User value for Kumasi zoological garden, Ghana

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Abstract: This study identifies factors influencing the demand for recreation at the Kumasi zoological garden and estimates the consumer surplus for users. An onsite survey was conducted with the aid of a questionnaire to collect data from visitors to the zoo. Two stage least square (2SLS) and ordinary least square (OLS) regression was performed in a double log functional form. The result reveals that socioeconomic factors significantly influence visitation to the zoo. In addition, adult visitors enjoy a consumer surplus of GH¢29.21 per annum. Student visitors enjoy a consumer surplus of GH¢17.22. This suggests that the actual price paid by visitors to the Kumasi Zoo understates the true value they attach to such a visit. The study concluded that travel costs influence a visitor’s decision to visit the Kumasi Zoo and that, generally, visitors are willing to pay a higher amount to enjoy the services of the zoo than they actually pay as gate fees. The study recommends an increment in gate fees for adults and students.

Keywords: consumer surplus; Ghana; Kumasi; recreational facility; zoo.


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1 Introduction

Zoological gardens (Zoos) have existed in many forms for hundreds of years. They are perhaps the oldest form of wildlife tourism as efforts to tame and keep wild animals in captivity are nearly as old as human society itself. Loisel (1912) claims that the first documented examples were the animal collections associated with places of worship in Ancient Egypt around 2,500 BC. Baatay and Hardouin-Fugier (2002) argue that the history of the modern zoo began in the late 18th and early 19th centuries with the formation of the first public zoos, open to all.

Zoos are defined by the World Zoo Conservation Strategy (1993) as organisations that possess and manage collections that primarily consist of wild (non-domesticated) animals, of one or more species, that are housed so that they are easier to see and to study than they would be in nature. They display at least a portion of this collection to the public for at least a significant part of the year, if not throughout the year. The institutions collectively designated as ‘zoos’ vary greatly with respect to their animal collections.

From their origins as private collections maintained for the amusement of royalty and nobility, zoos have developed into centres of conservation where it is possible for visitors to see firsthand the importance of biodiversity and the need for protection and preservation of different animal species. The role of zoos as a congenial place for a recreational and social visit has dominated their history and evolution. They provide entertainment to people and satisfy human curiosity about rare and exotic species. They provide a pleasant setting for tourists, local visitors and family outings, and can be an integral part of the social and cultural life of the community. Besides recreation, zoos are established for conservational, educational and research purposes. Turley (1999) claimed that there is a changing emphasis by zoos’ management towards conservation and education. Today, zoos are in the forefront of worldwide efforts to save endangered animal species, protect ecological systems and train people in the challenge of preserving biodiversity and the environment no longer are they merely places where wild animals are kept for display.

In spite of their conservation and education roles, Woods (1998) observes that, of the various reasons for establishing zoos, paramount amongst them seems to be recreation. As such a significant segment of the tourism industry, zoos can make a considerable contribution to the economy of their local region, city or even nation. Through their business activities, zoos create employment, purchase goods, materials and services, earn foreign exchange through their visitation by overseas tourists, and generate operating surpluses that are usually reinvested in zoo development projects. Australian Bureau of Statistics (1998) observed that the Australian zoo industry, with eight (8) million paid admissions per year, has an annual turnover of some AU$143 million; generates an operating surplus of AU$16 million; and employs almost 2,000 people. However, as they have become more business oriented, zoos are now marketing themselves as wildlife tourism destinations.

The majority of zoos are found in cities, where they have the potential to attract large number of visitors. These metropolitan zoos typically display a large number and
diversity of species, in relatively small groups and enclosures. However, the modern trend for presenting animals in their natural physical and social environments has resulted in the development of safari parks and open-range zoos. Perhaps as a consequence of this, zoos in the past generally have not seen themselves as being in the tourism industry, but rather as an integral part of their local communities. This, then, is the major difficulty for today’s zoos - how to attract and entertain their visitors, without compromising their other objectives - education, conservation and research.

Running zoos is a highly expensive venture. It is difficult to generate the necessary annual revenue from seasonal income to cover the substantial costs of housing and displaying a core resource, which requires year round attention, maintenance and staffing. Turley (1999) noticed that zoos in the UK, reliant upon self-engendered income, rarely generate sufficient visitors to meet the expenditure requirements they face. The closer they come to a conservational centre, the more expensive they become. Education and conservation activities give rise to further expenditure yet they provide no direct return on investment.

