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Factors Influencing the Appreciation of Benefits Provided by Peradeniya Botanic Garden: Willingness to Pay Approach

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ABSTRACT. Although the necessity of environmental quality for human welfare is fast being recognized, human appreciation on environment is a comparatively less explored area in economic theory. In this study an attempt was made to determine factors influencing the appreciation of an environmental amenity and its policy implications. Two techniques of contingent valuation method (CVM), namely the open ended and the iterative bidding approaches were used to gather information on the selected site of Peradeniya Botanic Gardens. Multiple regression was used to analyze the data.

Results have shown that the iterative bidding approach is a more reliable device than the open ended approach as a specific CVM technique. Respondents' income and appreciation for benefits of botanic garden show a positive relationship however, with a very low co-efficient. Education and special interest on environment show a higher positive relationship with appreciation of botanic gardens. Marital status shows a positive and age shows a negative relationship with appreciation of botanic gardens. Regarding certain other factors, the outcomes of the constructed models are not very consistent and therefore are less reliable. Overall results suggest that measures are needed for improving people's knowledge and interest on environment rather than just considering environment as a market commodity for better appreciation of the botanic gardens policy.

INTRODUCTION

One of the major problems faced by the developing countries in their development efforts is undervaluation or complete neglect of services provided by the natural environment. Economic growth and environmental quality are often viewed as alternatives where deterioration in environmental

quality is considered as a necessary cost of rapid economic growth (Hufschmidt *et. al.*, 1983). In the light of this situation economists show growing interest on valuation of environmental amenities.

The economic value of the environmental amenities is fast being recognized and today few people dispute the desirability of protecting selected natural areas even in developing countries (Dixon and Sherman, 1990). Yet the knowledge on human behaviour of appreciation and creating a demand for environmental goods is comparatively less. Most of economic theory deals with traditional market goods whereas environmental goods in most cases are non-market goods. Hence developing the knowledge on human appreciation and demand for environment would generate useful information to be used by the policy makers. In this study an attempt was made in this direction with following objectives:

1. to identify and develop a model on factors affecting consumer appreciation for the benefits provided by an environmental commodity (of an urban park in Sri Lanka); and

2. to compare the suitability of environmental economics techniques that can be used to achieve the above mentioned objective.

METHODOLOGY

Study area and data

The selected study site was the Peradeniya Botanic Garden located within the city limits of Kandy, Sri Lanka. It is an ex-situ conservation site designed to collect local and exotic plant species which are presently over 4000 (Ekanayake, 1985). It stretches over a 60 ha of land, and is allowed for visitors for recreation and other benefits such as education and research by charging only a nominal fee.

Primary data collected through a structured questionnaire were used for the study. Visitors to the garden were interviewed and their responses for two questions which designed to create a hypothetical market were recorded. The two questions asked from visitors were as follows:

1. an open ended question on how much they would pay as a supporting membership fee; and

2. the iterative bidding approach to obtain the final bid on the last value they would place as their Willingness to Pay (WTP) as a supporting membership fee

In addition to the answers to these two questions, general information regarding each individual were inquired.

Method

A total sample of 200 visitors were interviewed. This sample was divided into two sub samples of 100 visitors and respondents in each sub sample were asked one out of two questions either the open ended or the iterative bidding.

The Contingent Valuation Method (CVM) is the technique used in current study. It addresses the individual valuation of non market goods directly by the use of data sets that are hypothetical or experimental (Randall, 1987). Here the researcher creates a hypothetical market for non-market environmental good and allows respondents to operate in this market and uses the outcome for analytical purposes.

Experiences have shown that in many situations CVM is the only method available, especially in occasions where non-use economic values such as option or existence values are involved (Winpenny, 1991). Adaptability to generate information which may be useful in making policy decisions and planning is an added advantage in CVM. Instead of establishing a money value for a given environmental commodity it can relate declared values to the other variables attached with consumers' appreciation of the resources such as income, education *etc.* (Winpenny, 1991).

The economic principle involved in the CVM is an attempt to determine the price that consumers are willing to pay or willing to accept (WTA) which is essential to restore the individual on an initial or subsequent utility level. Theoretically it is based on two willingness to pay measures of consumer welfare proposed by Hicks (1943) which later came to be known as Hicksian surplus. Two willingness to pay measures of consumer surplus are namely; Compensating variation and Equivalent variation.

Compensating Variation is the income which should be taken away from or given to consumer after a given economic change, to restore his

original welfare level.

Equivalent Variation is the amount of money which should be given or taken away if the perceived economic change is avoided so as to leave the consumer as well off as with the subsequent welfare level after the change.

