JOURNAL OF FOREST SCIENCE, *62*, 2016 (9): 399–406

doi: 10.17221/12/2016-JFS

Determining the recreational value of forest park by travel cost method and defining its effective factors

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ABSTRACT: Considering the importance of recreation and excursions in household's basket of expenditures on the one hand, and not paying attention to the economic value of recreational function for natural resources and environment as non-market goods on the other hand, this paper was written with the aim of estimating the recreational value of Shahid Zare Sari Forest Park when using the individual travel cost method. Requested data sets were obtained by completing questionnaires from 302 individuals who visited the above-mentioned park in 2012–2013. In the individual travel cost method, for the investigation of distributional effects of variables on the number of travels, a linear regression model was applied. For this purpose the travel generation function using linear, double log, linear-log and log-linear forms was estimated. Among these forms, according to the econometrical parameter, a linear function was selected and parameters were estimated based on the method of ordinary least squares. The consumer surplus was 12.53 USD per each visit and the annual recreational value of 72,500 people who visited the park annually was 52,558 USD·ha^{-1}. The findings also showed that the involved variables, travel costs, income and visitor's distance were statistically significant at 1% level and family and education were significant at 5% level. Results revealed that forest parks have a considerable recreational value that, from this point of view, can help programmers and executives, social and economic managers in the preservation planning and sustainable utilization of natural resources.

Keywords: Shahid Zare Forest Park; travel function; economic value; consumer surplus

One of the key elements of ecologically sustainable development is to ensure that environmental assets are valued appropriately. This concept of valuing the environment inevitably leads to questions being asked about the extension to which accounting for the environment could take place in financial terms. In recent years, resource economists have begun the task of quantifying the contribution of forest resources to human wellbeing (Amirnejad 2005). Total Economic Value of natural resources can be split into two main groups of use and non-use (intrinsic) values. Use values are derived from the actual usage of environment (such as income from timber, recreational activities). Values defined by selecting the type of environment use (selection value) in the future are little more complicated. They are basically an indicator of willingness to pay for preserving environmental systems or system components for people's possible use in future (e.g. personal entertainment in the future). Values of future generations are not a use value to the present assessment, but they will be counted as a potentially use value or as a non-use value for future generations (such as recreation of future generations). However, the measurement of non-use values is more complicated, because these values are not exchanged. In addition, these values are distinguished as values that indicate the preference rate of people (like recreation of future generations), and also empathy and respect as well as welfare to other animals such as maintaining the biodiversity are considered in this approach (Dehghanian et al. 1995). A large number of values of parks are not exchangeable in the market, so their value is not easily and directly defined and the demand for public parks cannot be determined by market equations. This issue causes the difficulty to evaluate the value of the parks because while the planners try to maximize social welfare, they should be able to determine the level at which the benefits of creating a park will be more important than costs. Various methods have been presented in order to determine the demand curve for parks and other public goods that it is possible to evaluate various values of parks. As it is concluded, the travel cost method is the most important and widely used technique for measuring the consumer surplus of recreation. According to this method, it is assumed that the value of recreation sites is severely related to the costs that people use for recreation (Lansdell, Gangadharan 2003).

There are a number of techniques developed by economists which can be used to assess the economic benefits generated by wilderness recreation. Two prominent methods are the travel cost method (TCM) and the contingent valuation method (CVM). Travel cost method can be used to estimate the costs-benefits of a recreational site such as: elimination of an existing recreational site, addition of a new recreational site and changes in environmental quality at a recreational site. Travel cost method is relatively uncontroversial, because it is modelled on standard economic techniques for measuring value, and it uses information on actual behaviour rather than verbal responses to hypothetical scenarios. It is based on the simple and well-founded assumption that travel costs reflect the recreational value. It is often relatively inexpensive to apply. Arbab (2003), however, suggested that CVM should not be used in developing countries. According to Cooper (2000), TCM is "the best method of evaluating and determining willingness to pay (WTP) of recreational regions". Travel cost method has been widely proposed for evaluating nonmarket goods and/or services. It has been especially used for evaluating recreational sites in Iran (Sohrabi Saraj et al. 2009). Hence, the main objective of this study was to use TCM to empirically estimate the value of ecotourism benefits of Shahid Zare Forest Park (SZFP), as one of the most potentially hedonic forest parks across the region.

