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Dealing with Attributes Non-Attendance in a Discrete Choice Experiment on Valuation of Tourist Facilities Attribute in Kenyir Lake, Malaysia

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ABSTRACT

Accounting for ignored attributes, or attribute non-attendance (ANA), in discrete choice experiment (DCE) is believed to produce more reliable willingness to pay (WTP) estimates. However, there is evidence that respondents who claimed to have ignored some attributes may simply have assigned them lesser importance. To explore this issue in the context of tourism research, a new follow-up question is used to investigate whether the respondents have ignored certain attributes or just assigned the attribute as of lesser importance when responding. Three different mixed logit (MXL) models were estimated and compared. Results generally indicate that some respondents do indeed ignore certain attributes, and some of them put less emphasis on certain attributes when making decisions. Comparison of the different MXL models reveals different WTP estimates, suggesting the importance of considering an appropriate method to deal with ANA.

JEL Classification: Q51, Q57

Keywords: Discrete choice experiment, attribute non-attendance, mixed logit model, willingness to pay, tourism

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INTRODUCTION

Discrete choice experiment (DCE) originated in the field of transportation and marketing, and are used to a growing extent to measure the willingness to pay (WTP) for non-market goods and services within the field of non-market valuation. This includes the use of DCE as a mechanism to analyse preferences in the field of tourism research (e.g. Huybers, 2003; Apostolakis and Jaffry, 2006; Willis, 2009; Wuepper, 2017).

A DCE involves a trade-off process by respondents among several alternatives or scenarios, where each alternative or scenario comprises several attributes. The continuity axiom of consumer behaviour assumes that respondents have fully considered each and every attribute presented in a choice set when deciding which alternative they prefer most. However, it is now generally accepted that there is a limitation on the human capacity to process information. DCE choice tasks usually pose a complex and cognitively demanding judgement to be made in trading-off attributes. This situation requires additional cognitive effort from the respondents to process the information and make their choice. Repeated choices, the number of attributes, the number of attribute levels, and the different combination of choice tasks, are among the elements that contribute to the complexity of the task. Consequently, a combination of the complex choice tasks and a limited respondent cognitive ability may lead to a risk that the respondents use simplifying strategies or a simplifying heuristic to make a judgement. One such strategy is to ignore or not attend to specific attribute(s) presented in the choice cards.

Ignoring attributes in a DCE indicates non-compensatory strategy or non-compensatory behaviour as the given attribute level improvement fails to compensate for degrading levels of other attributes (Scarpa, Gilbride, Campbell and Hensher, 2009). As a consequence, choices that are made using non-compensatory behaviour cannot be denoted as preferences over a utility function. This has important implications towards the precision of welfare estimates. Thus ANA in DCE has become an issue that has received much attention in the literature. Regardless the reason why some individuals ignore attributes, it is important for the analyst to consider this behaviour when estimating a stated preference model. Based on the DCE literature, it is believed that failure to account for ANA may give biased welfare estimates, and may result in wrong policy recommendations (e.g. Campbell, Hutchinson and Scarpa, 2008; Hensher and Rose, 2009; Carlsson, Kataria and Lampi, 2010).

Two methods have been suggested in the DCE literature to account for ANA in the data analysis, namely, stated non-attendance (SNA) and inferred non-attendance (INA). While the inferred ANA method uses an analytical model that interprets ANA from the observed pattern of choice (e.g. Campbell, 2008; Scarpa et al., 2009; Campbell, Lorimer, Aravena and Hutchinson, 2010), the stated ANA method involves asking individuals directly whether or not they have ignored some attributes during the completion of the choice tasks (e.g. Alemu, Mørkbak, Olsen and Jensen, 2013; Caputo, Loo, Scarpa, Nayga and Verbeke, 2014).

In a DCE, there are two techniques that can be used to monitor SNA, i.e. at the serial level or at the choice task level. In the serial SNA approach, the follow-up question is asked at the end of the whole choice task about which attributes individuals have systematically ignored. In contrast to the serial SNA approach, the choice task level approach asks individuals to report which attributes they ignored after each single choice task. This may reveal whether ANA differs from choice task to choice task as respondents go through each of the choice situations (Scarpa, Thiene and Hensher, 2010). The parameter of the ignored attributes is restricted to zero in the choice model analysis[*].

Nevertheless, there is evidence that individuals who claimed to have ignored some attributes may simply have assigned them lesser or lower importance (e.g. Hess and Hensher, 2010; Hess, 2014) based on the fact that the most ignored attribute receives the lowest preference ranking in the estimated utility model. Also, there is evidence that not all of the individuals who claimed to have ignored an attribute really did (Carlsson et al., 2010). In other words, there is an inconsistency between what individuals declare and what they really do. Hence, restricting the parameter of the ignored attributes to zero in the SNA method may be incorrect and lead to misspecification of models (e.g. Campbell and Lorimer, 2009; Alemu et al., 2013). Taking everything into account, it seems inadequate to simply ask individuals whether they have ignored certain attributes or not. Thus Alemu et al., (2013) asked respondents to indicate the reasons why an attribute has been ignored; whereas Scarpa, Zanoli, Bruschi and Naspetti (2013) and Colombo, Christie and Hanley (2013) asked respondents to indicate their frequency of attendance to each attribute (e.g. never, sometimes, always).