The technique adopted to establish the relationship between variables was multiple regression. Two regression models were constructed based on the response for open ended or iterative bidding questions. The respective dependent and independent variables of the relevant models are as follows.

Dependent variables of two estimated models were:

Model 1 - Maximum Willingness to Pay as a supporting membership fee according to the response for open ended question. (MFO)

Model 2 - Final bid of the iterative bidding process which is the Maximum Willingness to Pay value as a supporting membership fee. (MFI)

The following nine independent variables were identified and required information were obtained from the answers (general information) provided by the respondents.

1. Sex of the Respondent (SEX) - Male = 1; Female = 0

2. Age of the Respondent (AGE) - Numerical value in years.

3. Distance (DIS) - Distance from Peradeniya to the administrative district in km from where respondents arrived from.

4. Marital Status of the Respondent (MAR)-
   If married = 1 unmarried = 0

5. Number of Dependents (DEP) - Numerical number was used.

6. Respondent's Income (RINC) - Income earned by the respondent in numerical rupee value.

7. Total Family Income (TINC) - Total income of the respondent's family (Respondent's income + Spouse or care taker's income + Other income sources)

8. Education Level (EDU) - Five levels of education, starting from primary education up to the level of post graduate was identified. They were scored in an ascending order from 1-6 so that the highest education level scored the highest values.

9. Member/non-member in an Environmental Related Society (MEM) If member = 1 non-member = 0

RESULTS AND DISCUSSION

At the beginning of the analysis basic statistics regarding the dependent variables of willingness to pay were calculated for both models to have some basic idea about membership fee values placed by people. These are given in Table 1.

Table 1. Basic statistics regarding the dependent variables of willingness to pay

Model	Min	Max	Mean	Std. Dev.
Model 1-(MFO)	0	5000	274.49	573.82
Model 2-(MFI)	20	2000	183.84	258.15

In the initial stage of analytical process, all nine regressors with all the observations were used.

Results indicate that the two models are not so comparable in their magnitudes and signs of the co-efficient (Table 2). Overall level of significance is high in the model 2 (Prob > F=0.0001) It has comparatively high R^2 value which indicates the higher level of explanatory power (R^2=0.5646). Both of these indicators show poor fit regarding model 1

(Prob > F,=0.2982, R^2=0.1091). Three variables were found significant under 5% level of probability in model 2. However in model 1 none of the variables were significant at 5% level of probability.

Table 2. Comparison of model co-efficients.

Variable	Co-efficient		Significant level	
	Model 1	Model 2	Model 1	Model 2
Intercept	115.02	182.64	0.7213	0.0823
SEX	180.45	-11.32	0.1791	0.8116
AGE	-7.54	-4.42	0.4029	0.2867
DIS	0.43	0.34	0.7258	0.2569
MAR	237.03	74.64	0.1189	0.1875
DEP	-76.87	7.19	0.2269	0.8179
RINC	0.02	0.02	0.2162	0.0001
TINC	-0.01	-0.01	0.3393	0.0001
EDU	56.45	10.67	0.3424	0.6080
MEM	182.13	269.12	0.5898	0.0027

Model 1 - R^2 = 0.1091 Adj R^2 = 0.0190 Prob > F = 0.2982
Model 2 - R^2 = 0.5646 Adj R^2 = 0.5185 Prob > F = 0.0001

Poor fit in a model may arise due to major reasons of pursuance of outliers, correlations among independent variables and problem of heteroscedasticity or unequal error variance. In the process of handling outlier problem precautions were taken to detect extreme value observations (Outliers) and very unlikely or unrealistic WTP value proclamations by comparing them with total family income (disposable income).

The respondent's income (RINC) and the total family income (TINC) have shown higher level of correlation (r=0.906) in model 1, it was decided to remove the respondent's income. This decision was made on the assumption that ultimately total family income can be well expected to have a higher influence on individual decisions irrespective of the size of the respondent's income. According to this assumption in the cases where

respondent is unemployed (*i.e.* Housewives) or dependent on parents (*i.e.* Students) it is much realistic to regress their WTP against total family income rather than against a zero income. As the correlation was poor (r=0.560) among these two variables in model 2 it was decided to keep both variables.

