 (Ehime Prefecture)	0.147	(**)		
Zone 7 (Kochi Prefecture)	0.171	*(**)		
Zone 8 (Fukuoka Prefecture)	0.174	(**)		
Zone 9 (Saga Prefecture)	0.072	(**)		
Zone 10 (Nagasaki Prefecture)	0.426	**(**)		
Zone 11 (Kumamoto Prefecture)	0.298	**(**)		
Zone 12 (Kagoshima Prefecture)	0.008	(**)		
Zone 13 (Miyazaki Prefecture)	0.236	**(**)		
Zone 14 (Oita Prefecture)	0.226	**(**)		
Travel party choice				
Travel with family				
Constant	−0.619	*	−2.211	**
Gender (male = 0,female = 1)	0.675	**	0.831	**
Age (1, <30; 0, otherwise)	−0.282	**	−0.294	**
Marital status (single = 0, married = 1)	3.757	**	3.884	**
Travel with friends				
Constant	0.976	**	−0.298	
Gender (male = 0,female = 1)	0.790	**	0.841	**
Age (1, <30; 0, otherwise)	−0.238	**	−0.241	**
Marital status (single = 0, married = 1)	0.165		0.269	
Inclusive value for travel party choice ("travel alone" serves as a reference)				
Travel with family members			0.521	
Travel with friends and others			0.424	(*)
Latent class membership probability	49.3%		50.7%	
Sample size	2050			
Initial log-likelihood	−9083.17			
Converged log-likelihood	−8157.91			
McFadden's Rho-squared	0.102			

* Significant at the 90% level, ** significant at the 95% level.
Inside the parenthesis: null hypothesis "parameter = 1".
Outside the parenthesis: null hypothesis "parameter = 0".

4.4. Heterogeneous influences between choice behaviors

The parameter θ in Equation (1) or Equation (2) is used to capture the interdependencies between destination choice and travel party choice. The estimated parameters θ are all located between 0 and 1, and especially most of the parameters are statistically different from both 0 and 1 at the 90% or 95% level. When $\theta = 0$, it is suggested that choice of destination and choice of travel party are independent; in contrast, when $\theta = 1$, it is suggested that using the multinomial logit model is enough to represent the joint choice of destination and travel party. These statistical test results suggest that the NL model is applicable to both latent classes. Larger values of these parameters suggest the larger influence of the choice behavior at lower level on that at upper level and decreasing substitution among alternatives in the nest. The estimated parameters for destination choice suggest that tourists' choices of some destinations are influenced more strongly by the travel party choice. Taking the Nagasaki prefecture (Zone 10) as an example, the parameter is 0.426, which is the highest, indicating that the choice of this destination is most influenced by travel party choice and travel party choice conditioned on this destination shows weaker substitution. In other words, the change in the utility of an alternative in travel party choice under this nest could change the probability of the nest being chosen more dramatically. In contrast, choices of some other destinations such as Saga Prefectures of (Zone 9) and Kagoshima Prefecture (Zone 12) are less influenced by travel party choice. In terms of travel party choice, these estimated parameters shows that "travel with family members" and "travel with friends and others" is more influenced by the destination choice than "travel alone" and destination choice conditioned on choice of "travel with family" and "travel with friends" show weaker substitution, suggesting that tourists tend to travel to certain kind of destination when they choose to travel with family or with friends and others. The part of reason might be that tourists would like to visit destination which is suitable for group traveling (e.g. destinations where they can enjoy group activities such as camping) when they travel with family or with friends and others.

