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Covariates of repeat tourism: an endogenous switching Poisson model

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This paper introduces the endogenous switching Poisson model to analyse the underlying reasons behind repeat visitation to Madeira Island. The advantage of the model is that it allows for both unobserved heterogeneity and endogeneity in the covariates. Using data gathered by questionnaire, the authors confirm that the overall fit of the model is good and outperforms other related count data models. From the model estimation it is clear that the number of visits to Madeira Island is supported by multiple variables such as destination attributes, hotel facilities and travel cost, tourist motivation and tourist satisfaction. The related policy implications are derived.

Keywords: repeat visitation; endogenous switching Poisson model; destination attributes; tourist motivation; tourist satisfaction; destination management

Repeat visitation is often considered a direct reflection of the quality and management of a particular destination (Oppermann, 1997, 1998, 2000; Alegre and Juaneda, 2006; Hong *et al*, 2009). Repeat tourists are generally those who are satisfied with the destination (Kozak, 2001), insensitive to price (Alegre and Juaneda, 2006), familiar and comfortable with the destination, and who have a positive image of the destination (Milman and Pizam, 1995; Hong *et al*, 2009). The motivation behind repeat visitation has recently been analysed by a variety of models, including the mixed logit (Correia *et al*, 2007); the binary

logit (Alegre and Cladera, 2006); and the normal regression (Alegre and Juaneda, 2006; Kozak, 2001). Generally, there is agreement in the literature that formulating strategies for encouraging repeat visitation starts with a good understanding of the covariates that drive the return of tourists.

In this paper we aim to contribute to the above literature by analysing the sources of repeat visitation to Madeira Island. It is one of Europe's oldest travel locations specializing in sun and sea (Aguiló *et al*, 2005) and has evolved over different phases with a continuous characteristic: a high number of repeat tourists (Câmara, 2002). We focus on different covariates, including the tourists' nationalities and their socio-demographic characteristics, trip motivation, hotel and travel characteristics, destination attributes, and trip satisfaction. The methodology used in this paper also innovates on other related studies in the literature. We allow for unobserved heterogeneity and endogeneity in the covariates using the endogenous switching Poisson model (Miranda, 2004). Switch signifies that the models split the variables between two groups, characterizing the heterogeneity of the variables. This paper estimates two switch models: one with exogenous variables that characterizes the heterogeneity on the data; and a second with endogenous variables characterizing the endogeneity in the data (Chesher, 1984; McAlister and Pessemier, 1982; McFadden and Train, 2000; Chesher and Santos Silva, 2002; Hong *et al*, 2009).

The paper proceeds as follows. The next section provides an overview of the literature. The subsequent two sections, respectively, elaborate on the methodology and describe the research design. The final two sections present the results and discussion.

Literature review

Over the past three decades, the literature has focused extensively on repeat visitation (Mazursky, 1989; Milman and Pizam, 1995; Court and Lupton, 1997; Sônmez and Graefe, 1998; Oh, 1999, Baker and Crompton, 2000; Kozak and Rimmington, 2000; Kozak, 2001; Bigne *et al*, 2001; Bowen, 2001; Caneen, 2003; Pritchard, 2003; Um *et al*, 2006). In general, most studies indicate that repeat visitation is positively explained by tourist satisfaction, since a satisfied tourist is more likely to return to a particular destination, or to recommend it to others (Kozak and Rimmington, 2000; Kozak, 2001). The intention to return can also be influenced by motivation factors such as comfort or familiarity with a particular destination (Iso-Ahola and Mannell, 1987, Dunn Ross and Iso-Ahola, 1991). With a more favourable destination image, the likelihood that a visitor will be satisfied with a destination and consider future visits is higher (Ashworth and Goodall, 1988; Cooper *et al*, 1993; Bigne *et al*, 2001; Lee *et al*, 2005). Other factors identified as important in explaining a visitor's intention to return include the attributes and facilities of a particular destination (Woodside and MacDonald, 1984; Barros *et al*, 2010).