These days, zoos are organisations seeking to satisfy multiple stakeholders with limited resources, and consequently zoo managers must tackle a number of important challenges (Turley, 1999). These include maintaining a satisfactory balance between running the zoo as a tourism business and a conservation organisation; generating sufficient finance and funding; effectively communicating their roles in order to attract an optimum number of visitors; managing the demands of the animal collection; and attaining cultural status on the basis of their conservation work. To do this effectively will require zoos to be efficient, competitive businesses within the broader wildlife tourism market.

Visitors are an integral component of the zoo concept. Millions of people visit zoos as a source of recreation every year. According to Mahat and Koirala (2004), the Central Zoo of Nepal receives about 800,000 visitors annually generating about NRs 20,692,600 in revenue from entrance fees. A study by Shammin (1999) also revealed that the Dhaka Zoo in Bangladesh receives between two and three million visitors per annum. In an increasingly complex and competitive market environment, zoos must position themselves clearly, positively and appropriately in the minds of the prospective visitor.

Basically, zoos exist to provide conservational, educational, research and recreational services. Amidst the fierce competition in the tourism industry, the major difficulty for today’s zoos is how to attract and entertain their visitors without compromising their other objectives of education, conservation and research.

The Kumasi Zoo sits on 11 hectares in a prime location in the Kumasi metropolis. The main benefits of the zoo include displaying local fauna in captivity to satisfy the curiosity of the viewing public; conducting conservation education with the aim of educating the public about wild animals, especially the rare and endangered species; conducting scientific research into various aspects of wildlife biology, ecology, etc., engaging in breeding of endangered species; offering a sanctuary for orphaned animals; and offering recreational services to visitors.

People come from far and near to patronise the services of the zoo. The zoo had a total of 111,487 and 129,000 visitors in the years 2007 and 2008, respectively. In spite of
its high patronage, the zoo still relies heavily on donations from philanthropists and government subventions. The zoo is faced with challenges such as inadequate funds for its day-to-day operations including the feeding of the animals, staff salaries, and maintenance. The zoo also lacks the modern facilities to attract and entertain visitors. The broad objective of this study is to estimate the recreational value of the Kumasi zoological garden to its visitors.

2 Related literature

2.1 Economic valuation of environmental resources

Environmental valuation is the process of putting monetary values on environmental goods and services or natural resources, many of which have no easily observed market prices. It is a key exercise in economic analysis and its results provide important information about values of environmental goods and services. This information can be used to influence decisions about wise use and conservation of natural resources. The basic aim of a valuation is to determine people’s preferences by gauging how much they are willing to pay for given benefits or certain environmental attributes. Economic valuation never refers to stock, only the change in stock. If one speaks of the economic value of a natural resource, it means the value of a change in the resource. It is not a question of determining the ‘true’ value of the resource but valuing changes and comparing them with their alternatives.

A valuation has an important role to play in environmental planning and management activities because it helps to answer many questions relating to the value of conserving certain natural resources like forests. These include how the degradation and loss of the natural resource lead to costs to different segments of society; and how natural resource conservation can be efficiently and equitably financed. Environmental goods and services are public goods and therefore non-exclusive and non-rival in consumption. In this case, market prices are unreliable indicators of social costs, because they may not capture all effects of resource use. However, environmental economists have developed methods to reveal values in the presence of market failure, which incorporate external effects.

There are many components of value as far as environmental resources are concerned. This is summarised in Figure 1. As shown from Figure 1, the Total Economic Value (TEV) of an environmental asset or resource consists of the Use Value (UV) and Non-Use Value (NUV). Use value refers to the benefits that an individual derives from the physical consumption of an environmental resource. Use value is further broken down into direct use value and indirect use value. Direct use value is the value derived from direct utilisation of an environmental resource such as lumber and recreation. Indirect use value refers to the value derived from indirect utilisation of an environmental resource such as the aesthetic and functional services it provides.
Non-use value refers to Willingness To Pay (WTP) to maintain some goods in existence even though there is no actual, planned or possible use. This is further broken down into option value, existence value and bequest value. Option value represents present WTP based on the future benefit to be derived from an unutilised asset when the option to use it will be exercised. Existence value is the satisfaction of merely knowing that the environmental asset exists, although the person assigning the value has no intention of using it. Bequest value refers to the WTP to preserve the environment for the benefit of future generations.

