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Ana Isabel Moniz

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Ana Isabel Moniz
Universidade dos Açores (DEG e CEEApIA)

RESUMO/ABSTRACT

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This paper introduces the Dynamic Probit model to analyse the underlying reasons behind repeat visits to the Azores Islands. The advantage of the model is that it allows investigating for lags in the covariates as well as for endogeneity in the covariates enabling a more accurate view of the repeat visits phenomenon in a specific tourism island destination. From the model estimation it is clear that the number of visits to the Azores Islands is a time effect that should be analyzed only with dynamic models permitting to identify persistent variables that attract the repeat tourists. The repeat tourist is supported by multiple variables such as overall satisfaction with the destination and specific satisfaction with destination attributes. However, the most important covariates are the destination attributes that are the persistent attractors of the repeat visitor. Related policy implications are derived.

KEYWORDS: repeat visitor; dynamic probit model; destination attributes; tourist satisfaction; destination management.

Ana Isabel Moniz
Universidade dos Açores
Departamento de Economia e Gestão
Rua da Mãe de Deus, 58
9501-801 Ponta Delgada

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Ana Isabel Moniz

University of the Azores and Centre of Applied Economics Studies of the Atlantic (CEEAplA),

Rua da Mãe de Deus, 9501-801 Ponta Delgada, Portugal. Email: amoniz@.uac.pt.

ABSTRACT: This paper introduces the Dynamic Probit model to analyse the underlying reasons behind repeat visits to the Azores Islands. The advantage of the model is that it allows investigating for lags in the covariates as well as for endogeneity in the covariates enabling a more accurate view of the repeat visits phenomenon in a specific tourism island destination. From the model estimation it is clear that the number of visits to the Azores Islands is a time effect that should be analyzed only with dynamic models permitting to identify persistent variables that attract the repeat tourists. The repeat tourist is supported by multiple variables such as overall satisfaction with the destination and specific satisfaction with destination attributes. However, the most important covariates are the destination attributes that are the persistent attractors of the repeat visitor. Related policy implications are derived.

Introduction

Repeat visits are a main issue in tourism destination management, since they represent client destination loyalty. 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 have a positive image towards the destination (Milman and Pizam, 1995; Hong *et al.*, 2009). Over the past three decades, considerable research has dealt with the topic of repeat visitation (Mazursky, 1989; Milman and Pizam, 1995; Court and Lupton, 1997; Sönmez and Graefe, 1998; Oh, 1999, Baker and Crompton, 2000; Kozak and Rimmington, 2000; Kozak, 2001; Bigné *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 present research aims to analyze repeat visits in the Azores islands using data from a questionnaire to tourists who visited the Azores that enables to analyze repeat tourists satisfaction with a dynamic probit model (Stewart, 2006).

The motivation for the present research is the following. First, it aims to contribute to the above literature by analyzing the sources of repeat visits to the Azores Islands. This archipelago of nine islands is an autonomous region of Portugal and one of the seven ultra-peripheral regions of the European Union. It focuses on different covariates, including the tourists' socio-demographic characteristics and income, destination attributes and trip satisfaction. Second, the methodology used in this paper also innovates on other related studies in the literature since it adopts a dynamic probit model not previously adopted in tourism research. The paper estimates two probit models for comparative purpose, a static and a dynamic one. Finally, the present

research aims to call the attention of the research for the importance to adopt dynamic models in tourism research enabling a more accurate characterization of the process analyzed.

Literature Review and Methodology

Literature Review

Repeat visitation is a persistent issue in tourism research (Mazursky, 1989; Milman and Pizam, 1995; Court and Lupton, 1997; Sönmez and Graefe, 1998; Oh, 1999, Baker and Crompton, 2000; Kozak and Rimmington, 2000; Kozak, 2001; Bigné *et al.*, 2001; Bowen, 2001; Caneen, 2003; Pritchard, 2003; Um *et al.*, 2006; Barros and Assaf, 2011; Assaf *et al.*, 2011). 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 comfortability or familiarity with a particular destination (Mannell and Iso-Ahola, 1987, Dunn Ross and Iso-Ahola, 1991). Being a repeat visitor is an important criterion to identify tourists who are likely to experience longer stays (Menezes *et al.*, 2008; Barros and Machado, 2010). With a more favorable destination image, the likelihood that a visitor will be satisfied with a destination and consider future visits is higher (Cooper *et al.*, 1993; Ashworth and Goodall, 1988; Bigné *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, 1994).

