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Research Paper

Recreational Value of Vellayani lake in South India: A Travel Cost Approach

Economic

KEYWORDS : Travel Cost Method, Poisson Regression, Count data Model, Trip Generating Function, Consumer Surplus

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ABSTRACT

Travel cost method (TCM) is a consumer oriented method used for estimating recreational values of natural resources. Vellayani lake is the only freshwater lake of Thiruvananthapuram district of Kerala state. Satellite imageries revealed that the lake has got an area of 243.39 ha in 2011. The serene picturesque beauty of the lake has attracted several people towards it. The lake is also part of religious and cultural functions. For empirical estimation of the Trip Generating Function of the Travel Cost Method poisson regression for count data was used. The sign and significance of travel cost variable (-0.0018) was consistent with economic theory. By finding the absolute value of reciprocal of travel cost coefficient, consumer surplus per visit was estimated as Rs. 555.55. The estimated total recreational value of the lake obtained by multiplying the total number of vistors by the consumer surplus per visit was Rs. 55.83 lakh per year.

Introduction

Travel Cost Method (TCM) is a standard procedure for estimating the recreational value of natural resources. TCM is considered as the oldest method for assessing environmental amenities, developed by Harold Hotelling in 1947. His model was extended by Clawson and Knetch who employed the price of substitutes and quality of evaluated destinations (Spacek and Antouskova, 2013). TCM estimates the Marshallian consumer surplus, which approximates, and is bounded by, the compensating variation (CV) and equivalent variation (EV) welfare measures (Brander *et al.,* 2006). It is based on actual behaviour or what people actually do rather than willingness to pay or what people say they would do in a hypothetical situation. It is a non-market procedure whereby a recreational site value is estimated by considering how much people spend to access the site (Limaei, 2014).

Vellayani lake is the only freshwater lake of Thiruvananthapuram district of Kerala state. The area of the lake as per IRS-P6 satellite imageries in 2011 was 243.39 ha. The serene picturesque beauty of the lake is attracting several people towards it. The lake is also part of religious and cultural functions. Its relevance in tourism is increasing owing to its proximity to Kovalam beach, the world famous tourism spot. In this context, the present study was conducted to estimate the recreational and spiritual value of Vellayani lake using TCM.

Materials and Method

TCM methodology is a surrogate market approach where by expenditure in an associated market, (in this case the market for travel) is used to estimate the benefits of the recreation service provided by natural areas. The travel cost incurred by individuals while visiting a recreation site is an implicit price for the services of that site. Exploiting the empirical relationship between increased travel distances and associated declining visitation rates would allow for the estimation of the demand relationship. In this way, the Marshallian demand curve for the recreation service can be estimated and appropriate consumer surplus measures calculated thus provides a basis for comparing them with the cost of their supply (Driml, 2002).

At first, a pilot study was conducted to identify the recreational, spiritual and cultural activities of the lake. The study revealed that the spiritual activities for which people are coming to the lake was for performing *Karkidaka vavu bali* (religious ritual performed by Hindus in the lake), cultural activity was watching Ayyankali boat race and the recreational activities included bird watching, photography and enjoying the beauty of the lake.

Data collection was done from random sample of respondents during the *Karkidaka vavu bali* and boat race. The main recreational area identified for visitors for recreation was the reservoir bund area of the lake. These visitors were surveyed during the month of October 2013. The survey was conducted in reservoir area from 7.00 am to 5.00 pm as the opportunity for enjoying the cool serene beauty of the lake and bird watching was more in this area.

Visitors making multi destination trips were purposively avoided as it was commonly observed that the people travelling along the bund roads halt a few minutes to enjoy the beauty of the lake and the gentle breeze.

The collected data were critically examined to get the respondents who gave reasonable answers, who made single destination visits and who incurred an expense in visiting the lake. The total sample size selected was eighty five.

The total number of visitors coming for performing spiritual activity *ie. Karkkidakavavu bali* was obtained from the temples in the boundary *viz.* Thrikulangara Mahavishnu temple and Vevila Mahavishnu Temple and that for Ayyankali boat race was collected from *Ayyankali Jalolsava Samithi.* The total number of visitors for other purposes were estimated by extrapolating the number of visitors during the surveyed month for the entire year.

For empirical estimation, the study employed Individual Travel Cost Method. Poisson regressions are one type of generalised linear model. It assumes that the response variable follows a Poisson distribution conditional on the value of the predictor variables. Here the number of trips is a non negative integer. A Poisson model can be used to model invisible goods, for which the probability distribution defined only over the non-negative is required. This can be used to model the occurrence of an event of interest as a function of predictor variables. The Trip Generating Function (TGF) was estimated using poisson regression for count data. Econometric reasons for choosing a count data model was explained by Hellerstein and Mendelson (1993).

A random variable Y is said to have a Poisson distribution with parameter μ if it takes integer values y = 0, 1, 2, . . . with probability

$$\Pr(Y = y) = \frac{e^{-\mu}\mu^{y}}{y!} \qquad \text{for } \mu > 0.$$

The Poisson regression model uses a log link function that relates the expected value of the response variable to the linear predictor. This ensures that the mean remains positive for all linear predictors and hence positive for all parameters and co-variate combinations. Use of Poisson regression for count data model for TCM studies had been confirmed by Fonseca and Rebelo (2010). The method of maximum likelihood was used to estimate the parameters of TGF. This method isolates the parameter estimates that are most likely to occur in the given data. These parameter estimates maximize the likelihood function which expresses the probability of the observed data as a function of unknown parameters (SAS Institute, 2008). The data was analyzed using SAS package with Poisson regression for count data model.