2.2 Valuation methods

Economic theory advocates that markets transmit a great deal of information about a commodity such that its value can be inferred from the price at which people are prepared to purchase it. The situation is different when it comes to commodities that lack market. Estimating the values of resources that lack a market could be a complex venture due to the lack of appropriate prices. Non-market valuation methods have been the tools used to compensate for this inadequacy in the process of incorporating such resources into the economic analysis. As González-Sepúlveda (2008) observed, environmental economists have used non-market valuation methods to estimate the value of an environmental assets for years. They represent an alternative approach to obtaining information on people’s preferences about goods that are not priced by market forces. Without markets, little information can be directly obtained about the benefits consumers enjoy from having such goods available and their willingness to trade such benefits for other goods. Methods of valuation of environmental goods and services may be classified into two categories:

1. The stated preference approach (also called indirect approach).
2. The revealed preference approach (also called direct approach).
Figure 2 shows the categorisation of the various methods or techniques of economic valuation of environmental resources. The stated preference methods, also called the direct methods, use WTP estimates derived from questionnaires. They attempt to gauge value by asking people directly for their ideas of the worth of an asset. The Contingent Valuation Method (CVM) and Choice Experiment (CE) are the methods under this category.

Contingent valuation method, which is the travel cost method’s (TCM) primary alternative, uses survey questions to elicit from a sample of consumers their WTP or willingness to accept for a change in the level of environmental goods or services in a carefully structured hypothetical market. The criticisms of CVM centre on the issue of whether people give accurate responses to such hypothetical questions. It is quite popular, however, contingent valuation studies have the advantage of allowing respondents to aggregate the various types of benefits of a site (non-use as well as use value). An associated disadvantage is the question of whether the public is sufficiently educated to properly estimate some categories of non-use value: ecological value, for example.

The choice experiment approach has its roots in Lancaster’s characteristics theory of value, in random utility theory and in experimental design. In this method, people choose their preferred alternative from a choice set in a survey setting. Repeated choices are made, so each individual answers more than one question. The alternatives are described in a number of attributes and are differentiated by the levels taken on by the attributes. The interest in choice experiment is not to value the whole resource but to put value on the various attributes. Choice experiment is used to value both use value and non-use value.

In revealed preference or indirect methods, individuals indirectly reveal the WTP for environmental good through market and surrogate market prices. Revealed preference methods are used where conventional or proxy market prices exist. Hedonic price method, TCM, production function, and replacement cost methods, among others fall under this category.

The hedonic pricing method was developed based on the characteristics theory of value. It infers the value of environmental features from the prices of traded goods. It is applicable in those cases where the prices of a good are directly influenced by
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environmental factors. The most commonly used example is the housing market, where the value of two otherwise comparable properties or apartments will differ depending on the environmental amenities in the vicinity of each site. Thus, if the proximity to a hazardous waste site leads to a measurable drop in the property price (compared to equivalent houses in other locations), this difference in prices gives an indication of the external cost of the waste site. Hedonic pricing method can also be applied to the valuation of external benefits, e.g., if properties in the vicinity of an undisturbed river or lake command a higher price than comparable properties elsewhere. Hedonic property value models assert that individuals perceive housing units as bundles of attributes and derive different levels of utility from different combinations of these attributes. When transactions are made, individuals make tradeoffs between money and attributes that reveal the marginal values of these attributes.

The production function method is used to estimate the economic value of environmental goods and services that contribute to the production of commercially marketed goods. It tries to value natural qualities by valuing their impact on production costs. Environmental services support other economic processes and activities. Where these other economic activities have a market value, the changes in production and consumption may be used to provide value for integrity of the environmental resource base.

These effects on production reflect the indirect contribution of environmental services to economic output. Environmental goods and services are also linked to other outcomes; for example, they provide raw materials, support ecosystem services and generate income and employment. Environmental goods and services that have no market but support consumption and production processes can be valued by looking at the effect on their production functions. Examples of effect on production include loss of income, employment and foreign exchange arising from loss of wildlife; and flood damage and water shortage caused by loss of forest watershed catchment protection. If a natural resource is a factor of production, then changes in the quantity or quality of the resource will result in changes in production costs, and/or productivity of other inputs. This in turn may affect the price and/or quantity supplied of the final good. It may also affect the economic returns to other inputs.