The literature is also rich in terms of the methodologies proposed to analyse repeat visitors. 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 behavior literature, and introduced to the tourism literature by several studies (Crompton, 1979; Woodside and Lysonski, 1989; Um and Crompton, 1992; Crompton and Ankomah, 1993; Woodside and MacDonald, 1994; Opperman, 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 Tsay, 2007; Weaver *et al.*, 2007 and Hong *et al.*, 2009).

Examples of tourism studies that use the binomial logit model include Fleischer and Pizam (2002) who determined the constraints of senior Israeli tourists; De la Viña and Ford (2001) who described the demographic and trip factors of potential cruise passengers based on a sample of individuals who previously requested travel information; Costa and Manente (1995) who investigated the characteristics of visitors to the city of Venice with respect to their origin and socio-economic profile, their preferences and their holiday decisions; Sheldon (1995), who examined the travel incentive among U.S. corporations; and Stynes and Peterson (1984), who proposed a logit model to estimate recreational choices. Kockelman and Krishnamurthy (2004) proposed a micro-economically rigorous method to characterize travel demand across a great variety of choice dimensions, including trip generation. Their study applied a multivariate negative binomial model for trip demand functions derived from an indirect underlying translogarithmic utility function. Both time and money budgets were incorporated into the model structure via an effective or generalized budget constraint. A nested logit model of trip mode and destination was used to calculate the effective prices for each trip proposed via nested logsum expressions.

More in line with the present research, Ledesma *et al.* (2005) used a left truncated Poisson and a binomial logit model to analyse the repeat visitation in the Island of Tenerife, and Hellström (2006) used an inflated truncated bivariate Poisson lognormal 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.

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 the Azores Islands. More details about the methodology and the sample under analysis are provided in the next sections.

Dynamic Probit Model

The equation for the latent dependent variable defined on individuals and time is specified as a classic regression:

$$y_{it}^* = \gamma y_{it-1} + x_{it}^{'}\beta + \alpha_i + \mu_{it}$$

with $i = 1, \ldots, N$ individuals and $t = 2, \ldots, T$ time periods, where y_{it}^{*} is the latent dependent variable and y_{it} is the observed binary outcome variable, defined as: $y_{it} = 1$ if $y_{it}^{*} \geq 0$ or $y_{it} = 0$ else and where x_{it} is a vector of explanatory variables and $\mu_{it} \sim N(0, \sigma_{u}^{2})$. The subscript i indexes individuals and the subscript t indexes time periods. N is taken to be large, but T is typically small and regarded as fixed, so that asymptotic are on N alone. Even when the errors μ_{it} are assumed serially independent, the composite error term, $v_{it} = \alpha_{it} + \mu_{it}$, will be correlated over time due to the individual-specific time-invariant α_{i} terms, justifying the adoption of the dynamic probit model (Heckman, 1981; Orme, 1996; Wooldridge, 2005; Stewart, 2006).

Following Stewart (2006), the individual-specific random effects specification adopted implies equi-correlation between the v_{it} in any two (different) periods:

$$\lambda = Corr(v_{it}, v_{is}) = \frac{\sigma_{\alpha}^{2}}{\sigma_{\alpha}^{2} + \sigma_{u}^{2}}$$

with $t, s = 2, \ldots, T; t \neq s$.

The standard (uncorrelated) random effects model also assumes α_{i} uncorrelated with x_{it}. Alternatively, following Mundlak (1978) and Chamberlain (1984), correlation between α_{i} and the observed characteristics in the model can be allowed for by assuming a relationship between α and either the time means of the x-variables or a combination of their lags and leads, e.g.: $\alpha_{i} = \bar{x}'_{i}a + \zeta_{i}$, where $\zeta_{i} \sim iid$ Normal and independent of x_{it} and μ_{it} for all i, t (Stewart, 2006).

In the case of the correlated random effects model, since y is a binary variable, a normalization is required. A convenient one is that $\sigma_{u}^{2} = 1$. If μ_{it} is normally distributed, the transition probability for individual i at time t, given α_{i}, is then given by:

$$P\left[y_{it} / x_{it}, y_{it-1}, \alpha_i\right] = \Phi\left[(\gamma y_{it-1} + x_{it}'\beta + \alpha_i)(2y_{it} - 1)\right]$$

Estimation of the model requires an assumption about the initial observations (Stewart, 2006).