[*] If an individual n states that she/he ignored an attribute i in a choice situation, the attribute parameter β_{ni} will be constrained to zero in the utility function.

In this paper, we extend the previous analysis by introducing a new SNA follow-up question that assists the respondents to make a choice between the attribute(s) they really ignored and the attribute(s) that is lesser of importance for them. Based on the information gathered from the supplementary question provided at the end of choice task, we estimate three different specifications of MXL models:

Model 1 (Full attribute attendance): no restriction on the parameter
Model 2: restricting the parameter of the ignored attributes as being equal to zero, as applied by many previous studies[†]
Model 3: excluding the respondents who ignored any attribute presented in the choice cards.

To the best of our knowledge, this paper presents the first study to estimate and compare the different specifications of MXL models that account for ANA behaviour in the context of tourism research, particularly in Malaysia case study.

STUDY DESIGN AND IMPLEMENTATION

Data used for this study of ANA came from a DCE survey which aimed to elicit tourists' preferences for improvements in tourist facilities in Kenyir Lake, Malaysia. Each improvement alternative was defined by different improvement levels of five tourist facilities - toilet, jetty, car park, tourist information centre (TIC) and playground. The final attribute, defined as an entrance fee, was also included. The WTP for an improvement in a single attribute tourist facility can be estimated by the ratio of estimated parameter of the attribute to the parameter of the cost or entrance fee attribute. Table 1 presents the attributes levels used in the DCE survey. The identification of attributes and their levels were based on two focus group studies of public opinion about what are the important facilities that need to be provided at recreational areas, along with a rigorous literature review, and a discussion with the government policy maker responsible providing the tourist facilities at the lake.

Table 1 Attributes and attribute levels for a DCE survey in Kenyir Lake, where SQ represents the current situation

Level	Description
Toilet	
Basic (SQ)	10 toilets + 2 disabled toilets
Medium	Basic + bathrooms
Superior	Medium + Babies' changing rooms
Jetty	
One (SQ)	The current small jetty where the speed boats and houseboats load and unload passengers
Two	One jetty for a speedboats and another one jetty for the houseboats to load and unload passengers.
Car Park	
30 slots (SQ)	The current slots are limited and cannot accommodate the increasing numbers of tourists' car
100 slots	Adding more slots can accommodate the increasing numbers of tourists' car
Tourist Information Centre	
Basic (SQ)	Brochures, pamphlets and information boards.
Medium	Basic + video presentation.
Superior	Medium + tourist information counsellor
Children's Playground	
Small (SQ)	The playground is small, old and limited in equipment.
Large	A large playground with a new equipment can provide a plenty of space for children to play
Entrance Fee per person (Ringgit Malaysia, RM)	
0, 1, 2.50, 5, 7.50, 10	

Once attributes and levels were determined, a D-efficient experimental design, generated from a SAS programme, was used to construct thirty-six choice cards. The choice cards were blocked into six versions of six choice cards each, where each respondent was randomly answered one block of six choice card, to reduce the cognitive burden and to avoid tedium. In each of six choice sets presented to each respondent, s/he was required to indicate her or his preference

[†] Examples of previous studies that restrict the parameter of the ignored attributes to zero are such Hensher, Rose and Greene (2005), Campbell et al., (2008) and Carlsson et al., (2010).

between two hypothetical alternatives without the SQ option. An example of a DCE choice set is presented in Figure 1.

An example of a choice card is presented below. Two possible development options for the tourism facilities at Gawi Jetty are presented. If you would like to see an additional jetty, medium toilets and superior tourist information centre; but you are happy with the existing car parking slots and a small children's play area, and are willing to pay an entrance fee of RM 1 per person you should choose Option 1.

If you would like to see a large children's play area, medium information centre, an additional jetty, more car parking slots; but you are happy with the existing toilet conditions and are willing to pay an entrance fee of RM 7.50 per person, then you should choose Option 2.

Please tick √ which option you prefer.

Facilities	Option 1	Option 2
Toilet	Medium	Basic
Jetty	Two	Two
Car Park	30 slots	100 slots
Tourist Information Centre	Superior	Medium
Children's Playground	Small	Large
Entrance Fee	RM 1	RM 7.50
Your Option		

Figure 1 An example of DCE choice set

As suggested by Johnson and Desvousges (1997), the DCE choice sets need not be constrained or restricted by the requirement of the SQ in each alternative. Thus, the forced choice question without the SQ option was applied in this paper to estimate the tourists' preferences for the tourism facilities attributes, and on the basis of these, to develop policy recommendations about the facilities and amenities to those involved in the management of the recreational lake.

After the last choice set, respondents were presented with four follow-up options for each attribute, to explore whether they had ignored any of the six specified attributes when making their decisions. The first option was "Did you ignore this attribute because it is not important to you?", following Carlsson et al., (2010) and Alemu et al., (2013). Carlsson et al., (2010) argued that individuals may indicate that they have ignored a certain attribute simply because the attribute does not affect their utility or they do not have a WTP for the proposed change in that attribute. The second option offered was "Did you put less emphasis on this attribute because there were more important attributes in the choice set?" based on the discussion in the focus groups, and the finding by Hess and Hensher (2010) that the respondents who claimed to have ignored a certain attribute may simply have assigned it lesser importance. Response option three was "Did you give the same weight to this attribute as all the other attributes in reaching your choice?"; and option four, "Did you put more emphasis on this attribute because it is more important than other attributes?" were generated based on the recommendation and suggestion from the focus group discussions. This framework gives respondents the opportunity to differentiate which attributes they ignored, and which attributes were of lesser importance for them, when making their decision. This approach differs from asking respondents whether they did not consider, or whether they ignored certain attributes when making their decision; the approach applied in Hensher and Rose (2009), Carlsson et al., (2010) and Alemu et al., (2013).