The replacement cost approach is an accounting approach, which estimates the value of environmental benefits by examining the potential costs of restoring or replacing productive assets lost or degraded due to project impacts or improper management. The method estimates economic values based on costs of replacing environmental assets, or costs of restoring the assets so that it again provides the service. The method uses the cost of replacing an ecosystem or its services as an estimate of the value of the ecosystem or its services. These replacement costs represent the value of environmental services that can be replicated by artificial or technological means. They represent expenditure saved by the presence of naturally occurring ecosystems, and their associated functions and services. The method can be used to estimate, for example, the benefits of implementing improved agricultural practices in upland soil areas that can be reflected in the cost of replacing soil and nutrients lost through erosion.
3 Methodology

3.1 Population, sampling and data collection

The target population considered for this study was visitors to the Kumasi Zoo. The study considered all individuals who visited the zoo during the period of the survey. This was because it is only the visitors who could provide the information or data needed to carry out the study. The sample for the study was drawn using the stratified sampling technique. This technique was used to ensure an adequate representation of each category of visitors. Visitors to the zoo were divided into adults and students/children based on the gate fee paid by each group. A sample of 120 visitors was drawn from each group. Cross-sectional data were collected from the sampled visitors using well-structured questionnaires.

3.2 Analytical framework

In specifying the trip generation function the basic task was to translate the theoretical variables in the equations into the appropriate data variables from the survey instrument. The individual TCM was used for this study based on the nature of the recreational site. The demand for the zoo was modeled as follows:

\[
\text{Visit} = \beta_0 + \beta_1 \text{tcost} + \beta_2 \text{age} + \beta_3 \text{inc} + \beta_4 \text{farm} + \beta_5 \text{pknow} + \beta_6 \text{gender} \\
+ \beta_7 \text{mar} + \beta_8 \text{sub} + \beta_9 \text{dist} + \epsilon_i
\]  

(1)

where

\text{Visit} = \text{Number of visits made per year by individual } i \text{ to the zoo}

\text{tcost} = \text{Travel costs of the individual } i \text{ to the zoo}

\text{age} = \text{Age of individual } i

\text{inc} = \text{Income of individual } i

\text{farm} = \text{Family size of individual } i

\text{pknow} = \text{Previous knowledge of the zoo by individual } i

\text{gender} = \text{Gender of individual } i

\text{mar} = \text{Marital status of individual } i

\text{sub} = \text{Knowledge of substitute site by individual } i

\text{dist} = \text{Distance travelled by individual } i \text{ to the zoo}

\epsilon_i = \text{Error term}

Equation (1) may be estimated using the ordinary least square (OLS) estimator, however, the dependent variable Visit is jointly determined by the independent variable income [inc]. This means that the independent variable inc is endogenous. The endogeneity of this variable in Eq. (1) leads to an econometric analysis problem, which is identical to that of an omitted variable. Thus, the OLS estimation of the above equation would lead to an inconsistent and biased parameter estimate. To achieve consistent and unbiased
parameter estimates, the study adopted instrumental variable estimation method using 2SLS procedure. The endogenous explanatory variable \( inc \) can be expressed in terms of exogenous variables known as instrument \( (edu) \) as shown below.

\[
inc = \pi_0 + \pi_1 edu + \mu_i
\]  

(2)

where

\( edu \) is number of years of formal education of the respondents

\( \pi_0 \) and \( \pi_1 \) are parameters to be estimated and

\( \mu_i \) is the error term

The rest of the variables are as defined above. The two stage least squares (2SLS) estimation method has been adapted to estimate Eqs. (1) and (2) in order to achieve consistent and unbiased parameter estimate. For the first stage of the two-stage procedure, Eq. (2) was estimated and predicted values of the independent variable \( inc \) which is \( inc \) was extracted and used as the instrument in the second stage of the analysis.

