Which factors affect the willingness of tourists to pay for renewable energy?

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Abstract: This study presents insights into the determinants of tourists' intention to pay a premium for accommodation in a hotel with renewable energy sources. The empirical analysis is based on the estimation of binary logistic regression models. Four subsets of independent variables were used in this empirical analysis, namely: (*i*) demographic factors, (*ii*) economic variables, (*iii*) past experience with regard to renewable energy sources and (*iv*) variables regarding environmental awareness and information dissemination. Empirical results suggest that middle-aged people are probably more willing to pay for their stay in a hotel using renewable energy. In general, men are more likely than women to pay extra money for accommodation in a "green" hotel. However, the results suggest that marital status and educational level are not statistically significant factors in the willingness to pay more. Rather, environmentally-conscious and adequately informed tourists are more willing to pay for renewable energy than others. Our analysis is focused on intention because we expect that those people willing to pay for staying in a green hotel are a potentially relevant market segment for developing sustainable tourism in Greece.

Keywords: *Tourists, WTP, Renewable energy*

1. Introduction

Contrary to fossil fuels, the intensive use of renewable energy is inextricably linked to zero greenhouse gas emissions. Thus, the penetration and implementation of renewable energy projects is one of the major goals of European countries in their quest for achieving sustainable development. However, the use of renewable energy sources is strongly related to public acceptance.

Previous studies have focused on attitudes towards green energy and on acceptance of renewable energy sources (Ek, 2005; Roe et al, 2001; Mallett, 2007; Jodert et al., 2007 Zoellner et al., 2008). Others have examined the intention of hotel customers to stay at a green hotel employing the theory of planned behaviour (Han et al., 2010; Han and Kim, 2010). In general, consumers who are more receptive to environmental products, and choose to purchase them, are willing to pay more for environmental benefits. Empirical studies have also focused on the amount that consumers are willing to pay by way of premium for renewable energy investments and the role of socio-demographic determinants in the case of Italy (Bollino, 2009) and Korea (Ku and Yoo, 2010).

Several studies have been conducted on the issue of renewable energy penetration in Crete (NTUA, 1992; Vamvuka and Tsoutsos, 2002). Crete hosts one-fifth of all tourists visiting Greece. More than 50% of all renewable energy projects in the Greek islands are implemented in Crete (Michalena and Angeon, 2009). The willingness of Crete's residents to pay for renewable energy sources was investigated by Zografakis et al. (2010).

The aim of this study is to examine the determinants that affect tourists' intention to pay more for their stay in a hotel using renewable energy sources. For this purpose, we employ cross-section data from the largest Greek island, Crete. Unlike previous studies, we chose tourists

because we expect tourists willing to pay for a stay in a green hotel to be a potential market segment important for the development of sustainable tourism on the island.

The paper proceeds as follows: Section 2 presents the methodological issues and the data used in the empirical analysis. Section 3 presents the empirical results, while the conclusions of the analysis and policy implications are discussed in Section 4.

2. Methodology

The research provides some insights into the determinants that affect tourists' positive attitude towards renewable energy. The empirical analysis is based on a cross-section data set. We carried out an extensive survey of 400 tourists during their summer holidays in Crete in 2009, using the random stratified sampling method. In particular, we distributed 100 questionnaires in each of the fourth prefectures of the island (Chania, Rethymno, Heraklion and Lasithi). The survey was conducted using a structured questionnaire and personal interviews. Given the purpose of our study, we interviewed tourists at hotels (Veal, 2006). We chose hotels at random taking into account the official hotel directory. The response rate was 80% and the survey resulted in a data set of 320 tourists. As a prerequisite, the respondents were above 18 years of age and income-earners.

Empirical results are based on the estimation of logistic regression models. Logistic regression (sometimes called the logit model) is used for predicting the probability of an event occurring by fitting data to a logit function. Logistic regression is a useful way of describing the relationship between one or more independent variables (e.g. age, gender, etc.) and a binary response variable, expressed as a probability, that has only two possible values (such as willingness or unwillingness).