The stated ANA approach used in this paper also differs from that of asking respondents about ignored attributes following every choice task, which was applied in Meyerhoff and Liebe (2009), Puckett and Hensher (2009) and Scarpa et al., (2010). ANA follow-up questions at the end of the choice task might be a suitable approach to apply, since asking respondents to state their ANA after every choice task could affect their behaviour in subsequent choice questions (e.g. Carlsson et al., 2010; Nguyen, Robinson, Whitty, Kaneko and Chinh, 2015). Answering the ANA question after the first choice task could make the respondents think that they are expected to pay no attention to some attributes in the choice cards, or alternatively put more focus on all the attributes. Consequently, individuals' behaviour towards the subsequent choice tasks may change, and their choices may not reveal the true preferences. Moreover, asking the ANA questions after each choice task increases the burden of the choice task (Colombo et al., 2013) and requires more cognitive effort from the individuals to complete the task (Caputo et al., 2014).

According to the National Oceanic and Atmospheric Administration (NOAA) panel report (Arrow et al, 1993), a face-to-face interview is the most suitable method of gathering information from respondents in any stated preference study, including DCE (Portney, 1994). Thus, from March to May 2016, face-to-face interviews were conducted at Gawi Jetty, which is the main entry point to Kenyir Lake.

The maintenance and supervision of the facilities provided at this main entrance point to Kenyir Lake are not done appropriately and regularly, and eventually, this impacts on the quality of the facilities provided to tourists. Therefore, evaluating tourists' preferences for improvement to tourism facilities at Gawi Jetty could help the responsible body in designing a better provision of facilities in the future. Interviewers were carefully trained to conduct and explain all the questions, particularly the DCE question, to respondents. The tourists were randomly sampled. The targeted tourists were those who showed up at the Gawi Jetty, aged eighteen years old and above. Once interview was finished, the next individual to pass was interviewed. In other words, this study systematically sample the next person to avoid any selection bias. In all, 180 surveys were collected with usable responses. Each respondent answered six DCE questions.

ECONOMETRIC SPECIFICATION

The model applied in the analysis of ANA responses is a MXL which is a highly flexible model that can estimate any random utility model (McFadden and Train, 2000). The MXL model can take a number of different forms (see Hensher and Greene, 2003; Train, 2003). In this paper, we used a random parameter logit (RPL) model. Under the random parameter specification, the decision maker *n* faces a choice among *j* alternatives. The utility can be indicated as:

$$U_{nj} = \beta'_n x_{nj} + \varepsilon_{nj} \tag{1}$$

where x_{nj} is a vector of observed variables that relate to alternatives j and the decision maker *n*, β_n is an unobserved vector of the parameters for each *n* and represents the decision maker's tastes which vary in the population with density *f* (*β*). This density is a function of parameters *θ* that denote, for example, the mean and covariance of the *β* in the population. Therefore, the density can be denoted as $f(\beta_n|\theta)$. Meanwhile, ε_{nj} is an unobserved random term, assumed to be IID extreme value, independent of β_n and x_{nj}. The goal is to estimate the population parameter (*θ*) *w*hich defines the distribution. We used a normal distribution for all of the attribute parameters, with the exception of the entrance fee attribute. Once the type of distribution is specified, the estimation of the parameter to describe density *f* can be completed. The estimation can be done by maximizing the log likelihood function.

Referring to Train (2003), the simulation of the log likelihood function can be done through a simulation procedure for any given value of *θ* and the procedure is as follow. First, a value of *β* is drawn from $f(\beta|\theta)$ and this is denoted as $\beta_{r.}$ Subscript r =1 refer to the first draw. Secondly, the logit formula $L_{ni}(\beta_r)$ is calculated for this draw. Then the first and second steps are calculated many times, and the results are averaged. The average results are the simulated probability as presented below:

$$\check{P}ni = \frac{1}{R}\sum_{r=1}^{R} Lni(\beta r) \tag{2}$$

where *R* is the total number of draws, $\check{P}_{ni}$ is an unbiased estimator of P_{ni} by construction. The simulated log likelihood (SLL) can be derived by inserting the simulated probabilities into the log likelihood function:

$$\sum_{n=1}^{N}\sum_{j=1}^{J} Dnj \ln\check{P}nj \tag{3}$$

where D_{nj} = 1 if decision maker *n* chooses alternative *j* and zero otherwise.

Based on the above general econometric specification, we specify and compare three different MXL models. All models were estimated with the simulated maximum likelihood using 100 Halton draws and the models were estimated using Nlogit 4.0.