Many studies have been conducted about the benefits obtained by recreational places using TCM. Shrestha and Loomis (2003) conducted a meta-analysis of outdoor recreation economic values of the past 30 years in USD and found a mean predicted consumer surplus (CS) value of 47.10 USD·day^{-1} with the original values extracted from existing recreation valuation studies ranging between 1.97 and 116.78 USD. Past studies also indicated that pristine natural resources and wilderness sites are highly valuable (Twerefou, Adjei Ababio 2012). In Nillesen et al. (2005), by choosing a reverse form of travel function, the recreational value of Bellenden Ker National Park in Australia using regional travel costs was estimated to amount to 250,825 USD·yr^{-1}. In another research, in Pak and Fehmi (2006) the value of Kayabasat forest recreation site located in the east Black Sea region of Turkey was estimated by means of total CS by using the individual travel cost method (ITCM) as 522.79 × 10^{9} TRY (442.233 × 10^{9} USD) per year. Chae et al. (2011) concluded that the average CS for visiting the protected marine natural areas of land with travel cost was 359–574 GBP per travel. Amoako-Tuffour and Martínez-Espiñeira (2012) determined individual CS per travel for Gros Morne National Park using individual travel that was 1,000 USD. A few studies to evaluate recreational values of parks by travel cost method have been conducted in Iran. Yachkaschi (1972) concluded that the recreational value of park located in the north of Iran by TCM was 8.15 USD. Kavianpour and Esmaieli (2002) also mentioned that the recreational value of Sisengan Park was 2,143 USD·day^{-1} after calculating the cost, number of visitors and distance properties. The values of Khazaneh and Meli Park located in Tehran by TCM were 8.52 and 2.24 USD·ha^{-1}, respectively (Majnounian 1977). Seodi Shahabi and Esmaieli Sari (2006) determined the recreational value of Anzali Pond to be 5,040.64 USD by TCM. This determined that the recreational value of Fadak Park located in Khoy city with the use of individual travel cost was 10,445.34 USD (Hayati et al. 2011). Willis and Garrod (1991) using both the zonal travel cost method (ZTCM) and ITCM to evaluate forest recreation concluded that there are significantly different results for the two approaches but they put more emphasis on the use of ITCM.

The travel cost method first suggested by Hotelling (1974) in a letter to the US Department of Interior's Park Service and subsequently developed by Clawson (1959) to estimate benefits from recreation at natural sites is widely used to estimate use values of recreational sites. The method assumes that the travel cost that people incur to visit a site represents the price of access to the site. Thus, individuals' WTP for a visit to a site can be estimated based on the number of trips they make at different travel costs. Based on the choice of the dependent variable – visits, there are two main variants – ZTCM and ITCM. The zonal travel cost method uses information on the number of visits to the site from different zones at different prices to construct the demand for the site and consequently the estimation of the economic benefits of the recreational services of the site. The individual travel cost method defines the dependent variable as the number of site visits made by each visitor over a specific period, for instance, in a year (Twerefou, Adjei Ababio 2012). In our study, we use the ITCM due to its ability to produce precise results. Our empirical literature review will therefore focus on ITCM. The purpose of this study is to examine and estimate the recreational value of Shahid Zare Forest Park of Iran using ITCM and defining its effective factors.

MATERIAL AND METHODS

Study area. The study site is Shahid Zare Forest Park, a 70 ha forest park located near Sari city in Mazandaran Province, northern Iran. Shahid Zare Forest Park is one of the most valuable parks in Iran interesting for a large number of visitors in holidays and on weekends. People's demand for recreation and the importance of environmental supplies like this park are the main reasons that the forest park like SZFP will attract more attention and various studies about these natural supplies are needed. Therefore, this study was aimed to estimate the recreational value of SZFP and determine the effective variables in relation to the number of visitors.

Travel cost method. The travel cost method is a non-market procedure which seeks to place a value on recreational sites by using consumption behaviour in related markets (Fleming, Cook 2008). The underlying assumption in TCM is that the value of a place is equal to the costs respondents pay to use that place. In essence, the TCM evaluates the recreational use benefit for a specific recreation site by relating demand for that site (measured as the quantity of site visits) to its price (measured as the costs of a visit). A simple TCM model can be defined by a trip generation function (f) as follows (Eq. 1):

$$V = f(C, X) \quad (1)$$

where:
V – number of visits to a recreation site,
C – cost per visit,
X – other socio-economic variables which significantly explain V.