Thus, the second stage estimated equation can be specified as:

\[
Visit = \beta_0 + \beta_1 tcost + \beta_2 age + \beta_3 farm + \beta_4 pknow + \beta_5 gender + \beta_6 mar \\
+ \beta_7 sub + \beta_8 dist + \epsilon_i
\]  

(3)

Equation (3) is estimated for adults and it includes the income variable and the other socioeconomic variables. Since the students are not married and they do not earn income a different model was formulated for the students. Thus, the question estimated for the students is as follows:

\[
Visit = \beta_0 + \beta_1 tcost + \beta_2 age + \beta_3 farm + \beta_4 pknow + \beta_5 gender + \beta_6 sub + \beta_8 dist + \epsilon_i
\]  

(4)

STATA Econometric software version 10.0 was used in estimating the coefficients of both the 2SLS and OLS models. For the purpose of determining the demand curve and subsequent consumer surplus, the trip generating equation was transformed into the more familiar relationship with price as the dependent variable, and number of visits as the explanatory variable. The other significant variables were held constant and the demand curve was derived using the following relationship:

\[
tcost = 10.66 - 1.14 visit
\]  

[5]

The price elasticity of demand for the zoo is calculated as:

\[
\frac{\partial P}{\partial Q} = \frac{Q}{P}
\]  

[6]

\[
Ped = \frac{\partial Q}{\partial P} \times \frac{P}{Q}
\]  

[7]

\[.
Ped = \frac{\partial Q}{\partial P} \times \frac{P}{Q}
\]  

[8]
where

*Ped* is Price elasticity of demand

The formula in Equation (8) indicates that the price elasticity of demand is calculated by the slope \( \frac{\partial Q}{\partial P} \) multiplied by the price-quantity ratio at a specific point. Finally, the study used the area under the demand curves between the maximum amounts that visitors are willing to pay (i.e. the choke price) and the amount they actually pay to estimate consumer surplus (Eq. 9).

\[
\text{Consumer surplus} = \frac{1}{2} \text{base} \times \text{height} \tag{9}
\]

4 Results and discussions

4.1 Socio-economic background of respondents

Table 1 presents descriptive statistics of the socioeconomic characteristic of the respondents. Of the 116 respondents in the adults’ category, 87 representing 75% were males and 29 representing 25% were females. Also 97.4% of respondents were young people and adults in the age group of 18–50 years and about 2.6% were above 50 years old. This implies that visitors to the zoo mainly consist of the active working class and hence managers of the zoo should take this into consideration for the design and publicity of their policies especially with regards to products and services. Males dominated in all the age groups constituting 45 (or 70.3%) of the 18–30 age group, 30 (or 78.9%) of the 31–40 age group, 9 (or 81.8%) of the 41–50 age group and 3 (or 100%) of respondents in the >50 age group. This calls for re-design of products and services so that it would attract female in the future.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Grouping</th>
<th>Adult Frequency</th>
<th>Adult Percentage</th>
<th>Students Frequency</th>
<th>Students Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>10–17</td>
<td>-</td>
<td>-</td>
<td>68</td>
<td>60.7</td>
</tr>
<tr>
<td></td>
<td>18–30</td>
<td>64</td>
<td>55.17</td>
<td>44</td>
<td>39.3</td>
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<tr>
<td></td>
<td>31–40</td>
<td>38</td>
<td>32.76</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>41–50</td>
<td>11</td>
<td>9.48</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>&gt;50</td>
<td>3</td>
<td>2.59</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Travel cost</td>
<td>0–4.99</td>
<td>66</td>
<td>56.9</td>
<td>84</td>
<td>75</td>
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<tr>
<td></td>
<td>5–9.90</td>
<td>35</td>
<td>30.2</td>
<td>28</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>9.91–19.99</td>
<td>13</td>
<td>11.2</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>&gt;20</td>
<td>2</td>
<td>1.7</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
There were 112 respondents in the students’ category of which 70 (or 62.5%) were males and 42 (or 37.5%) were females. Their ages ranged between 10 and 28 years. The mean age of respondents in this category is approximately 18 years. The majority (60.7%) of the student respondents were in the age group of 10–18, while 39.3% were in the age group 19–28.

The minimum travel cost of an adult visitor was GH¢2.50 and the maximum was GH¢54.50. Table 1 shows that 56.9% of the respondents in this category spent less than GH¢5.00 on their trip, while 1.7% spent more than GH¢20 on their trip. Further analysis shows that 52.9% and 69.0% of male and female respondents respectively spent 0–49 Ghana Cedis. The mean travel cost in this category was about GH¢3.54.