The literature is also rich in terms of the methodologies proposed to analyse repeat visitation. The model used in this paper aims to explain the concept of repeat visitation, as expressed by the number of times a tourist has visited the destination. Our model is part of the choice set models' family, originally

proposed by Spiggle and Sewall (1987) in the consumer behaviour literature, and introduced to the tourism literature by several studies (Crompton, 1979; Woodside and MacDonald, 1984; Woodside and Lysonski, 1989; Um and Crompton, 1992; Crompton and Ankomah, 1993; Oppermann, 1997, 1998; Kozak and Rimmington, 2000; Petrick *et al*, 2001; Woodside and Dubelaar, 2002; Sirakaya and Woodside, 2005; Alegre and Cladera, 2006; Alegre and Juaneda, 2006; Chen and Tsai, 2007; Weaver *et al*, 2007 and Hong *et al*, 2009).

More in line with the present research, Ledesma *et al* (2005) used a left truncated Poisson and a binomial logit model to analyse repeat visitation in the island of Tenerife, and Hellström (2006) used an inflated truncated bivariate Poisson log normal model to analyse the households' choice of overnight stays. Other related studies include Palmer-Tous *et al* (2007) who used several count data models (Poisson, negative binomial, zero-inflated Poisson, zero-inflated negative binomial, truncated Poisson, zero-truncated negative binomial) to analyse the use of hire cars by tourists in Mallorca, Spain, and Moran *et al* (2006) who also presented several count data models (negative binomial model, zero truncated negative binomial, negative binomial with truncation and endogenous stratification) to estimate the recreational value of mountain biking sites in Scotland. The authors concluded that correcting for endogenous stratification in addition to over-dispersion and truncation is needed to avoid biased results. Hellström (2006) estimated a bivariate count data for tourism demand.

From our review of the literature, it is clear that the endogenous switching Poisson model has not been used before in tourism related studies. This is despite its clear advantage over the traditional Poisson model, particularly as it can account for unobserved heterogeneity and endogeneity in the covariates. This paper also innovates by focusing on Madeira Island (Oliveira and Pereira, 2008; Almeida and Correia, 2010). More details about the methodology and the sample under analysis are provided in the next sections.

Methodology

The dependent variable in this study is the number of times the interviewed tourist visited Madeira. This variable is a counting variable characterized for being non-negative, and thus should be modelled as a Poisson or a binomial negative model (Cameron and Trivedi, 1998; Greene, 2003). The Poisson model is based on the hypothesis that the endogenous variable y_i (counts of the number of visits to Madeira), given the covariates x, is independent with the conditional probability function of n:

$$\Pr(n;\lambda) = \frac{e^{-\lambda}\lambda^{n}}{n!} \text{ for } y = 0, 1, 2..., \quad (1)$$

where n is the number of occurrences of an event (visits to Madeira) the probability of which is given by the Poisson mass function, $n!$ (factorial of n), and λ is the shape parameter thatindicates the average number of events (visits)

in a given time interval. For a sample K, the likelihood function of the Poisson distribution is:

$$L(\lambda) = -n\lambda + (\sum_{i=1}^{n} k_i)\log(\lambda) - \sum_{i=1}^{n} \log(k!). \quad (2)$$

The Poisson distribution tends to exhibit over-dispersion, when the observed variance is superior to the theoretical variance. This problem is prevalent in questionnaires with heterogeneous tourists. Under-dispersion can also occur if the observed variance is lower than the theoretical variance. To account for these problems, we use here the endogenous switching model, which was originally considered in Terza (1998).

Research design

Survey methods

The study was undertaken in March and April 2008. Tourists departing from Funchal Airport, Madeira, were randomly approached to answer the questionnaire. The interviewer approached the randomly selected tourist while he or she was waiting in the departure lounge to board the flight home. Budgetary restrictions limited the number of questionnaires to 550, assuming a response rate of 80% and the number of unusable questionnaires of 10%. The number of answered questionnaires obtained was 498, but only 346 were usable, due to errors and incomplete fields, Dillman (1978).

Most of the respondents were male (52%) with an average age of 33. On average, they were middle-class, with a family that includes one child. Other characteristics of the sample are summarized in Table 1.

Questionnaire

Table 1 describes the characteristics of all model variables. Respondents were asked to complete the questionnaire, which included questions concerning tourist nationalities, socio-economic characteristics, trip motivations, hotel and travel characteristics, destinations attributes, and tourist satisfaction. Items described in each of these questions are line with previous studies in the area (Sirakaya *et al*, 1996; Fodness, 1999). We assessed the importance of each of the above-mentioned attributes (destination) with a five point Likert-type scale. This scale ranged from 'without importance' 1 to 'extremely important' 5, but was renumbered as a dummy variable 0–1 due to the fact that Likert is not a normal distribution.