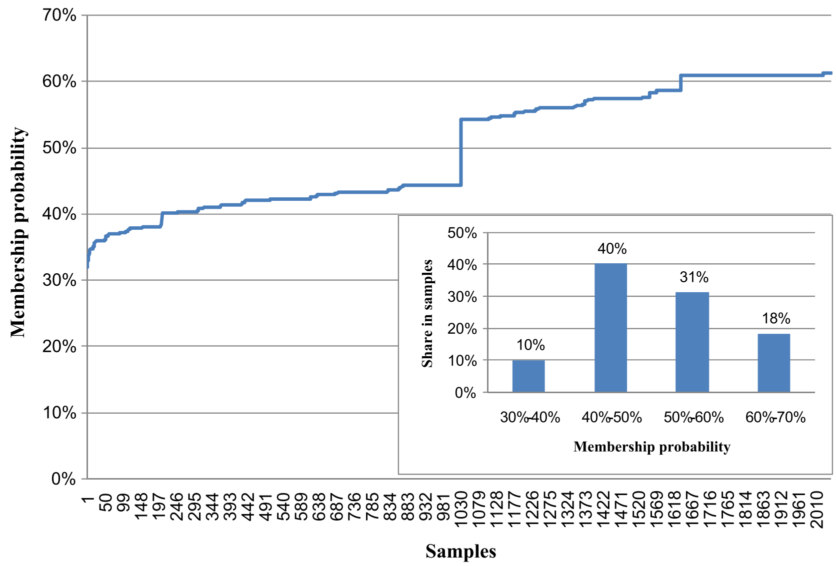
4.5. Influential factors to choices of destination and travel party

The results also confirm the impacts of tourists' individual characteristics and trip characteristics on destination choice and travel party choice. All of the explanatory variables included in the destination choice model have statistically significant parameters at 95% level. The negative sign of parameter for travel time indicates that the increase of travel time to a destination will reduce the probability of choosing the destination. The positive signs of attractiveness of destination and number of tourist spots mean that tourists tend to visit destinations which are popular (more visitors) and have more tourist spots. In term of travel party choice, the positive signs of gender and marital status indicate that female and married people are more likely to travel with family members and with friends and others. The negative sign of age indicates that young people are more likely to travel alone.

To further understand the influence of each variable, the proportion of variance for each explanatory variable in the total variance of the utility (excluding the influence of unobserved factors, i.e., the error term) is calculated as follows.

$$\text{Proportion of variance } (\%) = \frac{\operatorname{var}\left(\beta_k x_{ijk}\right)}{\operatorname{var}\left(\sum_k \beta_k x_{ijk}\right)} = \frac{\beta_k^2 \operatorname{var}\left(x_{ijk}\right)}{\sum_k \beta_k^2 \operatorname{var}\left(x_{ijk}\right)} \tag{11}$$

The variance proportions for the two classes are shown in Table 4. It is revealed that the most influential factor in destination choice is travel time, which accounts for almost 50% of the total variance. This indicates that the change of travel time will have important impact on destination choice. The second and third influential factors are attraction and number of spots, respectively. In terms of travel party choice, the most influential factor is marriage status for the choice of traveling with family, which accounts for more than 90% of the total variance. It is straightforward that the choice of traveling with family is influenced by tourist's marriage status to a great extent. For the choice of traveling with friends, the most influential factor is gender.



Note: Membership probabilities less than 30% or larger than 70% are not observed in samples.

Fig. 1. Distribution of membership probabilities belonging to latent class 1.

Table 4
Proportions of variances explained by explanatory variables.

Explanatory variable	Variables proportion	
	Class 1	Class 2
Destination choice		
Travel time (min)	48.2%	49.9%
Attraction (number of tourist per year)	31.6%	40.0%
Number of spots	20.2%	10.1%
Travel party choice		
Travel with family		
Gender(male = 0,female = 1)	3.2%	4.4%
Age	4.4%	4.4%
Marriage status(single = 0, married = 1)	92.4%	91.2%
Travel with friends		
Gender(male = 0,female = 1)	56.5%	58.5%
Age	41.2%	36.1%
Marriage status(single = 0, married = 1)	2.3%	5.4%

5. Conclusions

There are various interdependencies existing in tourist behavior due to the influences of various constraints and tourists' preferences. Such interdependencies might be different across tourists. Focusing on the choice interdependence between travel party and destination, this study has attempted to represent the heterogeneous nested choice structure involved in the choices of these two decision aspects by combining the latent class and the nested logit modeling approaches. Using a data collected from 2050 tourists in Japan, the effectiveness of the developed model was first confirmed. Statistical significances of the parameters used to explain the latent classes and the nested model structure suggest that there are surely heterogeneous interdependencies between choices of destination and travel party, which are represented by two types of the nested choice structures. It is observed that the nested choice structure could significantly differ across income level and gender. In this case study, it was confirmed that on average the two types of the nested choice structures are almost shared equally by the samples. These results support our developed model. The theoretical contribution of this study is to develop an additional modeling approach that can represent tourists' heterogeneous choice behavior. Even though we applied the approach to deal with choices of destination and travel party, it could be also applicable to other choice contexts. The observed findings about heterogeneous interdependencies between choices of destination and travel party have important practical implications. For example, the proposed modeling approach could helpful to policy makers to quantitatively evaluate the effects of tourism policies or marketing activities on tourist choice behavior in advance in a more convincible way, and it is also suggested that segmentation in tourism marketing should be done by focusing on not only tourists' individual attributes, but also their interrelated choice behaviors.