Using the choice model data, the WTP value or welfare measure can be estimated. This measure helps us to understand the impact of attributes changes in economics, and also the implications to the associated policy. Marginal WTP value is calculated by dividing the coefficient value of any attribute by the coefficient value of cost attribute

(Hoyos, 2010). The value indicates the amount of money that respondents are willing to pay in order to have the benefit of the attribute improvement (Bennett and Adamowicz, 2001). Thus, the WTP for a unit change in attribute *i*, for example, can be calculated as the negative of the ratio of *i's* β coefficient divided by the parameter of cost attribute β_{cost}.

$$WTP = - \beta_i / \beta_{cost} \quad (4)$$

where:
β_i = the coefficient of any of the attributes in the model
β_{cost} = the price coefficient

EMPIRICAL RESULTS

Incidence of Stated ANA

The responses to the stated ANA supplementary questions are summarised in Table 2. As shown in Table 2, the most ignored attribute was the TIC (37.2% of responses), followed by the children's playground (15.6%). For the toilet, jetty and car park attributes, most of the respondents stated that they gave the same weight as all other attributes in reaching their choices with 69.4%, 77.2% and 85.6% respectively. Meanwhile, for the children's playground, most of the respondents stated that they put less emphasis on this attribute because there were more important attributes in the choice set (40%). For the entrance fee attribute, half of the respondents (50%) indicated that they gave the same weight as all other attributes in reaching their choices, and 43.9% of the respondents stated that they put more emphasis on this attribute because it was more important compared to the other attributes.

Table 2 Stated ANA follow-up question

Response	Answer (%)					
	Toilet	Jetty	Car Park	TIC	Playground	Fee
1. Did you ignore this attribute because it is not important to you?	0.6	1.7	0.6	37.2	15.6	0.6
2. Did you put less emphasis on this attribute because there were more important attributes in the choice set?	2.8	1.7	3.2	29.4	40	5.5
3. Did you give the same weight as all other attributes in reaching your choice?	69.4	77.2	85.6	19.5	38.3	50
4. Did you put more emphasis on this attribute because it is more important than other attributes?	27.2	19.4	10.6	13.9	6.1	43.9
Total	100	100	100	100	100	100

The results produce evidence that some of the respondents do indeed ignore certain attributes when making their decision. Moreover, some of the respondents put less emphasis on certain attributes when making the trade-off between all attributes presented in the choice cards. Therefore, the ANA follow-up question provided in this study enabled the respondents to express their different responses between ignored and the less important attributes. A common criticism in the literature related to the ANA issue is that respondents may indicate an attribute as ignored, whilst in reality they only regard it as less important. Thus, the results obtained from the ANA follow-up questions provided in this study identify the respondents who stated that they ignored certain attributes as those who really did ignore them.

The results presented in Table 2 clearly reveal that some of the respondents do not attend to all attributes presented in the choice cards. This means that, in consequence, attributes are being ignored by the respondents, and this behaviour violates the continuity axiom on which the theory of DCE is built. There are many factors that can influence respondents to employ attribute processing strategies in DCE. Internal factors, for example, the complexity of the DCE task (DeShazo and Fermo, 2002; Scarpa et al., 2009; Weller, Oehlmann, Mariel and Meyerhoff, 2014), and the relevance of the attributes incorporated in the experiment (Hensher, 2006), are possible explanations for an individual employing attribute processing strategies. External factors, for instance, the cognitive ability of the individuals, the strength of attitude, beliefs, and other demographic characteristics of the individuals, are also likely to influence the use of lexicographic[‡] decision-making rules (Rosenberger, Peterson, Clarke and Brown, 2003).

Table 3 presents the results of a cross tab analysis of TIC which is the most ignored attribute by the tourists and the characteristics of respondents. The results from Table 3 revealed that 37.2% [(10+57)/180 x 100] of the respondents ignored the TIC attribute because this attribute was not important to them. However, only 17.2% of the first-time tourists

[‡] Individual consistently selects the option that is best with respect to one specific attribute (Sælensminde, 2006)

ignored this attribute. Meanwhile, 46.7% of the repeated tourists ignored the TIC attribute. A Chi-Square Test of Independence was computed in order to understand the variables that may have impacted the frequency of attribute responses for the TIC attribute. The Chi-Square result revealed that the frequency of attribute responses does depend on the number of visits (*Chi-square (3) = 27.122, p < 0.05*). No statistically significant dependencies were found between attribute responses and gender (*Chi-square (3) = 1.47, p > 0.05*), age (*Chi-square (12) = 8.882, p > 0.05*), household number (*Chi-square (9) = 12.402, p > 0.05*), and income (*Chi-square (12) = 20.464, p > 0.05*).