Hypotheses

To evaluate repeat visitation of tourists in the Madeira – we assume that the repeat visitation can be explained by several factors: the nationalities of the individuals who completed the questionnaire, other socio-demographic characteristics beyond nationality (such as age, education, gender, and social class of the individuals), trip motivation, hotel and travel characteristics, destination attributes, and trip satisfaction.

Table 1. Variable characteristics.

Variable	Description	Min	Max	Mean	SD
Dependent variable					
Frequency	Number of times a tourist has visited Madeira	1	9	1.150	0.702
Nationalities					
French	Dummy variable which is one if the tourist is French and zero elsewhere	0	1	0.546	0.498
UK	Dummy variable which is one if the tourist is from UK and zero elsewhere	0	1	0.050	0.218
Spanish	Dummy variable which is one if the tourist is Spanish and zero elsewhere	0	1	0.029	0.168
German	Dummy variable which is one if the tourist is German citizen and zero elsewhere	0	1	0.027	0.163
Socio-demographic characteristics hypothesis					
Education	Education (number of years of education after primary school)	1	8	3.430	1.740
Age	The respondent's age	21	72	39.87	12.78
Gender	The gender (1 = male, 0 = female)	0	1	0.565	0.496
Marital status	Marital status (1 = married; 0 = non-married)	0	1	0.340	0.474
Motivations					
Firstmotive	What is the main motivation for your trip: Familiarity with the destination (0 – low, 1 – high)	0	1	0.300	0.286
Secondmotive	What is the main motivation for your trip: Comfortable with the destination (0 – low, 1 – high)	0	1	0.216	0.328
Thirdmotive	What is the main motivation for your trip: Positive image of the destination (0 – low, 1 – high)	0	1	0.128	0.095
Hotel facilities and travel cost					
Hotel type	What kind of hotel did you reserve (other than 5/4 star)	0	1	0.525	0.499
Travel cost	What much did you spend on travel (US$)?	600	10,000	2,182.7	1135.9
Destination attributes					
Landscape	What was the importance of landscapes in your decision? (0 – without importance; 1 – extremely important)	0	1	0.113	0.091
Nature	What was the importance of nature in your decision? (0 – without importance; 1 – extremely important)	0	1	0.584	0.557
Climate	What was the importance of climate in your decision? (0 – without importance; 1 – extremely important)	0	1	0.450	0.042
Sun and sea	What was the importance of sun and sea in your decision? (0 – without importance; 1 – extremely important)	0	1	0.820	0.496
Security	What was the importance of security in your decision? (0 – without importance; 1 – extremely important)	0	1	0.678	0.323

Table 1 continued.

Variable	Description	Min	Max	Mean	SD
Hospitality	What was the importance of the hospitality in your decision? (0 – without importance; 1 – extremely important)	0	1	0.421	0.167
Satisfaction					
Satisfaction	What is your satisfaction with the overall quality of Madeira island? (0 – not satisfied, 1 – highly satisfied)	0	1	0.832	0.218

Hypothesis 1 (nationalities): Repeat visitation is affected by the nationality of tourists. Visitors from the same country usually share homogenous cultural tradition that can affect their preferences (Kozak, 2001, 2003). This hypothesis will be measured by the principal tourist nationalities in Madeira: *British*, *German*, *Dutch*, *Swedish* and *French*.

Hypothesis 2 (socio-demographic characteristics): Repeat visitation is affected by the tourists' socio-demographic characteristics (for example, age, education, gender and marital status). These variables have been used in previous studies to classify individual tourists (Goodall and Ashworth, 1988; Woodside and Lysonski, 1989; Weaver *et al*, 1994; Zimmer *et al*, 1995; Kozak, 2001, 2003). This hypothesis will be tested with the following variables: *age*, *gender* and *marital status.*

Hypothesis 3 (motivation): Repeat visitation is affected by the tourists' preferences (driving forces or motivations). Motivation analysis in tourism is a long-standing focus that has been researched by, among others, Pearce (1982), Dann (1981), Beerli and Martín (2004), March and Woodside (2005), Yoon and Uysal (2005) and Poria *et al*, (2006). This hypothesis will be tested with the variables *firstmotive*, *secondmotive* and *thirdmotive.*

Hypothesis 4 (hotel facilities and travel cost): Repeat visitation is affected by the accommodation characteristics and travel cost. Barros *et al* (2010) identified these two variables as important attributes of destination choice. This hypothesis will be tested with the variables *hotel type* and *travel cost*.