There are some unsolved research issues. First, this study adopted a linear function to examine the influences of explanatory variables. Some non-linear functions should be applied to describe both non-linearity and inter-variable interactions. Second, some simulations could be conducted to predict the changes in tourist behavior that would occur due to the changes in travel style and socio-economic situations and to explore what kinds of destination management policies could effectively support the stable growth of tourism demand. Thirdly, the developed modeling approach should be extended to cover more decision aspects of tourist behavior, and it is also necessary to build a model system, into which all the relevant choice aspects are rationally and systematically incorporated. Finally, the generalization of the proposed model should be tested by explicitly incorporating the influence of cultural factors. For example, the model should be compared between domestic and international tourists, and cross-national comparisons should be done to clarify whether the same set of attributes used in this study could be usable in other cultural contexts or not.

Acknowledgement

We would like to express our appreciation to the Kyusyu Regional Development Bureau, Ministry of Land, Infrastructure, Transport and Tourism, Japan for it's providing the survey data.

References

Ankomah, P. K., Crompton, J. L., & Baker, D. (1996). Influence of cognitive distance in vocation choice. *Annals of Tourism Research, 23*(1), 138–150.

Awaritefe, O. D. (2004). Motivation and other considerations in tourist destination choice: a case study of Nigeria. *Tourism Geographies, 6*(3), 303–330.

Bansal, H., & Eiselt, H. (2004). Exploratory research of tourist motivations and planning. *Tourism Management, 25*(3), 387–396.

Basala, S. L., & Klenosky, D. B. (2001). Travel-style preference for visiting a novel destination: a conjoint investigation across the novelty–familiarity continuum. *Journal of Travel Research, 40*(2), 172–182.

Beckena, S., & Gnoth, J. (2004). Tourist consumption systems among overseas visitors: reporting on American, German, and Australian visitors to New Zealand. *Tourism Management, 25*(3), 375–385.

Ben-Akiva, M., & Lerman, S. R. (1985). *Discrete choice analysis: Theory and application to travel demand*. Cambridge, MA: The MIT Press.

Bucklin, R. E., & Gupta, S. (1992). Brand choice, purchase incidence, and segmentation: an integrated modeling approach. *Journal of Marketing Research, 29*(2), 201–215.

Chadwick, R. A. (1987). Concepts, definitions, and measures used in travel and tourism research. In J. R. Brent Ritchie, & C. R. Goeldner (Eds.), *Travel, tourism and hospitality research* (pp. 65–80). New York: John Wiley.

Christensen, J. E., & Yoesting, D. R. (1973). Social and attitudinal variants in high and low use of outdoor recreational facilities. *Journal of Leisure Research, 5*, 6–15.

Crompton, J. L. (1981). Dimensions of the social group role in pleasure vacations. *Annals of Tourism Research, 8*(4), 550–568.

Crouch, G., & Louviere, J. (2004). The determinants of convention site selection: a logistic choice model from experimental data. *Journal of Travel Research, 43*(2), 118–130.

Dellaert, B. G. C., Ettema, D. F., & Lindh, C. (1998). Multi-faceted tourist travel decisions: a constraint-based conceptual framework to describe tourists' sequential choices of travel components. *Tourism Management, 19*(4), 313–320.

Eymann, A., & Ronning, G. (1992). Discrete choice analysis of foreign travel demand. In H. J. Vosgerau (Ed.), *European integration in the world economy. Studies in international economics and institutions*. Berlin: Springer.

Fesenmaier, D., & Jeng, J. (2000). Assessing structure in the pleasure trip planning process. *Tourism Analysis, 5*, 13–27.

Fisher, R. J. (2001). The role of collaboration in consumers' in-store decisions. *Advance in Consumer Research, 28*, 251.