In our case, under the binary logistic model, the estimated value of the dependent variable is interpreted as the probability that a tourist will pay more for accommodation in a "green hotel", as identified by the values of the explanatory independent variables. Thus, binary logistic analysis enables us to measure the impact of each variable on a tourist's intention to stay in a hotel using renewable energy sources. Four subsets of independent variables were used in this empirical analysis, namely: demographic factors, economic variables, past experience with regard to renewable energy sources, and variables regarding environmental awareness and information dissemination. Therefore, in the empirical study, we employed the following expanded specification for a tourist's willingness to pay more for accommodation in a "green" hotel:

$$W_i = b_o + b_1 A_i + b_2 TA2_i + b_3 M P g_i + b_4 K_i + b_5 D_i + b_6 I r d e_i + b_7 D_i + b_8 E_i + b_9 R h x e_i + b_1 S \rho_{i0} + b_1 R i a e n_1 + b_1 n E t_{i2} + u_i \quad (1)$$

where WTPi is a binary variable indicating whether the tourist *i* is willing to pay extra for hotel accommodation using renewable energy sources or not; specifically, the variable takes the value 1 when the tourist is willing and zero otherwise[1]. $Gender_i$ is a dummy variable accounting for 1 if the respondent is male and zero if female; Age is the respondent's age;

[1] To be more precise, we asked "Are you willing to pay extra for hotel accommodation with RES?" (Yes/No). A similar question format was followed by (Dalton et al., 2008) in Australia. Jun et al. (2010) had also performed contingent valuation methodology employing dichotomous choice questions.

$Age2_i$ is the square of the respondent's age; $Married_i$ is a dummy variable taking the value 1 if the respondent is married and zero otherwise; Kid_i is a dummy variable accounting for 1 if the respondent has children and zero otherwise; $Degree_i$ is a dummy variable accounting for 1 if the respondent has completed undergraduate studies and zero otherwise; $Income_i$ is the respondent's monthly private income in euros; $Days_i$ is a quantitative variable indicating the average duration of a hotel stay while on holidays; $Expense_i$ is a quantitative variable expressing the average holiday cost per person; $Rhome_i$ is a dummy variable accounting for 1 if the consumer has already implemented an energy conservation system at home and zero otherwise; $Satisf_i$ is a dummy variable expressing the tourist's satisfaction with a previous stay in an energy-conserving hotel (yes: 1, 0: otherwise); $Rinf_i$ is a quantitative variable expressing awareness of renewable energy sources; $Envin_i$ is a dummy variable accounting for 1 if the respondent is aware of global environmental problems and zero otherwise; and u is an error term. The empirical results from the estimation of Eq. (1) are presented in Section 3 of this study.

Table 1 summarizes the expected sign for bi coefficients of Eq. (1). In particular, it is assumed that the people most likely to pay more for accommodation in a hotel with RES are those with a positive previous experience with the implementation of energy-conserving practices. Therefore, the expected sign for variables "Rhome" and "Satisf" is positive. We also assumed that adequately informed consumers are more likely to participate in eco-friendly actions. Thus, a positive relationship should be expected between "Rinf" or "Envin" and willingness to pay. In addition, previous studies reported that higher income groups are more willing than others. Higher income groups tend to spend more money on vacations. Thus, we also expected a positive sign for "Expense". On the other hand, it may be difficult for these groups, who have longer vacation periods, to pay a premium for environmental purposes. In this case, the expected sign for the variable "Days" is negative. Although, it is difficult to predict the impact of demographic characteristics on the decision to pay more for accommodation in a hotel with RES, it is expected that highly educated consumers are more prone to support energy-conserving actions. Thus, a positive sign is expected for the variable "Degree".

Table 1. Expected sign of the variables specified in the empirical binary logistic regression

Designation	Expected sign	Designation	Expected sign
Gender	+/-	Days	-
Age	+/-	Expense	+
Age2	+/-	Rhome	+
Married	+/-	Satisf	+
Kid	+/-	Rinf	+
Degree	+	Envin	+
Income	+		

3. Results

In this section we present the results of the statistical and econometric analyses to estimate the profile of 'green' tourists. As 'green' tourists we define those consumers willing to pay extra for accommodation in a hotel using renewable energy sources.