Table 3 Cross tab attribute responses of TIC and characteristics of the respondents

	Tourist Information Centre								Total	
	Ignored		Less Emphasis		Same Weight		More emphasis			
Number of Visits	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%
First time visit	10	17.2	15	25.9	16	27.6	17	29.3	58	100
Repeated	57	46.7	38	31.2	19	15.6	8	6.5	122	100
Pearson Chi-Square Value = 27.122, df = 3, Asymptotic Significance (2-sided) =0.000										
Gender										
Male	37	37.4	28	28.3	22	22.2	12	12.1	99	100
Female	30	37	25	30.9	13	16	13	16	81	100
Pearson Chi-Square Value = 1.47, df = 3, Asymptotic Significance (2-sided) = 0.689										
Age										
18-24	11	28.9	14	36.8	8	21.1	5	13.2	38	100
25-34	26	40	22	33.8	8	12.3	9	13.8	65	100
35-44	20	41.7	9	18.7	11	22.9	8	16.7	48	100
45-54	7	31.8	6	27.3	7	31.8	2	9.1	22	100
55 and above	3	42.8	2	28.6	1	14.3	1	14.3	7	100
Pearson Chi-Square Value = 8.882, df = 12, Asymptotic Significance (2-sided) = 0.713										
Household Number										
2 persons or fewer	6	50	4	33.4	1	8.3	1	8.3	12	100
3-5 persons	36	35	31	30.1	17	16.5	19	18.4	103	100
6-8 persons	20	36.4	14	25.5	17	30.9	4	7.3	55	100
More than 8	5	50	4	40	-	-	1	10	10	100
Pearson Chi-Square Value = 12.402, df = 9, Asymptotic Significance (2-sided) = 0.192										
Income										
Low (< RM 2000)	15	62.4	2	8.3	3	12.5	4	16.7	24	100
Medium (RM 2001-RM 4000)	41	32	44	34.4	24	18.8	19	14.8	128	100
High (> RM 4001)	11	39.3	7	25	8	28.6	2	7.1	28	100
Pearson Chi-Square Value = 20.464, df = 12, Asymptotic Significance (2-sided) = 0.059										

DCE Results

The effect of ignored attributes on preference estimates, and subsequently welfare values, were assessed using DCE models.

Table 4 presents the results of the simple MXL models with three different specifications for the ANA analysis. Model 1 was statistically significant with a χ^2 statistic of 433.276, against a critical value 24.996 (with 15 degrees of freedom at alpha level 0.05). Model 2 was statistically significant with a χ^2 statistic of 424.988, against a critical value 24.996 (with 15 degrees of freedom at alpha level 0.05) and Model 3 was statistically significant with a χ^2 statistic of 188.128, against a critical value 24.996 (with 15 degrees of freedom at alpha level 0.05). Comparing the results achieved in Model 2 with the results achieved in Model 1 reveals only minor differences. Besides the fact that the PlayG2 attribute is not significant in Model 2, the overall conclusions reached in these two models are somewhat similar. Similar to Carlsson et al., (2010), the model fit decreased in the restricted model. Nevertheless, the decrease in pseudo-R^2 value is very little (0.289 to 0.283). Contrary to the finding of Campbell et al., (2008), Campbell and Lorimer (2009) and Kosenius (2013), accounting for ANA, by the traditional method of restricting the ignored parameters to zero, did not improve the performance of the estimated model.

It has been argued in the literature that some individuals might put less weight on the attribute they claim to have ignored (e.g. Hess and Hensher, 2010; Hess, 2014). The results obtained from our study on this issue have construct validity. This is because the respondents who stated that they have ignored certain attributes were genuine, and they were differentiated from the respondents who put less emphasis on certain attributes.

Based on the attribute responses results in Table 2, the most ignored attribute was the TIC attribute. If many individuals do not care about the TIC attribute, then the parameter estimated for this attribute in Model 2 should be statistically insignificant. However, the statistical evidence of the respondents' choices shows the otherwise. The results presented in Model 2 in Table 4 revealed that the TIC2 attribute was highly significant at 1% level and the TIC3 attribute was not significant, similar with that achieved in Model 1. These results suggest that rather than completely ignoring the TIC attribute, respondents might only ignore the individual level of this attribute, which is the TIC3 attribute level whilst still considering the TIC2 attribute level. As a consequence, setting the value of the parameters of the ignored attributes equal to zero in the analysis of the data might not be appropriate, since the respondents do care about the different levels of the attribute. This raises the question as to whether the stated non-attendance statement should be offered for each level of the attributes.

Accounting for ANA in Model 2 would be likely to have an impact on the overall model performance, considering some parameters that are excluded from contributing to the likelihood function. However, the results reveal no significant difference between Model 1 and Model 2. The really important question here is whether or not the standard way of dealing with ANA by restricting the parameter of the ignored attributes to zero, is an appropriate method to represent preferences? Or maybe even more precisely, do the estimates obtained from Model 2 represent the ANA effect? Hess and Hensher (2010) and Campbell and Lorimer (2009) debate that it is not appropriate to rely on stated ignoring information by fixing the value of the concerned parameters equal to zero. For that reason Model 3 are intended to present different modelling approach to deal with ANA.

When an individual does not consider all attributes presented in the choice cards, this behaviour leads to the violation of the continuity axiom and the assumption of compensatory decision-making. Accounting for the individuals who attend to all attributes on the choice cards is considered important in the DCE study. Model 3 represents those individuals who attend to all attributes on the choice cards. Based on Table 4, the comparison between Model 1 and Model 3 reveals that there is a notable decrease in the pseudo-R^2 value from 0.289 in Model 1 to 0.259 in Model 3. All the significant variables in Model 1 remain significant in Model 3, excluding the PlayG2 attribute. This means that, even when the respondents say they attend to all attributes as in Model 3, it does not mean that they necessarily desire all attributes or that all attributes will be statistically significant. The standard deviation estimates suggest the existence of heterogeneity in the parameters of CarP100 and Jetty2 in Model 1. Meanwhile, in Model 3, the results suggest the existence of heterogeneity in CarP100 only. Summarising, there is a significant difference between the results in both of the models.

