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DETERMINING TOURISM VALUE OF NATIONAL PARK OF URMIA LAKE IN IRAN BY FAMILY PRODUCTION FUNCTION

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Abstract:
According to the importance of environmental resources in preserving natural ecosystems and human life, preserving these resources and preventing their destruction is necessary. National Park of Urmia Lake in West Azarbayjan province of Iran is the settlement of rare species for different animals and herbs. Every year a lot of internal and foreign passengers and tourists visit this national Park, so the purpose of this study is recreation demand function derivation in National Park of Urmia Lake and determining social and economic factors on demand function. So we used travel cost pattern within the frame work of family production function. Optimal sample volume was 75 tourists and data is related to 2010 summer. Results showed recreation demand function has positive relation with tourists income, quality of National Park and visitor`s education, also it has negative relation with recreation shadow price that is according to theoretical expectations. So, quality improvement of National Park as an effective key factor on recreation demand and using suitable pricing policy are recommended.

Key words: family production function, recreation demand function, econometric methods, National Park of Urmia Lake.

Jel Classification: Q51, Q56

INTRODUCTION

In recent years, economic value of environmental resources for various reasons such as necessity of calculating environmental degradation, green national accounts preparation, taxation and suitable charges for controlling and preventing recreation centers destruction has special importance. Humans think environmental resources should be free. Less attention to the price of these sources leads to unsteady policies.

If we want to know the value of one natural source, we need to classify different products, goods and services that are important in valuing. These products are classified in four main groups including regulating products, settlement products, production products and information products (Nezhad 2007). Regulating products include gas regulation, weather regulation, soil regulation and biologic regulation and settlement products include shelter regulation and treasure regulation. At last,

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information products include aesthetics, recreation, spiritual, historical and ecotourism information and it`s the main case of environmental economy. Among environmental resources, national and natural parks play an important role in increasing human welfare. Recreation value as a part of national parks consumption values includes demand for using park, passing free time, making hobby, walking, hiking and aesthetics matters. Study records for valuing environmental resources and demand for using them are related to Hotling studies in 1930 and 1947. This method exactly was used by Klawson in 1967. Then Pazhooyan in 1978 according to theoretical frame work of Gary Backer model introduced recreation function and estimated shadow price of recreation by a two-level method. After Pazhooyan, Bruzelius (1980) showed the value of traveling time is 20 to 53 percent of people`s gross wage. Other economists as McKean and Revier (1990) showed the way of calculating shadow price in the condition that person visits some recreation places on his way is partially different from previous ways.

In 2002 Lee and Hun estimated the recreation value of five National Parks in South Korea about 11 dollars per family (The average income of each family is 4600$). Also Mendz (2005) studied the nonmarket value of City Park in Valencia, Spain. Total amount of value has estimated about 11945 peseta in year. In Iran Mojabi and Monavari (2006) according to Klawson model valued Lavizan and Pardisan Parks in Tehran. They derived recreation demand curve by using of maps and visitors social and economic features. Results showed recreation values of Lavizan and Pardisan Parks were 78 and 53 million rials. In Amir Nezhad`s (2007) study, payment tendency of each family for preserving Golestan National Park was 172800 rials. Bagherzadeh (2010) by cross-section data of year 2009 and Gary Backer methodology studied the effective factors on demand function of visiting Daghlar Baghi Park in Khoy. Results focused on the importance of demand function sensitivity to shadow price and family income variables.

Urmia Lake is the greatest lake in Iran. It is located in the northwest of Iran between two provinces of west and east Azarbayjan. The average depth of lake is 5.4 meters and the maximum depth, 13 meters in north of lake and approximate volume of it is 31 billion m^3. It is the biggest lake in west Asia with the survey of 483000 hectare. Urmia Lake was chosen as protected area in 1968 and after three years changed to a national park. In 1976 UNESCO was chosen it as one of nine areas that should be protected. Economic experts believe Urmia Lake as a unique ecosystem in world and country is a suitable bed for developing tourism industry. Urmia Lake with beautiful beaches can be one of development axes in the area and by expanding tourism industry can develop the area and other economic sectors. Urmia Lake as a national park and one of the most important settlements of world has 102 big and small islands and because of suitable saltiness, Artemia a one-cell creature that has high export value lives there. Also salty water and black mud of lake is helpful for different diseases. In ecologic zone of lake there are 547 herbaceous species, 27 mammal species, 21 fish species, 212 bird species and 41 reptile species. This park includes different kinds of blue and green algae. In the islands of National Park there are rams, ewes and Iranian yellow elks. Also among natural attractions some plants like cypress trees, wild pistachio and mountainous almonds are considerable for tourists. There fore, the importance and value of National Park is for different factors as preservative value for having rare wild life and herbaceous species, medical value and touristic value.