Hypothesis 5 (destination attributes): Repeat visitation is affected by the destination attributes, which can in many cases shape the visitor's experience (Ross, 1993). The experience that arises through tourist enjoyment, may help tourists make comparison with destinations with similar attributes (Fodness, 1994). Such experience might also affect the tourists' return intention (Woodside and MacDonald, 1984; Baker and Crompton, 2000; Kozak and Rimmington, 2000). The variables used to test this hypothesis are: *landscape, nature, climate sun and sea, security* and *hospitality.* These variables, if leading to a positive experience, are expected to increase repetition.

Hypothesis 6 (satisfaction): Repeat visitation is affected by the level of tourists' satisfaction with the destination. Several studies in the literature indicated that positive customer satisfaction results in repeat purchase and positive word of mouth (Oliver, 1980; Taylor and Baker, 1994; Zeithaml *et al*, 1996, Heung, 1999). In the tourism literature, it is also accepted that satisfaction has a positive influence on the revisit intention (Ross, 1993; Juaneda, 1996; Keane, 1997; Kozak and Rimmington, 2000; Baker and Crompton, 2000; Kozak, 2001; Caneen, 2003; Yoon and Uysal, 2005; Alegre and Cladera, 2006; Um *et al*, 2006; Rojas and Camarero, 2008), particularly in a highly competitive environment, where tourists are mainly paying for products that are cost effective and lead to high value and satisfaction. The variable used to test this hypothesis is *satisfaction*.

Results

Table 2 presents the results of the count models estimated. The reference model is the endogenous switching Poisson (Miranda, 2004). The other count models are estimated for comparison purposes. There is evidence that over-dispersion and unobserved heterogeneity is present in the data. Moreover there are some zeros in the data. Therefore, a zero truncated Poisson was first estimated to account for zeros. Second, an exogenous switching Poisson model was estimated to account for heterogeneity. We concluded that heterogeneity is present based on the significance of sigma parameter in the model with exogenous switching. Finally, an endogenous switching Poisson model was estimated to account for endogeneity. The final endogenous switching statistically significant rho parameter supports the adequacy of the endogenous switching specification. No changes of sign are detected once endogeneity is considered, but we found important differences in the magnitude of the coefficients.

The log-likelihood value of the estimated endogenous switching Poisson model (–279.21) is the lowest among the estimated models, suggesting thus a better fit. The overall fit of the model is reasonably good, with a Wald test of 126.63. The results show that the number of visits to Madeira Island is explained by multiple variables. Some nationalities, such as the British and Germans, are more 'addicted' to Madeira than others. Particular interest resides in satisfaction, which validates previous research in repeat visitation (Oppermann, 2000). Additionally, motivation issues, such as familiarity and comfort with the destination, and the positive image of the destination appear to play a positive role on repeat visitation, validating previous results by Hong *et al* (2009). Finally, the travel cost is negative and statistically significant in the endogenous switching Poisson, but insignificant in other models, validating Martinez-Espiñera *et al* (2008) but contradicting Alegre and Juaneda (2006). Of particular interest is the switching variable[1] (firstmotive) that maintains the sign between the exogenous and endogenous models but with a different value. The first equation includes all variables and the second equation includes the constant and second motive. An exclusion restriction for the switch process is suggested by the familiarity with the destination and it is concluded that second motive-familiarity with the destination is endogenous with repeat visitation, signifying that familiarity with the destination is a choice variable, correlated with

Table 2. Parameter estimates.