There are two forms of travel cost methods: ZTCM and ITCM. The latter method is used in this research to determine the recreational value. Generally, some data on the number of visitors from places with different distances are collected in ZTCM. Since the cost and the time of travelling increase by distance, these data allow the researcher to calculate the number of visitors at different costs. These data are used to draw the regional demand curve and to estimate the extra visitors or the economic profits of the recreational services over the area. In comparison with ZTCM, the number of visits paid by an individual per year is mostly used to draw the demand curve in ITCM. This method requires the collection of more data and a more complicated analysis. In this method, like in ZTCM, consumer's extra welfare and the real and physical capacity borders of the recreational site can be calculated. In the study, ITCM was applied to estimate the value of the recreational use of the forest site allocated for the recreational purposes. To estimate the travel function, a linear regression model is used. This model has different forms like linear function, log-log, linear-log, log-linear and reciprocal transformation. These models are linear from the point of view of their parameters; however, from the point of view of input variables they can also be linear or nonlinear. In this study, to study the effects of explanatory variables including economic and social variables on the number of visits to estimate the recreational value of forest park, a linear model is used (Eq. 2):

$$V_i = f(TC_i + P), X_{1i}, \ldots, X_{ni} \quad (2)$$

where:
V_i – number of visits made by individual i to a recreation site per year,
TC_i – individual travel cost per one visit,
P – participating cost for respondents from the park,
$X_{1i}, \ldots, X_{ni}$ – economic and social variables like income, education rank, age, preferences and proximate substitutions characterizing individual visitors (Lansdell, Gangadharan 2003).

In this way, the base of ITCM is formed. After estimating the above formula by gathered data, it is used to estimate the request equation. By increasing the hypothetical participating price and by Eq. 3, the number of total visits (Q) for each of variable prices is obtained:

$$Q = \sum_{i=1}^{n} f(TC_i + P) \quad (3)$$

where:
TC_i – individual travel cost per one visit,
P – participating cost for respondents from the park.

The important and basic result taken from estimating TCM is to estimate CS. The consumer surplus is obtained from the total individual CS. The level below the Marshal cycloid will be the reagent of the CS. The park has no participating cost, the whole level below the cycloid will show consumer's economic benefit (Eq. 4; Lansdell, Gangadharan 2003):

$$CS = \int \sum f(TC_i + P)dP \quad (4)$$

where:

CS – consumer surplus,

TC_i – individual travel cost per one visit,

P – participating cost for respondents from the park.

In this study, the total travel cost of each respondent is obtained from the total price of fare (if someone used his/her own car), the cost of time fortune and the cost of recreational site like recreational and refreshment facilities of the park. The cost of fortune is identified as 1/3 of the wage rate (Gurluk, Rehber 2008). The obtained cost of total travel is like the cost of a group, and the cost of a particular travel is obtained as the result of dividing the group cost by the number of group members. This procedure and all the other statistical analyses of assumed variables, the estimation of parameters by a linear regression model including calculating the form of the assumed linear function have been carried out using the MS Excel (Version 12.0.6425.1000, 2007) and Eviews (Version 5.1, 2007) software.

Sampling method. The sample size (number of questionnaires) is an important issue for the proper and reliable estimating of the economic value of the site. The sample was selected using a random method. In order to estimate the sample size, 80 preliminary questionnaires were used. Then the variances of questions were determined. The Cochran function (Eq. 5) was used to determine the number of required questionnaires (Cochran 1977):

$$n = \frac{Nt^2s^2}{Nd^2+t^2s^2} \quad (5)$$

where:

n – number of questionnaires (sample size),

N – population size (number of people who visit the recreational area),

t – critical value of Student's t-distribution when the number of observations (n) → ∞ and Student's t-distribution converges to the uniform normal distribution N (0; 1),

s^2 – estimated variance of responses to the questions in preliminary questionnaires,

d – required maximum error of estimation (it usually ranges between 1 and 10%).

The general rule relative to acceptable margins of error in educational and social research is as follows: 5% margin of error is acceptable for categorical data, and 3% margin of error is acceptable for continuous data (Yusuf Alhaji 2010).

The sample size estimation is usually done at two stages. At the first stage, it is assumed that it is possible to ignore the fraction size of n/N. Then, the following Equation (Eq. 6) is extracted from Eq. 5:

$$n = \frac{t^2s^2}{d^2} \quad (6)$$

where:

n – number of questionnaires (sample size),

t – critical value of Student's t-distribution when the number of observations (n) → ∞ and Student's t-distribution converges to the uniform normal distribution N (0; 1),

s^2 – estimated variance of responses to the questions in preliminary questionnaires,

d – required maximum error of estimation (it usually ranges between 1 and 10%).

Replacing the values of t, s and d in Eq. 6, the required sample was determined and it was 396 questionnaires:

$$n = \frac{t^2s^2}{d^2} = \frac{(1.96)^2 \times (0.406)^2}{(0.04)^2} \cong 395.77$$

However, 94 questionnaire forms have been removed because of incorrect and defective responses to question forms. The number of samples was measured to determine the recreational value of the park by the travel cost method using 302 questionnaires in the six months of 2012 and 2013. The questionnaires contain two main sections including firstly the socio-economic factors such as job, education, living place, family members, family income, etc. and secondly, the questions related to a distance to the park, vehicle type, time and cost.