The comparison between Model 2 and Model 3 is considered interesting because both of the models applied the different methods of dealing with ANA. Even though the method applied in Model 2 is commonly used in previous studies, there is an argument raised about the suitability of this method (e.g. Campbell and Lorimer, 2009; Hess and Hensher, 2010). Therefore, a comparison between Model 2 and Model 3 is worth conducting to explore whether these two methods yield a different result or not. From a review of the literature, our study is the first study that compares these two MXL model specifications. The pseudo-R^2 value was decreased from 0.283 in Model 2 to 0.259 in Model 3. All the significant variables in Model 2 remain significant in Model 3 with the same significance level. Parameters in Model 3 that are statistically significant, are, with one exception (i.e. CarP100), higher than those in Model 2. Meanwhile, the standard deviation results in both models suggest the existence of heterogeneity in Jetty2 and CarP100, with the exception of Jetty2 in Model 3. Overall, there is a significant difference between the results in Model 2 and Model 3.

Table 4 Estimated MXL models with different specifications for the stated ANA issue

Attribute	Model 1		Model 2		Model 3	
Random Parameters (mean)	Coeff.	tstat.	Coeff.	tstat.	Coeff.	tstat.
Toilet2	0.715	5.434***	0.712	5.692***	0.901	4.093***
Toilet3	1.449	8.436***	1.426	9.014***	1.747	5.247***
Jetty2	0.766	6.391***	0.727	6.586***	0.838	4.191***
CarP100	0.961	7.759***	0.934	8.564***	0.834	4.269***
TIC2	0.376	2.954***	0.409	2.614***	0.547	2.601***
TIC3	0.085	0.732	0.065	0.442	0.172	0.944
PlayG2	0.203	2.046**	0.155	1.571	0.205	1.412
Non-random Parameter						
Fee	-0.199	-8.217***	-0.194	-9.466***	-0.142	-4.272***
Standard Deviations						
Toilet2	0.271	0.735	0.085	0.134	0.470	1.282
Toilet3	0.271	0.735	0.085	0.134	0.470	1.282
Jetty2	0.762	4.45***	0.713	4.493***	0.477	1.557
CarP100	0.452	2.073**	0.426	1.998**	0.660	2.190**

Table 4 Cont.

TIC2	0.107	0.338	0.044	0.094	0.096	0.224
TIC3	0.031	0.06	0.384	1.170	0.628	1.526
PlayG2	0.019	0.067	0.149	0.422	0.040	0.134
Summary Statistics						
LL(β_b)	-531.961		-536.105		-267.758	
LL(β_0)	-748.599		-748.599		-361.822	
Pseudo-R^2	0.289		0.283		0.259	
Adjusted Pseudo-R^2	0.28		0.274		0.239	
Number of Observations	1080		1080		522	

Notes: ***significant at 1%, **significant at 5% and *significant at 10%

Willingness To Pay Estimates

Based on Table 5, the comparison between the results from Model 1 and Model 2 reveals that the respondents in both models have the same relative importance ranking of WTP estimates; Toilet3, followed by CarP100 and Jetty2. Focusing only on the similar significant attributes in Model 1 and Model 2, the WTP values for all of the significant attributes were comparable, based on the overlap of implicit prices. Overall, the evidence suggests that the WTP estimates derived from the model accounting for ANA by restricting the parameter of the ignored attribute to zero are not statistically different to those estimated by the model that assumed full attribute attendance. This finding is similar to the findings of Carlsson et al., (2010) and Nguyen et al., (2015), but it is in sharp contrast to the findings of Hensher et al., (2005), Hensher, Rose and Bertoia (2007), Campbell (2008), Puckett and Hensher (2008) and Campbell and Lorimer (2009).

The comparison between Model 1 and Model 3 revealed that the respondents in Model 3 were unwilling to pay for the PlayG2. In addition, the WTP values in Model 3 were much higher than the WTP values in Model 1. The WTP value for Toilet3 did not overlap between both models, suggesting that there is a significant difference in the WTP value. Thus, eliminating the respondents who did not consider all attributes given in the choice cards, significantly affects welfare estimates.

The comparison between Model 2 and Model 3 revealed that the WTP estimates in Model 3 were higher compared to Model 2. For example, the difference between the WTP value of the Toilet3 attribute in Model 3 and Model 2 was large, i.e. RM 12.253 – RM 7.329 = RM 4.924. Also, the WTP value for Toliet3 attribute did not overlap in both models. Therefore, accounting for ANA by restricting the parameter of the ignored attribute to zero in contrast to accounting for ANA by eliminating all the respondents who ignored any of the attributes indeed produced statistically different WTP results. The relative importance ranking of WTP estimates also differed.