	Zero truncated Poisson	Exogenous switching Poisson	Endogenous switching Poisson
Variables	Coefficients (std error)	Coefficients (std error)	Coefficients (std error)
Constant	1.023	–1.533	1.040
	(2.103)	(1.311)	(0.280)*
French	0.017	1.182	1.016
	(0.123)	(0.352)*	(0.411)
UK	0.411	1.125	1.040
	(0.069)*	(0.070)*	(0.025)*
Spanish	0.792	0.832	2.525
	(0.809)	(0.322)	(1.629)
German	0.682	1.621	0.322
	(0.051)*	(0.039)*	(0.048)*
Gender	0.035	1.322	1.088
	(0.116)	(0.309)*	(0.220)*
Age	0.014	0.990	0.984
	(0.009)	(0.012)	(0.010)*
Education	0.082	1.025	1.089
	(0.063)	(0.083)*	(0.090)*
Marital status	0.530	1.832	2.321
	(0.305)	(0.322)*	(0.551)*
Firstmotive	0.001	0.997	0.915
	(0.0002)*	(0.030)	(0.020)*
Secondmotive	0.212	0.223	0.733
	(0.075)*	(0.085)*	(0.087)*
Thirdmotive	0.488	0.588	0.655
	(0.231)	(0.132)*	(0.183)*
Hotel type	0.120	0.815	1.073
	(0.218)	(0.138)*	(0.038)*
Travel cost	–0.915	–0.689	–0.399
	(0.328)	(0.305)	(0.031)*
Landscape	0.333	0.218	0.735
	(0.069)*	(0.079)*	(0.090)*
Nature	0.225	0.716	0.711
	(0.111)	(0.189)*	(0.162)*
Climate	0.216	0.967	1.075
	(0.301)	(0.287)*	(0.048)*
Sun and sea	0.884	0.721	1.408
	(0.218)*	(0.309)*	(0.208)*
Security	0.421	1.037	0.525
	(0.123)*	(0.420)	(0.219)*
Hospitality	0.815	0.702	0.421
	(0.036)*	(0.019)*	(0.020)*
Satisfaction	0.139	0.021	0.032
	(0.018)*	(0.005)*	(0.008)*
Switch			
Constant	_	–0.521	–0.418
		(0.058)*	(0.056)*
Firstmotive	_	0.582	0.224
		(0.025)*	(0.011)*

Table 2 continued.

	Zero truncated Poisson	Exogenous switching Poisson	Endogenous switching Poisson
Variables	Coefficients (std error)	Coefficients (std error)	Coefficients (std error)
Sigma	_	0.321	0.081
		(0.030)*	(0.013)*
Rho	_	_	0.829
			(0.091)*
Number of respondents	346	346	346
Log likelihood	–248.72	–266.83	–279.210
LR	490.10	518.14	–829.32
Wald	_	582.27*	126.63*

Note: *Statistically significant at 1%.

unobservables related to the error term. For example, if familiarity with the destination correlates with repeat visitation, failure to control for this correlation will yield an estimated familiarity with destination effect that is biased down.

Conclusion

The paper analysed the determinants of repeat visitation to Madeira Island, using several competing count data models. From the results it was clear that Hypothesis 1 is accepted in the context of British and German nationalities, but rejected for the other nationalities. Hypothesis 2 is also accepted as age, education, gender and marital status are positive and statistically significant. Hypothesis 3 is accepted as both hotel type and travel cost are statistically significant and with the correct sign. Similarly, we also accept Hypotheses 4 and 5 as both destination attributes and satisfaction seem to have a positive and significant impact on tourism return.

Thus, it seems clear that future policies in Madeira should focus on upgrading hotel facilities and other destination attributes, and on increasing comfort and the positive image of Madeira. Targeting nationalities that have a significant impact should also be included in a policy to attract desired types of tourists. Thus, by combining and acting on these results, it is clear that there is an opportunity to refine policies to help increase repeat visitation.

How does this paper compare with previous research? While this paper supports some traditional results such as familiarity, comfort (Hong *et al*, 2009) and satisfaction (Oppermann, 2000), it does not validate the insignificance of price (Alegre and Juaneda, 2006) and supports the idea that endogeneity and heterogeneity exist in repeat visitation. This endogeneity has implications for the setting of managerial practices to increase repeat visitation, since it results in different managerial practices. In the present case, familiarity and repeat visitation are correlated and should be the focus of a target policy, along with all the other exogenous variables that affect repeat visitation. Based on the

heterogeneity and the endogeneity detected in the sample, the idea of a homogenous tourist population should be abandoned, even for such a destination as Madeira. This result implies that each destination has its own specificity, which thus justifies the existence of several studies.

Endnotes

1. Switch signifies that a separate *equation* is specified for each *mean* model and for each (co)variance model and are endogenous variables estimated taking heterogeneity into account. Therefore switch can signify heterogeneous variables.

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