Research Hypotheses

The tourism return choice can be explained by several factors. The theoretical framework supporting the present research is Fishbein and Ajzen's (1980) theory of reasoned action (Baker and Crompton, 2000), as applied in management and economics research, and the role theory of tourism behavior (Pearce, 1982; Yannakis and Gibson, 1992) from the perspectives of sociology and ethnography. Both theories take into account different variables to explain tourism choice, namely destination attributes and travel characteristics. The tourist is regarded as a rational individual who decides to visit a location according to its attributes, conditioned by previous experience (Howard and Sheth, 1969). This assumptions highlights the importance of travel characteristics and destination attributes in the returning choice.

The survey questionnaire therefore gathered data pertaining to: 1) socio-economic demographic variables including income; 2) destination attributes, and 3) satisfaction (overall satisfaction and specific satisfaction). Using the survey data on these characteristics, we tested the following hypotheses:

Hypothesis 1(lagged dependent variable): the return choice is a positive function of lagged repeat choice, signifying that there exists a persistence effect in return choice behavior. This hypothesis has not yet been tested in tourism research and consitutes an innovation of the present research.

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Hypothesis 2 (Socio-economic characteristics): the return choice is a positive function of individual socio-demographic characteristics such as age, gender, education and working status (Goodall and Ashworth, 1988; Woodside and Lysonski, 1989; Weaver *et al.*, 1994; Zimmer *et al.*, 1995).

Hypothesis 3 (Income): the return choice is a positive function of the individual's income. This is a traditional hypothesis in tourism demand models, in which price, income and budget constraints define the frontier of consumption possibilities for travel (Hay and McConnel, 1979; Aguiló and Juaneda, 2000; De la Viña and Ford, 2001; Nicolau and Más, 2005).

Hypothesis 4 (Destination attributes and activities): the return choice is a positive function of a destination's attributes and activities experienced such as events, food quality, nightlife, beach and whale-watching, bird-watching and walking tours. Woodside and Lysonski (1989) argue that a destination's image and its choice are influenced by destination attributes such as those considered in this study (Lundtorp and Wanhill, 2001).

Hypothesis 5 (satisfaction): Repeat visitation is affected by the level of tourists' satisfaction with the destination. Several studies in the literature indicated that 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; Petrick, 2004; Yoon and Uysal, 2005; Alegre and Cladera, 2006; Um *et al.*, 2006; Rojas and Camarero, 2008), particularly in highly competitive environment, where tourists are mainly paying for products that are cost

effective and leads to high value and satisfaction. The variable used to test this hypothesis is *satisfaction.*

Research Design

The survey was undertaken from April 2008 to September 2009, by the Observatório do Turismo dos Açores, using nonprobability quota sampling. Several waves of questionnaires were undertaken by direct interview of the tourists departing from São Miguel, Terceira and Faial airports, in the Azores, who were randomly approached to answer the questionnaire. The sample was defined by the confidence interval approach (Burns and Bush, 1995). The formula used to estimate a 95% confidence level was:

$$n = \frac{z^2(pq)}{e^2} = \frac{1.95^2(0.5 \times 0.5)}{0.0562^2} = 300.97$$

Where *z* is the standard error associated with the chosen level of confidence (95%); *p* is the estimated variability in population (50%); *q* =1-*p*; and *e* is the acceptable sample error ±5.62% (desired accuracy 95%). The amount of variability in the population is assumed to be 50%, which is frequently the case in social research (Chi and Qu, 2008). The interviewer approached the randomly-selected tourist while he/she was waiting in the departure lounge to board the flight home. The number of questionnaires to 300 and 16 waves were performed at regular 1-month intervals, reaching a total amount of 4800; assuming a response rate of 93.3%, gives 4800/0.993 = 4768 (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 summarised in Table 1.

Results

Table 1 shows also the observed variables in the questionnaire that assumed statistical significance in this model, the proposed questions and the corresponding scales. Respondents were asked to complete the questionnaire, which included questions concerning tourist socio-economic characteristics, destinations attributes and activities, and tourist satisfaction. Items described in each of these questions are in line with previous studies in the area (Sirakaya *et al.*, 1996).