The purpose of this study is the analysis of demand function for visitors of Urmia National Park and environmental value calculation for it. So in recreation demand function for Urmia National Park in Iran, we study the relations among recreation shadow prices, visitors` income and education with the amount of recreation demand and finally we analyze the relations between recreation demand amount and environmental quality of National Park.

MATERIALS AND METHODS

Nowadays economic valuing of environmental resources such as parks is done in two methods in environmental economy literature. First method is using utility function and calculating payment tendency (Nezhad 2007) but second method is according to family production function that environmental resource is an independent variable in it (Falihi 2005). Since environmental goods are not exchanged in market, Gary Becker`s family production function model is a rich frame work for highlighting important basis for decision process. Here we suppose that there are one consumer and one environment good that is park. Park has Q quality level that has positive effect on the number of park visitors. People mix time with a market or environment good and so recreation becomes meaningful. In this situation consumer in addition to consuming goods and services puts park in his utility function. There fore according to Pazhooyan and Falihi`s (2005) methodology utility function is:

$$U = f(c_m, c_h, z, Q) \qquad (1)$$

U is utility level, c_m, market goods and services, c_h, home goods and services, z, recreation level and Q is the quality level of park. Gary Backer`s family production function is:

$$c_h = f(X_h, T_h) \qquad (2)$$

In this function X_h is market good and T_h is the spent time for producing mixed good. So recreation production function of park is:

$$z = f(X_z, T_z) \qquad (3)$$

X_z is needed goods and services for travel and T_z , the spent time for traveling and using park. So budget and time constraint is:

$$T = T_h + T_z + T_w \qquad (4)$$

$$P_m C_m + P_h X_h + P_z X_z + T_w W + T_z W = W T_w + y \qquad (5)$$

In time and budget constraint y is unworked income, P_z , travel price, w, wage rate, T_w, working time and T is the total time (except leisure time). So Lagrange function is:

$$L = U(C_m, C_h(X_h, T_h), Z(X_z, T_z), Q) + \mu(w(T - T_h - T_z) + y - P_m C_m - P_h X_h - P_z X_z - T_h w - T_z w \qquad (6)$$

So we can derive park and travel demand function:

$$Z = f(y, P_{zt}, Q) \qquad (7)$$

$$y = T_w W + V \qquad (8)$$

$$P_{zt} = P_z + (T_z w) \qquad (9)$$

In this demand function, travel is a function of total income, park quality and total cost of travel. The opportunity time is calculated by multiplying travel time in wage rate.

According to Gary Becker`s family production function, we suppose all goods and services that have been bought by consumer, are not marginal and are not consumed directly. So consumer mixes time input with market good and the result is producing combined good. Now in this model recreation is a combined good. So we have:

$$U = u(R, Z) \tag{10}$$

$$\frac{\partial u}{\partial R} , \frac{\partial u}{\partial Z} > 0 \tag{11}$$

In equation 10, R is recreation service and Z, other goods. The person mixes needed goods and services with time to produce R. so we have:

$$R = R(X_R, T_R) \tag{12}$$

$$Z = Z(X_z, T_z) \tag{13}$$

In above equations, X_R is goods and services input for producing R, T_R , time input for producing R, X_R, goods and services input for producing Z and T_z , time input for producing Z. For defining budget constraint we face a basic problem, because the prices of recreation goods and services may be unobservable in market. So, we use a two-level method for deriving travel demand function. At first level, we define technology constraint and cost function of combined goods.

$$\min \quad \sum P_{x_i} X_i + w \sum T_i \tag{14}$$

$$st: \quad V(X, T) - V = 0 \tag{15}$$

V is combined goods vector, X, market goods vector and T, time input vector. Now we form Lagrange function:

$$L = \sum P_{x_i} X + w \sum T_i - \theta(V(X, T) - V) \tag{16}$$

$$\begin{cases} \frac{\partial l}{\partial X_i} = P_{X_i} - \theta V_{X_i} = 0 \\ \frac{\partial l}{\partial T_i} = w - \theta V_{T_i} = 0 \\ \frac{\partial l}{\partial \theta} = V(X, T) = 0 \end{cases} \tag{17}$$

We suppose people are price taker, so:

$$\theta = \frac{P_{x_i}}{V_{x_i}} = \frac{W}{V_{T_i}} \tag{18}$$

$$X_i = f(P_{x_i}, W, V_i) \tag{19}$$

$$T_i = f(W, P_{x_i}, V_i) \tag{20}$$

So cost function is:

$$C(P_x, W, V) = \sum P_{x_i} \left(X(P_{x_i}, W, V_i) \right) + W \sum T \left(W, P_{x_i}, V_i \right) \tag{21}$$