The final models can be given as follows:

Model 1 - (Open ended)

MFO = 125.74 + 73.35 SEX - 0.74 AGE - 0.08 DIS + 23.42 MAR - 22.37 DEP + 0.013 TINC* - 20.43 EDU - 35.85 MEM

R^2 = 0.2795 Prob > F = 0.0021

Adj R^2 = 0.1983 * Significant under 0.05 level

Model 2 - (Iterative bidding)

MF1 = 182.63 - 11.32 SEX - 4.42 AGE + 0.34 DIS + 74.64 MAR + 7.19 DEP + 0.02 RINC* - 0.01 TINC* + 10.66 EDU + 296.12 MEM*

R^2 = 0.5646 Prob > E = 0.0001

Adj R^2 = 0.5185 * Significant under 0.05 level

Both models agreed in signs of the co-efficient of variables AGE, MAR, and intercepts. Improved model 1 had only one variable significant at 5% level of probability.

Relationships regarding WTP with the respondent's income (RINC) and the total family income (TINC) have been further checked in model 2 by excluding only one variable at a time. Once the variable RINC was dropped, R^2 was reduced to 0.2872. But as the TINC was removed R^2 was reduced only to 0.4834. A fact that should be noted here is once the total income (TINC) was left alone it shows a positive relationship of low magnitude while both variables were together it shows a negative

relationship. Relationship with respondent's income (RINC) was always positive.

An explanation that can be reached is that on the average, although income is of a low magnitude has a positive relationship with WTP. Once we take the respondent's income (RINC) out of the total family income there is another component left which is the family income not earned by respondent. Although respondent's income always has a direct positive relationship with his/her WTP this other component is not so. Therefore, when total income is allowed to stand alone it shows a positive relationship with WTP due to aggregation of impact of both these components. Once the respondent's income was introduced, direct positive relationship with that component is separately exposed. Thus respondents' own income has a positive and consistent relationship with their WTPs rather than total family incomes.

SEX was introduced into the model as a dummy variable (Male - 1, Female - 0) keeping female as a reference. Therefore, it cannot distinguish the appreciation based on the sex of the respondent. Instead it shows the influence on the appreciation by the "maleness".

The most controversial point raised by the model 1 is negative relationship indicated by the variables EDU and MEM. Together these two variables stand for the individuals' knowledge, and their special interest regarding the environment. It can be well expected that the knowledge, and special interest on environment may give a positive appreciation regarding an environmental commodity. Although the concerned commodity may yield the same direct benefits for a learned person or an environment lover as others the values placed by them may still be higher due to possibly increased non-use components of their appreciation such as option, existence or bequest value components (variable MEM even becomes significant under 5% level). Therefore, the relationship shown by model 2 can be adopted with much confidence regarding the impact of these variables.

As suggested by both models age shows a negative relationship with WTP. It may be basically due to the higher appreciation by younger people for its recreation purposes over other uses of botanic gardens. Regarding the relationship between WTP and distance to the garden model 1 has shown a negative relationship while model 2 was showing a positive relationship. Theoretical reasoning regarding the model 1 can be given, as the individuals

get far away from an environmental commodity their appreciation will decline as their opportunity for consumption is reduced.

Such a situation arises in the case of a number of dependents (DEP) also where two models disagree regarding the sign of the respective parameter coefficients. Negative relationship shown by model 1 can be interpreted as the number of dependents increases people tend to give less priority for commodities like botanic gardens. Alternatively model 2 can be interpreted, as number of dependents increases individual appreciation of the garden may also increase due to its value as a site for family entertainment.

As the outcome of the study is not sound regarding these two variables, more information may be needed to come up with a final conclusive explanation. In case of marriage as a factor, there exists a positive relationship with individual's appreciation of botanic gardens in both models.

CONCLUSIONS

In an overall point of view, out of two approaches taken in this study the iterative bidding approach emerges as stronger device in generating information related to environmental commodities. This was suggested by its higher valued indicators of model fitness as well as its much reliable outcomes regarding variables such as education and interest on environment. Yet some of the results obtained by this approach are also highly questionable. This means contingent valuation method as a technique has its own limits. Therefore, if this technique is to be used in generating environmental information great care has to be taken on designing the specific methods. Otherwise it would yield to inadequate information and erroneous conclusions.

It was found that increase in individuals' income alone would not generate higher appreciation on non-market commodities like botanic gardens. As it was suggested by influence of education and special interest on environment, individual appreciation of such commodities may depend much on the knowledge on specific commodity. As Abeygunawardena and Kodithuwakku (1992) have assessed presently Peradeniya Botanic Garden provides its benefits mainly as a recreation site. In the case of present situation the people's appreciation of botanic garden could be improved by expanding the information set or knowledge regarding its value as an ex-situ

conservation site. Above facts may be useful to policy makers for their managerial decisions.

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