Insert Table 1 Here

Table 2 presents the results of the probit models estimated using the method of Stewart (2006) without initial conditions. Two models are estimated: a static probit panel data model and a dynamic probit model. The reference model is the dynamic probit model (Stewart, 2006). The other static probit model is estimated for comparison purpose.

Insert Table 2 Here

There is evidence that endogeneity is present in the data. Therefore, the dynamic probit with endogeneity accounts for endogeneity estimating the model with instrumental variables. 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 standard probit is the higher among the estimated models, suggesting thus a better fit for the dynamic probit with endogeneity. This estimator allows for the endogeneity of the initial conditions but assumes no autocorrelation in the μ_{it}. The overall fit of the model is reasonably good, with a Wald

test of 126.63. Taking the dynamic probit as reference, it is verified that the lambda (composite error variance) is positive and statistical significant and equal to 0.53 signifying that 53% of the composite error variance is attributed to the individual-specific effects; AR1 (first-order autoregressive process) is also positive and statistical significant implying that successive realizations of μ_{it} are positive and correlated and theta (correlation between the error term and the exogenous parameters) is also positive and statistical significant implying that the error terms are correlated with the parameters and therefore endogeneity is present in the standard probit model. No change of sign is detected once endogeneity is considered, but important differences in the magnitude of the coefficients are found. Therefore results not accounting for endogeneity achieve biased inference.

The results show that the number of visits to the Azores Islands is explained by multiple variables. Particular interest resides in overall satisfaction, which validates previous research in repeat visitation (Opperman, 2000). Additionally, motivation issues, such as gastronomy appear to play a positive role on repeat visitors, validating previous results by Hong *et al.* (2009). Finally, some destination attributes such as whale-watching and bird-watching are negative and statistically significant.

Discussion and Conclusions

The paper analysed the determinants of repeat visits to the Azores Islands using two probit models, a static probit model and a dynamic probit model. From the results it was clear that Hypothesis 1 is not accepted because the lagged variable is negative and statistical significant. This result is the most innovative and important in the present research, signifying that despite positive signs of some variable, the lag variable is

negative and statistical significant signifying a persistent lagged declaration of no return. All published papers on return hypothesis have not presented such lagged effect and therefore none comparison can be done.

Hypothesis 2 is accepted as age and working status are positive and statistically significant, validating previous research using other modeling approaches (Barros and Assaf, 2011; Assaf *et al.*, 2011) . This result signifies return tourism in Azores is done by older tourists and those that are working. Hypothesis 3 is not accepted as income is negative and statistical significant, which contradicts previous research on islands (Assaf *et al.*, 2011). This result signifies that higher income tourists don't return, which is also a specific conclusion that adds to hypothesis 1, signifying that, on average, tourists don't return to Azores and those that return tend to be the oldest and those with lower income. Additional, we also accept Hypotheses 4 and 5 as both destination attributes and satisfaction seem to have a positive and significant impact on tourism return. This validates previous results on return (Alegre and Juaneda, 2006; Alegre and Cladera, 2006; Assaf *et al.*, 2011). This result is the one this paper has in common with published papers in return hypothesis.

The general conclusion is that although destination attributes and satisfaction increase tourism return on Azores, the lagged variable and the negative effect of income are the distinct characteristics of this destination, signifying that, on average, the tourists do not return to the Azores and those that return are aged and less affluent.

Thus, it seems clear that future policies in the Azores should focus on upgrading hotel specific satisfaction attributes and on increasing other destination attributes. Targeting aged tourists 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 visits. However, new marketing strategies are needed to re-positioning this tourism destination on wealthier tourists and to increase the average number of those which want to return.

It might be also of potential value for tour operators to have a deeper insight into the variables that shape the decisions and actions of repeat tourists in the Azores. With a greater awareness of what these consumers require from a vacation, operators and organisations can focus on those statistically significant variables determined in the model when targeting their potential customers. The variables that increase repeat visits should also be the focus of future promotional campaigns. Similarly, the variables that decrease the repeat visitation should be controlled and addressed in order to minimise their potential effect.

How does this paper compare with previous research? While this paper supports some traditional results such as destination attributes, satisfaction (Opperman, 2000), it presents a negative income effect and the lagged effect is negative. This last result is the most distinctive result of this paper signifying that papers based in cross-section data are unable to obtain lagged effects and therefore unable to give a clear view of the destination effect.