Polak and Washter (1975) showed when we don`t have joined production, cost function is:

$$C = \left(P_{x_i}, W, y\right) = C\left(P_{x_i}, W, R\right) + C\left(P_{x_i}, W, Z\right) \tag{22}$$

Now we can get shadow price by partial derivative of cost function.

$$\pi_R = f\left(P_{x_i}, W, R\right) = \frac{\partial C}{\partial R} = MC_R \tag{23}$$

$$\pi_R = f\left(P_{x_i}, W, Z\right) = \frac{\partial C}{\partial Z} = MC_Z \tag{24}$$

In above equations, MCs are marginal cost of recreation production and goods. So in this way we can get shadow price of daily travel to park. Budget constraint is:

$$\pi_R R + \pi_Z Z = y \tag{25}$$

In second level, according to budget constraint, we maximize the utility.

$$\begin{aligned} &\max \quad U = u(R, Z) \\ &st: \quad \pi_R R - \pi_Z Z = y \end{aligned} \tag{26}$$

Demand function of recreation services is derived as follows:

$$D_R = D(\pi_R, \pi_Z, y) \tag{27}$$

In Cobb-Douglas form of production function, we have:

$$R = AX_1{}^{\alpha_1} X_2{}^{\alpha_2} T^{\alpha_3} \tag{28}$$

In production function, X_1 is personal car, X_2, other needed facilities for recreation and T, spent time for producing recreation. So according to Willis (1974) method, total cost function is a function of input prices:

$$TC_R = KR^{\frac{1}{n}} W^{\frac{\alpha_3}{n}} P_1{}^{\frac{\alpha_1}{n}} P_2{}^{\frac{\alpha_2}{n}} \tag{29}$$

N is return to scale parameter and is equal to cost elasticities summation. We assume return to scale is fixed.

$$K = n(A3^{\alpha_3} \alpha_1{}^{\alpha_1})^{\frac{-1}{n}} \tag{30}$$

In this condition recreation marginal cost or shadow price is:

$$MC_R = \pi_R = \frac{\partial TC_R}{\partial R} = KW^{\alpha_3} P_1{}^{\alpha_1} P_2{}^{\alpha_2} \tag{31}$$

Now we can determine economic value of parks or environmental resources. In this study statistic data are cross-section and were calculated through a sample random sampling by n=75 optimal sample volume of visitors.

$$n = \frac{Z_{\frac{\alpha}{2}}^2 \sigma^2}{d^2} \tag{32}$$

In above equation, d is the most limited error, σ^2 the variance of statistical universe and Z, standard normal distribution by α significance level. After determining the variance of statistic universe, we calculate the optimal amount of sample:

$$n = \frac{(1.96)^2 \times 400}{(4.02)^2} \approx 75 \qquad (33)$$

After having optimal number of sample, by using of random numbers table, we derive sample tourist and get necessary information. Total approximate number of Urmia National Park visitors is 2800 persons.

RESULTS AND DISCUSSIONS

This study is according to a cause and effect method, on the other hand, there is a regression analysis among variables. Statistical universe is all visitors and users of Urmia National Park. Most travels to National Park happen in summer. Now with Cobb-Douglas production function and OLS (Ordinary Least Squares) regression method estimate the model. Estimate results of recreation production function in National Park are in Table 1 and following equation is the model of our research:

$$\underset{(-0.75)}{\ln R = 3.1} + \underset{(2.1)}{0.09 \ln X_1} + \underset{(3.2)}{0.11 \ln X_2} + \underset{(2.5)}{0.23 \ln T} \qquad (34)$$

Table 1. Gained results of estimating recreation production function in National Park of Urmia Lake

variable	coefficient	t-Statistic
Ln X_1	0.09	2.1
Ln X_2	0.11	3.2
Ln T	0.23	2.5
C	3.1	0.75
R^2=0.65	F=44.32	D.W=1.8

Table 2. White-test of recreation production function in National Park of Urmia Lake