The consumer surplus (CS), which is an approximation of compensating variation) can be found out by integrating the area under the demand curve. The consumer surplus per trip can be estimated from this model as,

Where, β_4 is the estimated coefficient of travel cost (Hanley *et al.*, 2007). The CS is multiplied by the total number of visitors to get the recreational value of the site (Anoop, 2008).

Results and Discussion

Trip generating function was derived by making the number of visits made per year as a function of relavent variables. The functional form of the trip generating function is given below.

$$\mathrm{Log}(\mu) = \beta_0 + \beta_1 A_i + \beta_2 I_i + \beta_3 T_i + \beta_4 C_i + \beta_5 P_i$$

or

$$\mu = \exp(\beta_0 + \beta_1 A_i + \beta_2 I_i + \beta_3 T_i + \beta_4 C_i + \beta_5 P_i)$$

Where,

μ - Number of visits made per year

A_i - Age of respondent in number of years

β_1 - Regression coefficient of A_i

I_i - Individual income(Rs/month)

β_2 - Regression coefficient of I_i

T_i - Time spent in lake in hours

β_3 - Regression coefficient of T_i

C_i - Travel cost incurred per trip to visit the site (Rs.)

β_4 - Regression Coefficient of C_i

P_i -Purpose of visit

β_5 - Regression Coefficient of P_i

The criteria for assessing the goodness of fit of Poisson regression for countdata is given in Table 1.

Table 1.Criteria for goodness of fit of Poisson regression

Criteria For Assessing Goodness Of Fit			
Criterion	DF	Value	Value/DF
Deviance	78	203.2462	2.6057
Scaled Deviance	78	203.2462	2.6057
Pearson Chi-Square	78	203.4124	2.6079
Scaled Pearson X2	78	203.4124	2.6079
Log Likelihood		806.6812	
Full Log Likelihood		-259.0617	
AIC (smaller is better)		532.1233	
AICC (smaller is better)		533.5779	
BIC (smaller is better)		549.2219	

The value /DF (Degrees of freedom) values are computed by dividing the goodness of fit statistics by degrees of freedom. These values for the scaled deviance or the scaled Pearsons chi square are useful for assessing the goodness of fit of the model. Values close to 1 indicate good model fit. The value/ DF column was 2.6057 for scaled deviance and 2.6079 for scaled Pearson chi square. They are not close to one. This might indicate over dispersed data which occurs frequently in Poisson regression. But over dispersion does not affect parameter estimates (SAS Institute, 2008).

The fit statistics included the Akaike Information Crieteria(AIC), the Corrected Akaike Information Criteria (AICC) and Beyesian Information Criteria (BIC). Each statistics is a measure of the goodness of the model fit. Smaller value represents better fit. Different models were estimated taking into account various combinations of the explanatory variables. The model with the smallest AIC (532.12), AICC (533.57) and BIC (549.22) values was selected for the study. The parameter estimates are given in the Table 2.

Table 2. Parameter estimates of TGF

Parameter	DF	Estimate	Standard Error	Pr > ChiSq
Intercept	1	2.1766**	0.253	<.0001
Age(A_i)	1	-0.0041	0.0033	0.2173
Individual income(I_i)	1	0.000	0.000	<.0001
Time spent (T_i)	1	0.0769*	0.0382	0.0443
Travel cost (C_i)	1	-0.0018**	0.0007	0.0085
Purpose of visit (1)	1	-0.2702*	0.1338	0.0435
Purpose of visit(2)	1	-0.3155**	0.1075	0.0033
Scale	0	1	0	

** Significant at 1 per cent level of significance

The signs and significance of estimated co efficient of the present study were consistent with economic theory. The negative sign and significance of travel cost variable (-0.0018) indicates a demand schedule which is consistent with recreation demand studies of Shrestha *et al.* (2002) and Marawila *et al.* (2010). It also indicates that the visitation rate decreases as travel cost increases. Other significant variables were income, time spend in the lake, and purpose of visits.

Consumer surplus is widely accepted measure of net social benefit (Zawacki *et al.*, 2000). By finding the absolute value of reciprocal of travel cost coefficient consumer surplus per visit was estimated as Rs. 555.55. The estimated total recreational value of the lake obtained by multiplying the total number of vistors by the consumer surplus per visit was Rs. 55.83 lakh per year (Table 3).

Table 3. Recreational value of Vellayani lake

Particulars	Value
Consumer surplus per visit	Rs 555.55
No of visitors per year	10050
Total Consumer surplus	Rs 5583278
Recreational value in lakh Rs year $^{-1}$	55.83

*Significant at 5 per cent level of significance

In a similar attempt to determine the recreational value of the Periyar Tiger Reserve of Kerala, Bulov and Lundgren (2007) used TCM to determine the consumer surplus as 15 billion USD. Similarly recreational value of Ashtamudi estuary employing TCM by Anoop (2008) was Rs 0.15 crores which is less than the estimated value of Vellayani lake. Dehalavi and Adil (2011) also applied TCM to Keenjhar lake and estimated the recreational value of the lake as 42.2 million USD.

The recreational value even though does not appear impressive in economic terms, it is significant to note that the amount is derived from a natural resource which is not a renowned tourism spot. But as it is a pristine and picturesque lake the opportunity for tourism is there and so the study assumes relevance. At present the lake is a drinking water source for the surrounding panchayats and its role in maintaining water security for people enormous. So it is imperative that ecotourism may be promoted, preserving the cultural, spiritual and natural quality of the lake without disturbing it by conserving the environment and the water quality.

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