A general conclusion is that tourists seem to behave similarly in different contexts relative to some variables, but not necessarily relative to other variables. Based on the lagged effect detected in the sample, the idea of simple probit models should be abandoned in favour of dynamic models allowing for lags and leads. This result implies that each destination has its own specificity, which justifies the existence of several studies and lagged effects seems to be of paramount importance.

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Table 1. Variable Characteristics

Variable	Description	Minmum	Maximum	Mean	Std. Dev
Dependent variable					
Repeatt	Binary variable which is equal to 1 if the tourist declares he/she plans to return to Azores and zero elsewhere	0	1	0.822	0.381
Lags					
Repeatt-1	Lagged endogenous variable	0	1	0.832	0.373
Income					
Income	The respondent's income in Euro	800	5000	2550	20.793
Socio-demographic characteristics hypothesis					
Age	The respondent's age in years	15	70	42.35	10.392
Gender	The gender (1 = male, 0 = female)	0	1	0.525	0.499
Education	Education (1-university level, 0-other)	1	0	0.730	1.244
Working status	The respondent's working status (1-working; 0-not working)	0	1	0.77	0.613
Destination attributes					
Whale-watching	Which of the following activities did you experience during your stay in Azores. Whale watching (no=0, yes=1)	0	1	0.377	0.484
Bird-watching	Which of the following activities did you experience during your stay in Azores. bird watching (no=0, yes=1)	0	1	0.095	0.293
Walking tours	Which of the following activities did you experience during your stay in Azores. Walking tours (no=0, yes=1)	0	1	0.734	0.466
Cultural events	Which of the following activities did you experience during your stay in Azores. Cultural events (no=0, yes=1)	0	1	0.317	0.464
Gastronomy	Which of the following activities did you experience during your stay in Azores. Gastronomy (no=0, yes=1)	0	1	0.819	0.482
Beach	Which of the following activities did you experience during your stay in Azores. Beach (no=0, yes=1)	0	1	0.42	0.494

				6	
Night life	Which of the following activities did you experience during your stay in Azores. Night life (no=0, yes=1)	0	1	0.297	0.457
	Satisfaction				
Overall	Overall satisfaction (1-satisfied, 0-not satisfied)	0	1	0.869	0.086
Accommodation	Specific satisfaction with accommodation(1 hotel, 0-other)	0	1	0.901	0.924

Table 2. Parameter Estimates (dependent variable: Repeat)

	Panel data Probit Model	Dynamic Probit model
Variables	Coefficients (z-statistic)	Coefficients (std-error)
Repeat$_{t-1}$	_	-0.010 (-0.70)
Repeat$_{t-2}$	_	-0.108 (-7.68)*
Income	-0.042 (-3.32)*	-0.072 (-7.93)*
Income $_{t-1}$	_	-0.014 (-1.69)
Age	0.056 (2.60)*	0.016 (2.91)*
Gender	-0.044 (-1.08)	-0.006 (-0.46)
Education	-0.012 (-0.65)	0.0007 (0.12)
Working status	0.076 (2.99)*	0.039 (3.43)*
Whale-watching	-0.210 (-4.30)*	-0.085 (-5.55)*
Bird-watching	-0.210 (-2.92)*	-0.105 (-4.00)*
Walking tours	-0.054 (-1.08)	-0.004 (-0.29)

Cultural events	-0.171	-0.082
	(-3.41)*	(-5.19)*
Gastronomy	0.340	0.140
	(6.02)	(6.95)*
Beach	0.006	-0.033
	(0.14)	(-2.21)
Night life	0.146	0.025
	(2.70)*	(1.57)
Overall	0.063	0.032
	(3.02)*	(4.64)*
Accommodation	0.018	0.008
	(1.52)	(2.00)
Constant	0.070	0.992
	(0.31)	(9.98)*
Lambda	——	0.531
		(4.121)*
AR1	——	0.992
		(3.218)*
Theta	——	1.132
		(6.219)*
Nobs	4768	4768
Log Likelihood	-2090.26	-3012.14
LR Chi(29)	243.43	394.75
Proba>chi2	0.0000	(0.000)

*Means statistically significant at 1%;