TABLE 5 WTP Estimates (in Ringgit Malaysia) from the MXL for the Stated ANA Issue

Att.	Willingness-to-pay Value								
	Model 1			Model 2			Model 3		
	Coeff.	95% confidence limits		Coeff.	95% confidence limits		Coeff.	95% confidence limits	
Toilet2	3.598 (5.436***)	2.301	4.896	3.659 (5.551***)	2.366	4.951	6.323 (4.113***)	3.310	9.335
Toilet3	7.296 (8.325***)	5.578	9.013	7.329 (8.401***)	5.619	9.038	12.253 (5.198***)	7.633	16.872
Jetty2	3.855 (6.824***)	2.747	4.961	3.736 (6.567***)	2.622	4.849	5.879 (4.465***)	3.297	8.460
CarP100	4.835 (9.012***)	3.783	5.887	4.799 (8.952***)	3.748	5.849	5.852 (4.596***)	3.356	8.347
TIC2	1.892 (2.927***)	0.625	3.159	2.103 (2.585***)	0.509	3.697	3.839 (2.684***)	1.036	6.641
TIC3	0.427 (0.733)	-0.716	1.571	0.338 (0.442)	-1.16	1.839	1.206 (0.936)	-1.318	3.730
PlayG2	1.019 (2.165**)	0.096	1.942	0.796 (1.588)	-0.18	1.780	1.442 (1.509)	-0.429	3.313

Notes: ***significant at 1%, **significant at 5% and *significant at 10%; t-statistics

CONCLUSION AND FUTURE DIRECTIONS

The fact that survey respondents might ignore certain attributes presented in the DCE exercise is fast becoming a critical issue in DCE studies. In recent years, a growing number of DCE studies have acknowledged that investigating and accounting for ANA behaviour in stated choice analysis is vital, and have shown that ignoring this behaviour can lead to biased WTP estimates (Hensher, 2006; Hensher and Rose, 2009; Carlsson et al., 2010; Scarpa et al., 2010). Our study adds to this evidence presenting results from a DCE regarding the tourists' preferences for the tourist facilities attributes in Kenyir Lake, Malaysia.

Questions related to how respondents deal with the information given in DCE exercises, and the best approach to capturing such behaviour, are still not resolved. To further explore these questions, our study presents a new approach aimed at eliciting individuals' stated non-attendance behaviour by introducing a new ANA supplementary question at the end of the DCE exercise. Individuals have a chance to express which attributes they ignored, and which attributes they put less emphasis, based on a new ANA supplementary question presented in our study. We also test and compare different ways of dealing with ANA in the DCE analysis.

Methodological Implications For DCE And Suggestions For Future DCE Research

The results of the ANA analysis presented in this paper reveal interesting evidence concerning the responses of the respondents towards the DCE exercise. The results presented in Table 2 reveals that respondents do ignore certain attributes when making their decisions. This suggests that not all respondents make the assumed trade-offs between all attributes and levels presented on DCE choice cards. The most ignored attribute in our study was the TIC attribute. Interestingly, the results also reveal that some of the respondents do indeed put less emphasis on certain attributes when making the trade-off between all attributes presented in the choice cards. Therefore, it is important to distinguish between degrees of consideration being given to an attribute in some choice situations, as well as giving no attention (Hess, Stathopoulos, Campbell, O'Neill and Caussade, 2013).

The different characteristics of individuals have been identified as among the sources of ANA behaviour in the literature. A cross tabulation analysis between attribute responses and the characteristics of the respondents presented in Table 3 revealed that the different characteristics of the respondents influenced the exclusion of the TIC attribute during the decision making process. For instance, based on Table 3, the TIC attribute has been ignored mostly by repeat tourists compared to first-time tourists. A Chi-Square Test of Independence result signifies that the TIC attribute is not relevant, or not important, to the repeat tourists at Kenyir Lake. Thus, the relevance of the attributes used in our study is somewhat related to the different types of tourists to the lake.

Hence, it is recommended that future DCE studies should attempt to investigate what types of attributes, or facilities, are relevant to different types of customers: for first-time tourists and for repeat tourists, because these two different types of tourists might prefer the different combinations of attribute facilities. The construction of the different DCE choice cards can be based on this information. In other words, the first-time visitor and the repeat visitor will receive the DCE choice cards which differ in terms of the combination of attributes levels. The relevance of attributes to the first-time tourists and the repeated tourists may then cause all these individuals to consider all attributes presented to them.

To examine whether taking ANA into account can significantly affect survey results, the ANA information gathered from the follow-up question is consequently used to improve the estimation of MXL model, compared with a standard model that assumes continuous preferences. The estimations reveal that Model 2, which takes ANA into account by restricting the parameter of the ignored attributes to zero, did not result in a better performance compared to the Model 1. Relating to the WTP estimates, no significance different was found between the WTP values in Model 1 and Model 2.

The results in Model 2 also reveal that there is a discrepancy between what respondents declare and what was actually undertaken. This refers to the TIC attribute, which is the most ignored attribute in the sample. When the majority of the respondents declare that they ignore the TIC attribute, the parameter of this attribute should be statistically insignificant in Model 2. However, the results revealed that only the TIC3 attribute level was insignificant and the TIC2 attribute level was positive and highly significant at 1% level. These results suggest that some individuals might only ignore the TIC3 attribute level, and that they consider the TIC2 attribute level during the decision making process. Therefore, the standard approach of setting the parameter of the ignored attribute to zero in the analysis in Model 2 seems inappropriate, when in reality the respondents do not ignore the whole attribute.