Among the student respondents, the minimum travel cost was GH¢1.00 while the maximum was GH¢10.00. Table 1 shows that, of the 112 respondents in this category, 84% (or 75%) spent less than GH¢5.00. Only 25% spent GH¢5.00–GH¢10.00. No one spent more than GH¢10.00. About Seventy-Six percent of the male respondents in this category fell in the travel cost group of 0–4.90 Ghana Cedis while that of the female respondents was 73.8%. The mean travel cost of all respondents in the students’ category was about GH¢6.41.

More than half, that is, 53% had attained 7–12 years of education; 42% had attained more than 13 years of education while only 5% had attained 0–6 years of education. Similar to the adults group, more than half, that is, 63% had attained 7–12 years of education.
education; 28% had attained more than 13 years of education while 9% had attained 0–6 years of education.

When asked if respondents had any previous knowledge of the Kumasi Zoo before their visits, about 96.6% of adult visitors answered in the affirmative while 3.4% said ‘No’. On the part of the student respondents, 91.1% had previous knowledge of the zoo before their visits while 8.9% did not.

The difference between the married and single visitors in the adult category was quite marginal. From Table 1 out of 87 male respondents, 43, representing 49.4% were single while 44, representing 50.6% were married. Similarly, of the 29 females, 14, representing 48.3% were single and 15 representing 51.7% were married. Thus in each case, respondents who were married outnumbered those who were single. On the whole, about 49% of the respondents were single while about 51% were married. On income levels of respondents in the adult category, almost half, that is, 48% earned monthly income of 100–399 Ghana Cedis; 39% earned 400–699 Ghana Cedis while 12% earned more than GH¢700; and 1% earned GH¢99 or less.

Table 1 shows that 93, representing 80.2% of adult respondents travelled 10 kilometers or less from their places of origin to the zoo; 10, representing 8.6% travelled more than 20 kilometers from their places of origin to the zoo; and 13, or 11.2% of respondents in this category travelled between 10.1 and 20 kilometers. In the students’ category, 87.5% travelled between 0 and 10 kilometers from their places of origin to the zoo; 10.7% travelled between 10.1 and 20 kilometers; while 1.8% travelled more than 20 kilometers. Most of the respondents belonging to the adults’ category had family sizes of 5 or less; 88 of the respondents, constituting 76% had family sizes of between 1 and 5 persons; 27 respondents, represent about 23% had family sizes of 6–10 persons; while 1 respondent, or about 1% had a family size of more than 10 persons. Similarly, 52.7% of respondents in the students’ category belonged to families of between 1 and 5 persons; 46.4% were from families of 6–10 persons; and only 0.9% was from family sizes of more than 10 persons.

On the question of whether respondents had knowledge of substitute sites (sites with characteristics similar to the zoo), 77% of respondents in the adults’ category said they had never been to such a site before, while 23% answered in the affirmative. Similarly, 77% of respondents in the students’ category had no knowledge of substitute sites, while 23% had knowledge of substitute sites.

4.2 Regression results

In order to estimate more accurately the effects of travel costs and other socioeconomic variables on number of visits, and to also effectively deal with the problem of endogeneity of the income variable, a two-stage least squares regression method was applied to the models for adults. The OLS method was applied for students since there was no problem of endogeneity. Several functional forms have been tested in literature when applying the OLS method. In particular, studies by Prayaga, Rolfe and Sinden (2006) and Gillespie (1997) have tested the linear, semi-log and the double log functions, and then selected the most appropriate functional form. A similar approach has been adopted in this study with respect to student respondents.

In order to identify the best possible travel cost visitation relationship for Kumasi Zoo, the three functional forms, linear, log-linear, and double-log, were tested. Results of the second stage (structural equation) regression are presented in Table 2. Table 2 shows
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an $R^2$ of about 0.33. This indicates that the proportion of the total sample variation in the number of visits, which is explained by the independent variables, is about 33%. The Prob > F of 0.0000 shows that the explanatory variables are jointly significant in explaining variations in the number of visits.