3.1. Descriptive Statistics

From the sample of 400 tourists in question, 53.1% were women and 46.9% men. Most respondents were between the ages of 31 and 50 years (36.9%); 18.1% were between 25 and

37 years, 12.8% between 51 and 71 years and 29.7% between 18 and 24 years. As regards the educational level, 60.9% were university-educated. The majority were employees with 40% working in the private and 21.9% in the public sector, whereas 14.1% were freelancers. The tourists' average monthly private, non property-related, income was €1,400, with a large percentage of monthly incomes being no higher than €500 (17.5%). The income of 3.4% of tourists varied between €800 and €1,100 and 22.2% declared having an income above €2,000. 34.4% of tourists were married. The majority (32.8%) reported holiday expenses between €251 and €500; 25.3% between €751 and €1000 and 7.8% over €1,500. As shown in figure 1, 45% of tourists were willing to pay more for accommodation in a hotel with renewable energy sources. As to the vacation's purpose, the vast majority of respondents (92.2%) reported recreation and the rest professional reasons. Next, interviewees were asked about their past experience with renewable energy sources. In particular, 71.3% of tourists had previously implemented an energy conservation project at home, and only 25% were satisfied with their past accommodation at an energy-conserving hotel.

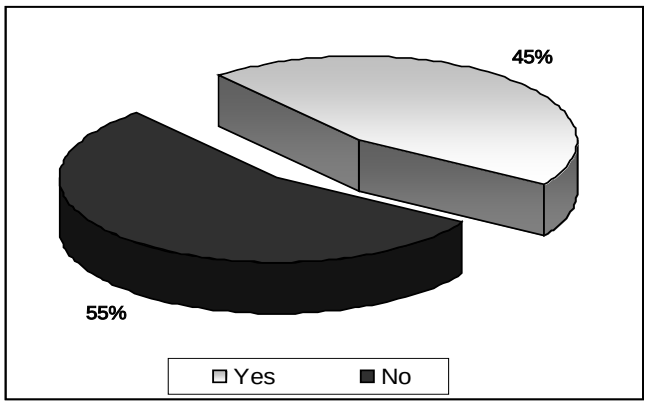

Fig. 1. Willingness to pay for accommodation in a hotel with RES

3.2. Logistic Regression Analysis

Several interesting results were obtained from the empirical estimation of Eq. (1). Table 2 summarizes the empirical results of the logit equation's estimated coefficients with respect to the willingness to pay extra for accommodation in a hotel using renewable energy sources. Statistically non-significant variables were omitted from model II. The final results for explanatory variables of tourists' willingness to pay are set out in the last column of Table 1, Model III. All the estimated coefficients of the explanatory variables presented in the final model have the expected sign and are statistically significant at a level of 5% or 1%. Estimated standard errors are corrected using White Heteroskedasticity. The Hosmer and Lemeshow statistic is one of the most reliable tests of model fit for binary logistic regression. The overall percentage of correct predictions for the final estimated model (model III) is 72.8%. The p-value 0.721 uses the Hosmer and Lemeshow Goodness-of-Fit Test with n-2 degrees of freedom. We are not able to reject the null hypothesis that there is no difference between the observed and predicted values of the dependent, implying that the model's estimates adequately fit the data. A p-value less than 0.05 indicates a good fit for a binary logistic regression model.

As follows from Table 2, men are more willing to pay extra than women, at a 10% level of significance (Model I & II). However, we didn't find any statistically significant relation between family status ("Married" and "Kid") and willingness to pay more for staying in a "green" hotel.

Age is a statistically significant factor in the willingness to pay more for accommodation in a hotel with renewable energy sources, at a 5% level of significance. Indeed, it is estimated that younger tourists are less willing to pay extra than middle-aged tourists. However, the negative sign of the estimated coefficient for the variable 'Age2' implies that age positively affects the dependent variable, but at a decreasing rate - reaching a maximum at 53 years of age

$$\frac{\partial(b_1 \text{"}A\text{"} + b_2 \text{"}AGE\text{"})}{\partial \text{"}AGE\text{"}} = b_1 + 2b_2 \text{"}A\text{"} \quad \text{"=0.106+2*(-0.001)*"AGE"=0.}$$

In particular, for all tourists under the age of 53, an increase in age will positively affect the probability of paying more to stay in a green hotel. The importance of age on willingness to pay for RES was also reported by Dalton et al. (2008), who performed a frequency statistics analysis.