Gupta, S., & Chintagunta, P. K. (1994). On using demographic variables to determine segment membership in logit mixture models. *Journal of Marketing Research, 31*(1), 128–136.

Haider, W., & Ewing, G. O. (1990). A model of tourist choices of hypothetical Caribbean destinations. *Leisure Sciences, 12*, 33–47.

Hong, S. K., Kim, J. H., Jang, H., & Lee, S. (2006). The roles of categorization, affective image and constraints on destination choice: an application of the NMNL model. *Tourism Management, 27*(5), 750–761.

Hsu, C., Cai, L., & Wong, K. (2007). A model of senior tourism motivations-anecdotes from Beijing and Shanghai. *Tourism Management, 28*(5), 1262–1273.

Huybers, T. (2003). Domestic tourism destination choices: a choice modeling analysis. *International Journal of Tourism Research, 5*, 445–459.

Hyde, K. (2004). A duality in vacation decision making. *Tourism Analysis, 8*(2–4), 183–186.

Hyde, K., & Lawson, R. (2003). The nature of independent travel. *Journal of Travel Research, 42*(1), 13–23.

Kim, N., & Chalip, L. (2004). Why travel to the FIFA World Cup? Effects of motives, background, interest, and constraints. *Tourism Management, 25*(6), 695–707.

Kozak, M. (2002). Comparative analysis of tourist motivations by nationality and destinations. *Tourism Management, 23*(3), 221–232.

March, R., & Woodside, A. G. (2005). *Tourism behaviour: Travellers' decisions and actions*. Wallingford: CABI Publishing.

McIntosh, R. W., & Goeldner, C. R. (1990). *Tourism: Principles, practice, philosophies*. New York: John Wiley.

Philipp, S. (1994). Race and tourism choice: a legacy of discrimination? *Annals of Tourism Research, 21*(3), 479–488.

Seddighi, H. R., Nuttall, M. W., & Theocharous, A. L. (2001). Does cultural background of tourists influence the destination choice? An empirical study with special reference to political instability. *Tourism Management, 22*(2), 181–191.

Seddighi, H. R., & Theocharous, A. L. (2002). A model of tourism destination choice: a theoretical and empirical analysis. *Tourism Management, 23*(3), 475–487.

Stemerding, M., Oppewal, H., & Timmermans, H. (1999). A constraints-induced model of park choice. *Leisure Sciences, 21*, 145–158.

Stewart, S. I., & Vogt, C. A. (1999). A case-based approach to understanding vacation planning. *Leisure Sciences, 21*, 79–95.

Swait, J., & Sweeney, J. C. (2000). Perceived value and its impact on choice behaviour in a retail setting. *Journal of Retailing and Consumer Services, 7*(2), 77–88.

Thornton, P. R., Shaw, G., & Williams, A. M. (1997). Tourist group holiday decision-making and behaviour: the influence of children. *Tourism Management, 18*(5), 287–297.

Van Raaij, W. F., & Francken, D. A. (1984). Vocation destinations, activities and satisfactions. *Annals of Tourism Research, 11*(1), 101–112.

Woodside, A. G., & Dubelaar, C. (2002). A general theory of tourism consumption systems: a conceptual framework and an empirical exploration,. *Journal of Travel Research, 41*, 120–132.

Woodside, A. G., & King, R. (2001). An updated model of travel and tourism purchase–consumption systems. *Journal of Travel & Tourism Marketing, 10*(1), 3–27.

Woodside, A. G., & MacDonald, R. (1993). General systems framework for customer choice processes of tourism services. In R. Gasser, & K. Weiermair (Eds.), *Spoilt for choice: Decision making processes and preference changes of tourists*. Thaur, Germany: Kultur Verlag.

Zenor, M. J., & Srivastava, R. (1993). Inferring market structure with aggregate data: a latent segment logit approach. *Journal of Marking Research, 30*, 369–379.

Zhang, J. (22–23 January 2010). *Tourist behavior analysis: A review. Keynote speech at the first international conference on the future of human mobility*. Phuket, Thailand: Thai Society for Transportation and Traffic Studies.

Zhang, H. Q., Qu, H., & Tang, V. M. Y. (2004). A case study of Hong Kong residents' outbound leisure travel. *Tourism Management, 25*(2), 267–273.