Table 2 Result of second stage of the 2SLS model for adults

| Independent variables | Coefficient | Standard Error | $P>|t|$ |
|-----------------------|-------------|----------------|--------|
| Travel costs          | −0.2455327*** | 0.0698057      | 0.001  |
| Age                   | −0.0633732*  | 0.0364456      | 0.085  |
| Income                | 0.0011814    | 0.0018614      | 0.527  |
| Family size           | −0.2947857** | 0.01130299     | 0.010  |
| Previous knowledge    | −2.934506**  | 1.190239       | 0.015  |
| Gender                | −0.4325547   | 0.5000187      | 0.389  |
| Marital status        | 0.0711932    | 0.5450055      | 0.896  |
| Knowledge of substitute site | −0.0434877 | 0.5392944     | 0.936  |
| Distance travelled    | 0.0222867*   | 0.0127769      | 0.084  |
| _cons                 | 11.17918***  | 2.254801       | 0.000  |

*** indicates the variable is statistically significant at 99% confidence level
** indicates the variable is statistically significant at 95% confidence level
* indicates the variable is statistically significant at 90% confidence level.

R-squared = 0.3287; F(9, 106) = 5.99; Prob > F = 0.0000

Source: Field survey, April 2014

Table 2 indicates that, for adults, five of the variables were significant. The variable tcost (being the price of recreation) was significant at 99% confidence level. Besides, its coefficient was negative as expected. This implies that the higher the travel costs, the fewer visits people would make to the zoo. This is consistent with the theory of demand which states that, all things being equal, the higher the price of a commodity, the lower the demand with a coefficient of $-0.25$ this implies that an increase in travel costs by 1% will result in about a 25% decrease in the number of visits.

Age was significant at 90% confidence level. Its $-0.06$ coefficients implies that a 1-year increase in the age of a visitor results in a decrease in the number of visits by 0.06. This shows that younger people visit the zoo more than older people. Family size is also significant at 95% confidence level. Its coefficient of $-0.29$ indicates that a 1% increase in family size will induce about a 20% decrease in the number of visits. This is a reflection of reality. As one’s family size increases, his/her financial burden increases and, since recreation is not considered a basic necessity, he/she reduces his/her consumption of recreational goods in order to satisfy some basic necessities. Previous knowledge of the zoo by an individual (pknow) is significant at 95% confidence level and its coefficient is $-2.93$. This indicates that the number of visits made by an individual decreases by about 2.93 times if the individual has previous knowledge of the zoo. Distance is significant at 90% confidence level. It has a coefficient of 0.22, which implies that a 1% increase in the distance from the zoo results in an increase in number of visits by about 22%. This could possibly be attributed to the fact that, because people near the zoo live with the facility, they do place less value on it than people from afar.
Table 3 presents the OLS regression results for students; the $R^2$ of the model is about 0.52. This indicates that the proportion of the total sample variation in the number of visits, which is explained by the independent variables, is about 52%. The $Prob > F$ of 0.0000, shows that the explanatory variables are jointly significant in explaining variations in the number of visits.

The Breusch-Pagan/Cook-Weisberg test for heteroscedasticity conducted initially gave a $Chi^2(1)$ value of 3.22 and a $Prob > Chi^2$ of 0.0726. This value is significant and shows the presence of heteroscedasticity. However, after including variable age squared, it corrected for the problem of heteroscedasticity. The $Chi^2(1)$ value became 2.47 and the $Prob > Chi^2$ was 0.1158 implying that the model was now homoscedastic.

Here, the variable tcost is significant at 99% confidence level. It has a coefficient of $-0.56$. This implies that a 1% increase in travel costs will cause a 56% decrease in the number of visits. This is in line with the law of demand, which states that, as the price of a commodity increases, *ceteris paribus*, the quantity demanded will decrease. Age is significant at 95% confidence level and it is positively related to the number of visits. This demonstrates that the older visitors are, the more trips they will undertake to the zoo.