Table 2. Estimated binary logistic regressions of tourists' willingness to pay more to stay in a hotel with renewable energy sources (yes: 1 no: 0)

Independent variables	Model I	Model II	Model III
Constant	-2.910***	-2.967***	-1.269**
	(4.460)	(6.146)	(4.032)
Gender	0.279*	0.308*	
	(1.715)	(1.656)	
Age	0.106**	0.104**	0.020**
	(2.619)	(3.361)	(4.136)
Age2	-0.001**	-0.001*	-0.001**
	(2.266)	(2.390)	(2.481)
Married	0.154		
	(1.204)		
Kid	-0.017		
	(0.002)		
Degree	0.090		
	(0.103)		
Income	0.135		
	(1.230)		
Days	-0.045*	-0.065**	-0.070**
	(1.839)	(3.938)	(4.500)
Expense	0.001		
	(1.577)		
Rhome	0.796***	0.796***	0.703***
	(8.085)	(8.187)	(6.691)
Satisf	0.074**	0.069**	0.075**
	(4.076)	(3.669)	(4.443)
Rinf	0.273***	0.273***	0.288***
	(4.715)	(5.018)	(5.758)
Envin	0.662**	0.635**	0.610**
	(3.033)	(2.980)	(2.873)
- 2 Log likelihood	393.541	395.512	399.677
Nagelkerke R Square	0.282	0.325	0.360

Note: ***, *, represent levels of significance at 1% and 10%, respectively. Wald statistics are presented in parentheses. Standard errors are corrected using White Heteroskedasticity.

As expected, the longest-staying respondents were also the least willing to pay more, at a 5% level of significance (Model I & II). Educational level is also included in the first model, indicating that there is a positive, but statistically insignificant relation, between higher education and willingness to pay. Generally, tourists with a positive past experience at an energy-saving hotel are more likely to be willing to pay extra for their accommodation in a hotel implementing renewable energy projects, at a 5% level of significance. Accordingly, those tourists who have not previously adopted an energy conservation project at home are less likely to pay more for staying in a "green" hotel than others, at a 1% level of significance. As Bollino (2009) mentioned, those consumers who have a positive attitude to renewable energy technologies, will be prone to pay a surplus.

As far as economic parameters are concerned, the estimated coefficients for income and holiday expenditure are (as expected) positive, but not statistically significant. These results may explained by the following three parameters: (i) the economic uncertainty that influences consumers' decision making process (ii) the fact that consumers stated preferences vary over time depending on their experience or knowledge and (iii) the hypothetical nature of the contingent valuation question and the fact that and consumer may value different public goods (Wang and Whittington, 2005). In contrast to the above-mentioned conclusion, the empirical results indicate that there is a positive, statistically significant, relation between information dissemination on renewable energy sources and willingness to pay, at a 1% level of significance. This result is in line with Roe et al. (2001) study for U.S. electricity consumers. Accordingly, environmental awareness about global environmental problems positively affects the probability of paying more, at a 5% level of significance. Zografakis et al. (2010), had also pointed out that high awareness levels or energy saving behavior resulted in a positive attitude for renewable energy sources.

4. Discussion and Conclusions

This paper has focused on providing insights into which factors affect tourists' willingness to pay for renewable energy sources in Greece. The empirical results suggest that middle-aged people and men are more likely than others to pay a premium for accommodation in a hotel with renewable energy practices. This study also shows the importance of information dissemination and environmental awareness in the willingness to pay for renewable energy sources. In particular, past experience, environmental awareness and information dissemination are strong, statistically significant, factors that positively affect tourists' willingness to pay for accommodation in a green hotel. Bearing in mind that tourism is considered to be Greece's "heavy" industry, it is important for enhancing sustainable development that hotels embrace renewable energy technologies. Accordingly, policies aimed at increasing consumer acceptance of green hotels can contribute to the adoption of sustainable lifestyles. As tourists become more sustainable consumers, the impact of tourism on the environment is limited. In this context, investigating the socioeconomic profile of tourists willing to pay a premium would have multiple useful policy implications. In particular, in the business sector, green hotel managers could expand their market share by focusing their advertising campaigns on those less willing to pay for renewable energy sources. Thus, green advertising can enhance a hotel's economic viability by increasing tourist demand. On the social level, renewable energy projects in hotels can contribute to environmental protection. However, further research is needed to achieve this goal in the tourism sector. Specifically, more analysis is needed on how information feedback can influence a tourist's actual choice in favour of a green hotel, rather than relying solely on self-reported intentions to pay more for one. More importantly, there must be an emphasis on the various barriers that tourists report when it comes to accepting to pay more for renewable

energy sources. In the case of willing tourists, research is needed on economic or other incentives for paying more and achieving sustainable behavioral consumption patterns.

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