Erdem, Campbell and Hole (2015) argue that respondents potentially ignore a subset of the attribute's levels while attending to the attribute. In such a situation, assuming that ANA applies to the whole attribute would be untrue and may possibly lead to erroneous policy recommendations. Hence, to fully account for non-attendance behaviour in DCE studies, one should take into consideration the ANA response not only at the attribute level but also at the different levels of the attribute. It is suggested that future research should provide the ANA follow-up question based on the level of each attribute. To the best of our knowledge, while previous DCE studies have examined only stated ANA at the attribute level, no other study has explored the ANA at the levels of the attribute, except Caputo, Nayga Jr, Sacchi and Scarpa (2016). Meanwhile, Erdem et al., (2015) explored both attribute level and levels of ANA behaviour through inferred ANA. In future, more research is needed to explore the stated ANA at the level of the attribute.

The assumption of different MXL model specifications to consider the ANA has a big impact on individual's preferences estimation and on WTP measures. Therefore, our study found that an important issue to be considered, methodologically, in a DCE study is whether ANA should be taken into account by restricting the parameter of the ignored attribute to zero or by eliminating all the respondents who ignored any attribute presented in the choice cards from the analysis. The important theoretical assumption in DCE is that individuals are expected to consider all attributes in making their choice based on trade-offs between all attributes presented in the choice card. This is known as the continuity axiom of consumer behaviour. Continuity also implies compensatory decision making. If the individuals do not consider all attributes presented on the choice cards, this behaviour leads to non-compensatory strategies which also violate the axiom of consumer choice theory in DCE.

Therefore, to fully adhere to the axiom of consumer choice theory in DCE, only those who consider all the attributes presented in the choice cards should be included in the analysis. In practical terms, Model 3 is the model that fully adheres to this axiom in DCE. Even though Lanscar and Louviere (2006) have argued that deleting 'irrational' responses is not appropriate and removal of such respondents may also cause the removal of valid responses, we have a rational justification for doing that. We did not find any significant difference between irrational responses and rational responses in terms of socioeconomic characteristics, as well as the experimental design. In addition, the comparison between Model 2 and Model 3 reveals that there is a significant difference in model performance between both of the models. Regarding the WTP estimates, the results reveal that the WTP values for all of the attributes in Model 3 were higher compared to Model 2. Thus, we suggest that future DCE study should also consider Model 3 instead of Model 2 when accounting for ANA. To the best of our knowledge, there is no previous DCE study that applies Model 3 when accounting for ANA.

If Model 3 is going to be used to account for ANA, there are a number of important aspects that need to be considered, e.g. whether the remaining percentage of respondents who fully consider all attributes presented in the choice cards is sufficient to be counted in the analysis, and whether there is a possibility that none of the respondents consider all attributes presented in the choice task. If the remaining percentage of respondents is too small, or if all of the respondents apply non-compensatory strategy, Model 3 is not applicable or is not suitable for the analysis. Hence, a bigger sample size may be required if a study applies Model 3 to account for ANA behaviour.

To conclude, the implication drawn from the ANA issue explored in this study concerns the importance of investigating the attribute processing strategy that might be employed by the individuals in any DCE study, and in considering this behaviour when estimating a stated preference model.

Policy Implications

The results of this study provide several policy recommendations. The key result was that, with the proposed entrance fees ranged from RM 1 to RM 10, respondents were willing to pay for improvements to most of the tourist facilities attributes presented in this study. This means that the respondents agree with the proposed entrance fees and they realise the benefit that they will get from the introduction of the entrance fee system. Thus, the responsible authority at Kenyir Lake should consider imposing an entrance fee, or other charges, for future tourists, as a viable way of increasing revenues to cover the development and maintenance of the tourist facilities at the main entrance point of the lake. Currently, no entrance fee is charged to the tourists who enter the lake. This means that the budget, or funds for managing the lake, come solely from the government source. Competition with other government funded programmes often results in the receipt of limited funds, insufficient to cover the maintenance and development of tourist facilities at the lake. As a result of limited government funds, it is reasonable that receipts from the future imposition of an entrance fee at Kenyir Lake be used for re-investment into the lake.

The analysis from this paper also reveals that the most important non-monetary attribute, which is the Toilet attribute (respondents put more emphasis on this attribute based on Table 2), receives the highest preference ranking in the WTP estimate in all MXL model specifications. The Jetty attribute, which is the second highest most important non-monetary attribute is also included in the top three highest WTP ranking estimates in all MXL models. The results also imply that the tourists are aware of the quality of services and facilities provided at the lake and are willing to pay for better services and facilities.

Meanwhile, the attribute with the lowest emphasis, which is the PlayG2 attribute, receives the lowest preference ranking of WTP estimates, or becomes insignificant in certain models. This finding suggests that the ANA self-reporting is relatively consistent with the choice behaviour that was actually adopted by the respondents. Therefore, this information is useful and allows the responsible policy maker to consider which attributes are important and which attributes are less important to tourists. The allocation of a budget for the improvement of facilities surrounding the Gawi jetty can then be done more efficiently.

In addition, the results provide evidence that the TIC attribute is not important to the repeat tourists compared to the first time tourists. This means that different types of visitor exhibit different preferences for improvement to the tourist facilities attributes. Thus, the policy maker should carefully consider the different preferences improvement of these two types of tourists at the lake, so that they can decide whether different policy implementations might be based on the needs of different categories of tourists to the lake.

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