Table 3 further shows that pknow is significant at 99% confidence level and its coefficient is negative. This implies that a unit increase in the previous knowledge of the zoo results in a reduction of number of visits of a student by 1.4 units. Knowledge of substitute site and age squared are both significant at 90% confidence level. Knowledge of substitute sites (sub) has a coefficient of $-0.6$. This indicates that the number of visits made by an individual decreases by about 0.6 times if the individual has knowledge of a substitute recreational site. This is also in line with the theory of demand. The availability of a close substitute reduces the demand for a product.
4.3 Price elasticity of demand at Kumasi Zoo

Price elasticity of demand for adults was derived with the aid of the adults demand function. At the current gate fee of GH₵2.50, the number of visits obtained was 7.16. Given the slope of \(-1.14\) and the price-quantity ratio, the elasticity coefficient for adults was \(-0.4\). It follows that a 10% increase in the gate fee will result in a 4% decrease in the number of visits by adults to the zoo. This suggests that the demand for recreation at the Kumasi Zoo by adults is price inelastic. This implies that an increase in gate fees will result in an increase in total revenue since the decrease in number of visits would be less than proportionate. Management can therefore increase gate fees for adults; as such an action will have little effect on the number of visits.

For students, at the current gate fee of GH₵1.00, the number of visits obtained was 7.28. With the slope of \(-0.65\) and the price-quantity ratio, the price elasticity of the demand coefficient obtained for students was \(-0.09\). This also implies that the demand is price inelastic as far as students are concerned. A 10% increase in gate fees will result in a less than proportionate 0.9% decrease in number of visits. An increase in gate fees will result in an increase in total revenue. Management can thus increase the gate fees for students without losing revenue.

4.4 Consumer surplus for Kumasi Zoo

The demand curve for adult visitors shows that they are willing to pay a maximum of GH₵10.66 for a visit but they actually pay GH₵2.50. Each adult visitor therefore enjoys a consumer surplus of GH₵29.21 per annum. In the same vein, students are willing to pay up to GH₵5.73 but they pay only GH₵1.00. Students therefore enjoy a consumer surplus of GH₵17.22 per student per annum. An average per person consumer surplus of GH₵23.22 per annum is derived for all visitors combined. This is calculated using the average of the total consumer surplus estimates for the two categories of visitors. With a total number of 78,465 visitors in 2009, the overall consumer surplus is estimated to be GH₵1,821,957.30. This is the user value of the Kumasi Zoo by adult and student visitors.

5 Conclusions

The results of this research show that the TCM offers a great prospective for determining the user value of recreation at the Kumasi Zoo. Following the findings of the study, the following conclusions are made. First, travel costs do influence a visitor’s decision to visit the Kumasi Zoo. The demand functions estimated indicate that a negative relationship exists between number of visits and travel costs. Second, WTP the estimates calculated indicates that, generally, visitors are willing to pay a higher amount to enjoy the services of the zoo than they actually pay as gate fees. Specifically, the study has shown that, while each adult visitor is willing to pay an amount of GH₵10.66 on a visit, they pay only GH₵2.50 as gate fees. In addition, while students are willing to pay GH₵5.73, they actually pay a gate fee of GH₵1.00 to enjoy the services provided by the zoo. It can also be concluded that visitors enjoy substantial consumer surpluses. Adult visitors enjoy a consumer surplus of GH₵29.21 per annum; and students enjoy a per annum consumer surplus of GH₵17.22 per visitor. Based on a 2009 visitor number of
78,465, the overall per annum consumer surplus enjoyed by visitors of the Kumasi Zoo was estimated to be GH¢1,821,957.30.

Elasticity estimates revealed that adult and student visitors are less sensitive to price increases as far as recreation at the Kumasi Zoo is concerned. Price elasticity coefficients for adults and students were 0.4 and 0.09, respectively. Thus, an increase in gate fees of adults and students will result in an increase in revenue.

Finally, this study concludes that some demographic/socioeconomic factors affect visitors’ demand for the services of the zoo. Socioeconomic factors such as family size, age, previous knowledge of the zoo, knowledge of substitute sites and distance were found to have a significant influence on visitation to the zoo.

6 Recommendations

Subsequent to the findings of the study, the following recommendations are made to the Wildlife Division of the Forestry Commission, which manages the Kumasi Zoo.

On the basis of the consumer surplus and elasticity estimates, it is recommended that the management of the Kumasi Zoo increase the gate fees for adults and students. It is important to develop the zoo as a self-sustaining recreation and nature conservation centre. Increasing the gate fees would immediately generate additional revenue to cover the operating and maintenance expenses of the zoo. This action, however, depends on the objectives of management.

In addition, since visitors to the zoo come from a variety of income groups, the zoo may consider developing some levels of service with progressively higher fees such group or individual guided tours, and catering services to support the needs of visitors.

References