F-Statistic	0.79	Probability	0.12
R^2	0.71	Probability	0.12

Model shows one percent change in car (vehicle) input, other needed inputs for travel and spent time, lead to 0.09, 0.11 and 0.23 percent positive change in recreation production. T-statistics have been written in parentheses under independent variables and show the significance of all variables in 95% confidence level but constant is not meaningful. R^2 is about 65% that is acceptable for cross-section data. DW statistic is 1.8 that shows not having correlation. Also white-test (Table 2) shows we don`t have heteroscedasticity of variance but F-statistic is 79% that rejects heteroscedasticity of variance hypothesis. So according to Willis (2000) marginal cost function of recreation is:

$$MC_R = 0.7^{-1} 0.13^{0.09} 0.23^{0.11} 0.36^{0.23} {P_1}^{0.09} {P_2}^{0.11} W^{0.23} \qquad (35)$$

In equation 35, independent variables are W, visitor`s wage, P_1, the price of renting car, P_2, the price of other inputs and MC_R, dependent variable of model means tourism marginal cost. By putting prices in equation, we can get the amount of recreation marginal cost or recreation shadow price. Calculated shadow price of recreation in National Park is about 653 rials per minute for every one. Shadow price for each day is 982870 rials. It should be noted that for calculating prices, market average price has been used. Also for calculating visitors` wage rate, we have divided total income into worked hours. If we multiple the recreation shadow price to the number of park visitors, we can get environmental value of National Park. In this study environmental value of park by supposing 2800 persons visit in year, becomes 2752036000 rials. After estimating recreation shadow price of park, we can estimate recreation demand function of National Park. Estimated recreation demand function is:

$$\ln D_R = -10.32 - 0.13 \ln \pi_R + 0.56 \ln y + 0.07 \ln Q + 0.11 \ln Ed_e \quad (36)$$

(-1.98) (-2.2) (2.7) (1.98) (1.96)

Above demand function shows that according to demand rule, the relation between recreation shadow price and recreation demand amount is negative and the relation between income and recreation demand is positive. The effect of education and studies on recreation demand function is positive and meaningful. This matter is because of people`s increased knowledge by studying and knowing the importance of environmental resources. Quality effect (Q) of park on demand is positive. Every one percent increase in park quality lead to 0.21 percent effect on recreation demand increase of park.

Results showed one percent increase in recreation shadow price (π_R) lead to 0.13 percent decrease in recreation demand amount (D_R). Also every one percent increase in visitor`s income (y) causes 0.56 percent increase in recreation demand. Estimated regression model has high t-statistics and all of coefficients in the significance of 90 percent are meaningful. The model has no econometric classical assumption problems (correlation and heteroscedasticity of variance problems). DW statistic is about 1.86 and F-statistic of white-test is 0.21 that rejects heteroscedasticity hypothesis. R^2 =49% and F-statistic related to analysis of variance shows the significance of total regression (Table 3 and 4).

Table 3. Gained results of estimating recreation demand function in National Park of Urmia Lake

variable	coefficient	t-Statistic
Ln π_R	-0.13	-2.2
Ln Y	0.56	2.7
Ln Q	0.21	1.98
Ln E_d	0.11	1.96
C	-10.32	-1.89
R^2=0.49	F=41.19	D.W=1.86

Table 4. White-test of recreation demand function in National Park of Urmia Lake

F-Statistic	0.21	Probability	0.30
R^2	0.42	Probability	0.19

CONCLUSION AND RECOMMENDATIONS

According to nonmarket aspects of goods, valuing environmental resources is too complicated. In this study, we used the clear preferences method that visitors showed in using parks. Also we used family production function methodology of Gary Backer. By using simple random sampling, we chose optimal sample volume and by Cobb-Douglas function estimated recreation production function and showed that recreation production is a function of travel time, car renting costs and other costs as food costs. After deriving production function, marginal cost function calculated. Calculated shadow price for each minute of person`s visit is about 653 rials that this amount for each day is about 982870 rials and the total environmental value is about 2752036000 rials. After calculating recreation shadow price in park and having visitor`s income information, we derived recreation demand function of park. The effect of shadow price on recreation demand amount is negative and the effect of income, visitors studying level and environmental quality of park on recreation demand are positive and according to theoretical expectation.

According to people`s importance toward Urmia Lake, government should preserve and expand the atmosphere of park and pay attention to the problems of water level decrease and by making secure environment increase people`s welfare. Based on gained results, following suggestions are presented:

1. In recreation demand, the amount of income coefficient is high, so government should make some decisions to increase people`s income and purchasing power, in this way people will welcome National Parks more than before.
2. The quality of park as one of effective factors on recreation demand lead to more focus of government on preserving environmental standards.
3. Less shadow price for using National Park per person causes more tendency for increasing recreation demand, so government should have more attempts about this matter.
4. Increase in knowledge and education of people lead to more need to environmental goods and increase their demand. So investing in education to preserve wildlife and environment and increase the value of National Parks are recommended.

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