RESULTS

Table 1 shows some statistical variables studied in the present research. The average age, family members, the number of educational years and the monthly income of family were 37.48 yr, 3.5 individuals, 12.99 yr and 383.62 USD, respectively. In addition, the mean annual visits were 4.09 times and the average distance from the park was 28.79 km.

The questions the visitors were asked were related to their travel cost to access the park which includes round-trip costs, food costs, car costs, other expenses (entrance, pavilion, play equipment, etc.) and also

Table 1. Statistical results of socio-economic characteristics of respondents

Model variables	Average	SD	Maximum	Minimum
Age (yr)	37.48	11.08	70	21
Education (yr)	12.99	3.34	22	0
Number of family members	3.50	1.27	8	1
Family income (USD)	383.62	216.98	1720.64	101.21
Number of visits made by individual in a year	4.09	2.39	10	1
Distance (km)	28.79	59.56	343	5
Total travel cost (USD)	14.04	4.71	35.91	4.21

the opportunity cost was time because this value was one-third of the hourly wage and it was computed based on visitor's stay length. Most visitors (56.69%) paid 10.16–16.19 USD to SZFP. The visitors who stayed in the park were classified into tree classes. Most visitors stayed in the park between 6 and 11 pm (84.44%). Due to the fact that the economic theories provide little information about choosing an appropriate functional form, selecting the functional form of travel cost was statistically performed. Generally, reciprocal transformation, log likelihood, adjusted R^2 and F-statistic are used for evaluating different functional forms. However, as the meaning of variables in the linear model is more appropriate than that in the logarithmic model, so the linear model was selected to estimate the travel function. Other criteria are fairly similar and the probability of F-statistic is significant at the 1% level in the linear model (Table 2).

As it is seen from Table 2, it is clear that from seven variables in the regression model, variables including travel cost, family income, family members, distance and education were statistically significant and their signs were similar to economic theories and had effects on visitor's times in the park. On other hands, the other variables were not statistically significant and did not have a significant effect on visitors, but their signs were acceptable and can be interpreted. Based on the findings, travel costs coefficient to visit the place was –0.0000052. A 1% significance level was obtained which indicated that when there was an increase of 0.4 USD in the travel cost, the number of visits would decrease by 0.052 and also the sign of the coefficient was consistent with the theory. Income had a positive and significant coefficient at the 1% level. According to the coefficient, by increasing the income by 0.4 USD

Table 2. The results obtained from estimating different trip function forms

Model type	Variable	Coefficient	SE	t-Statistic	Significant variables (%)	Statistic
Linear	total travel cost	–0.00000525**	0.00000140	2.919	71.43	log likelihood = –641.78 adjusted R^2 = 0.23 F-statistic = 13.71 Durbin-Watson = 1.97
	family income	0.000000121**	0.0000000269	–3.749		
	education	0.0859*	0.041	2.112		
	family members	0.221*	0.113	1.958		
	distance	–0.011**	0.002	–5.006		
	constant	2.24**	0.771	2.909		
Linear-log	total travel cost	–0.815**	0.365	–2.232	57.14	log likelihood = –625.29 adjusted R^2 = 0.30 F-statistic = 19.08 Durbin-Watson = 1.92
	family income	1.115**	0.238	4.677		
	education	0.61*	0.276	2.216		
	distance	–0.87**	0.121	–7.234		
	constant	–5.24*	4.399	–1.192		
Log-linear	total travel cost	–0.00000211**	0.000000595	–3.45	57.14	log likelihood = –384.45 adjusted R^2 = 0.23 F-statistic = 13.52 Durbin-Watson = 2.06
	family income	0.0000000437**	0.0000000437	3.817		
	family members	0.089*	0.048	1.866		
	distance	–0.005**	0.0009	–5.793		
	constant	0.61**	0.327	1.885		
Log-log	family income	0.31**	0.101	3.127	28.57	log likelihood = –366.74 adjusted R^2 = 0.29 F-statistic = 18.49 Durbin-Watson = 2.01
	distance	–0.43**	0.0512	–8.446		
	constant	–1.19	1.858	–0.641		

*statistical significance at 5% level, **statistical significance at 1% level the number of visits can also show an increase up to 0.0012. Distance from the park had a negative coefficient at the 1% level. According to this coefficient, with increasing the distance by one km, the number of visits will decrease by 0.013. The education variable with positive coefficient was significant at the 5% level while this coefficient indicates that increasing the education level by one year can make an increase of visitors by 0.086. In addition, with an increase by one member of the family an increase in the number of visits by 0.22 was found out. These results were proved by those obtained by Nillesen et al. (2005), and Hayati et al. (2011). The differences in values can be due to the type of travel cost method, the type of model, computing types of the values (Lansdell, Gangadharan 2003). Pearson's coefficient was 0.25%, which indicates that the respective variables in the model could explain 25% of the dependent variable, i.e. the times of park visit. In addition, the Durbin-Watson statistic was 1.97, which shows the lack of auto-correlation at 1% level in the model. Subsequently, the *F*-statistic was significant at 1% level, which shows that the model is completely significant at 1% level.

The estimated Equation of Travel Cost according to the finding of the research in Table 2 is inserted as Eq. 7:

$$N = 2.5764 - 0.00000525TC \qquad (7)$$

where:

N – population size (number of people who visit the recreational area),

TC – travel cost.

Travel cost using the integral function was 0–490,742.85 IRR, which was the value for family and the value for each person was 140,212 USD (Eq. 8):

$$\text{welfare surplus} = \int_0^{140.212} (2.5764 - 0.00000525TC)\, dTC = [2.5764TC - 0.00000525\,(TC)^2/2]_0^{140.212} = 309{,}472.351 \text{ IRR (12.53 USD)} \qquad (8)$$

where:

TC – travel cost.

The visitors to the park were 72,500 in 2012 and the mean annual times for each person were 4.05. Therefore, the recreational values of SZFP can be obtained by Eq. 9:

The annual recreational value of the park = user's welfare surplus × mean number of visits × total visitors = 12.53 × 4.05 × 72,500 = 3,679,121 USD (9)

The park covers 70 ha and also this value was 52,558 USD·ha^{-1}. The cost can be determined as the most effective factor on demand. The relationship between the number of visits and travel cost showed a negative and significant correlation, which indicates that with increasing cost the number of visits will be reduced.

DISCUSSION

The objective of this study was to estimate the economic value of SZFP as a recreational site in the north of Iran. Therefore, the monetary value of the above-mentioned recreational site using TCM was estimated. Travel cost method is used for estimating the economic values of environmental goods and services. It is usually applied to estimate economic values of sites such as national parks and forest parks for recreation.

The results were not similar to those obtained by Yachkaschi (1972), Hayati et al. (2011), and Chae et al. (2011). A strong correlation was found between the number of visit days and the income level when this result was proved by findings of Shrestha et al. (2002, 2007), Hayati et al. (2011), Chae et al. (2011), and Twerefou and Adjei Ababio (2012). Income and cost are not the main factors for attracting the people to come to the park. The results showed that local people covered a large number of visitors; i.e. with increasing distance from the park, the number of visitors would also decrease. This conclusion can be approved by the results of various researches including those obtained by Mojabi and Mansori (2005), Mafi Gholami et al. (2011), and Twerefou and Adjei Ababio (2012). This result showed that the education level has a significant role in attracting visitors to SZFP. Education level has a strong and positive relationship with income. People with a high level of education like to use natural resources and environmental supplies, so it is clear that if we want to get an appropriate level of tourism industry, we should enhance the level of people's education. People with a high level of education can protect their environment from damaging factors. The results of this part are similar to those obtained by Mojabi and Mansori (2005), Shrestha et al. (2007), Mafi Gholami and Yarali (2008), and Twerefou and Adjei Ababio (2012). The relationship between family members and the number of visits was positive and significant. The main reason for this issue is related to the fact that local families are large families and all of them can easily visit the park. The results of this study can improve the quality of environmental services of the SZFP and expand varieties of services that they could supply based on the people's demand.

The results of the present study showed that improving the eco-environmental resources and/or ecotourism services can have a valuable effect on the increase of the visitor's demands and the WTP in such a forest park, though there are other effective factors like costs, users characteristics, distance to access.

The park, time needed to reach the park, time needed to pass through the area, people's leisure time, amount of working hours per week, the visitor's job, the population residing in the park's region, available installations and facilities, and the landscape features actually play their role in the demand. Nevertheless, the improvement of eco-environmental resources/services can be the most significant factor which could be effective in visiting the park, in addition to the costs and users income. Accessibility of enough public transportation facilities (e.g., tele-cabin, hostels/residential venues offering required facilities) can persuade much more visitors to visit the area.

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Received for publication February 7, 2016
Accepted after corrections July 14, 2016

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