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Estimating the Recreational Demand for Domboshava Hill and Cave Using the Individual Travel Cost Method

By

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DECLARATION

This Dissertation is my own work and where other sources are used, acknowledgements have been made. I hereby declare that this Dissertation has not previously been submitted for the award of another degree at any university.

Signed _____ Date _____

Madzudzo Valentine

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DEDICATION

To my loving wife, Charity and adorable daughter, Valerie. You mean everything to me!

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ABSTRACT

The main aim of this study was to investigate the determinants of recreational demand for Domboshava Hill and Cave, estimate the consumer surplus as well as establish the impact of entrance fee on the recreational demand for the site. This study is motivated by the dearth of literature on the subject leading to suboptimal economic policies on the site. The study sought to model the recreational demand function for the site. The Truncated Poisson Regression Methodology was used to investigate factors that determine demand for recreational site visit while the semi-log demand function was used to estimate the demand function for the site, relating number of visits to travel cost, holding all other factors constant. On-site cross-sectional data was collected for the period March and April 2018. The findings were consistent with the Individual Travel Cost Model, showing that travel cost, income, mode of transport, household size, marital status and age are important determinants of recreational demand. There is need for the authorities to allocate substantially large budgetary allocations for the preservation of the site given the positive consumer surplus and recreational benefit. There is also need to pursue scientifically based economic policies to guide the site's optimal entrance fee. Future economic decisions have to be based on the economic value of the site.

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LIST OF ACRONYMS

CBTE**s**	Community Based Tourism Enterprises
CVM	Contingency Valuation Method
GDP	Gross Domestic Product
HPM	Hedonic Pricing Model
ITCM	Individual Travel Cost Method
ML	Maximum Likelihood
NBRM	Negative Binomial Regression Method
NCB	National Conventions Bureau
OLS	Ordinary Least Squares
RNTB	Rhodesia National Tourist Board
TC	Travel Cost
TCM	Travel Cost Method
TNBRM	Truncated Negative Binomial Regression Model
TPRM	Truncated Poisson Regression Model
WTP	Willingness To Pay
ZIMASSET	Zimbabwe Agenda for Sustainable-Socio Economic Transformation
ZTA	Zimbabwe Tourism Authority
ZTB	Zimbabwe Tourist Board
ZTCM	Zonal Travel Cost Method
ZTDC	Zimbabwe Tourist Development Corporation

CHAPTER ONE

INTRODUCTION AND BACKGROUND

1.0 Introduction

This study focuses on estimating the recreational demand for Domboshava Hill and Cave which is one of the less famous tourist resort areas in Zimbabwe. Domboshava Hill and Cave is an impressive granite hill situated in Chinamhora on the outskirts of Harare that is a pleasant place to visit. It boasts of a magnificent complete view of the surrounding countryside. Its main attractions comprise the Interpretive Centre, San rock art, geological formations and a breath-taking natural scenic environment with wooded vegetation, a sparkling flowing stream in the rain season as well as myriad walking trails. The Interpretive Centre is a rich source of ecological and historical information and has got a little but impressive museum that showcases early Shona lifestyle. Since 1936, the monument has been under the custodianship of the National Museums and Monuments of Zimbabwe, which is a supreme heritage organization established under Act Chapter 25.11 of 1972.

There is also the Domboshava Art Centre adjacent to the Hill and Cave where local sculptors make a living by selling their wares to tourists. Their sustenance depends on expenditure by tourists on their products. Essentially, sculptures are complementary to recreational visits to the site. Of late, the sculptors have been complaining of sluggish sales and this could probably be as a result of fluctuating visits by tourists or falling levels of income such that the tourists cannot afford to spend much on sculptures. There is also a restaurant and lodges where tourists often refresh themselves after the often wearisome mountain climb.

The photo below shows tourists climbing the Domboshava Hill.

Source: Garlake (2013)

Ward and Loomis (1986) posit that four main components of benefits can be generated from recreational sites and these are direct on-site recreational benefits, a stream of revenues, benefits such as option and existence values to off-site users and net-gain in regional income derived from on-site expenditures. The major motivation for the study is that although much marketing has been made to boost international tourism, the domestic tourism sector that is also crucial in driving the country's economic recovery has been neglected. Ghimire (2001) argues that most developing countries have a tendency of introducing policies that boost international tourism while neglecting domestic tourism.

The Zimbabwe Tourism Authority (ZTA) publicity has mainly focused on renowned tourist resort areas such as the majestic Victoria Falls and the Eastern Highlands, paying little or no attention to less known resort areas. Little or no research has been carried out to evaluate the feasibility of tourism in less known areas. Such research-marginalized areas include the Domboshava Hill and Cave. There are major tourist activities in rural areas, where a key reason for conducting them is to enhance the local tourism industry and generate expenditure in the local economy (Perdue *et al*., 2000).

Clawson and Knetsch (1966) argue that there is need to put an accurate value on outdoor recreation in the management of resources for three major reasons. First, an accurate value on outdoor recreation provides a means for comparing the importance of recreation with that of other uses of the same resources. Second, the recreational value would provide a measure of the willingness to make appropriate investment in the project. Third, the recreational value provides a ceiling to fees that are charged for its use.

1.1 Background

Since the country attained its independence in 1980, tourism has been associated with renowned attraction places such as the Victoria Falls, the Eastern Highlands, Great Zimbabwe, Kariba, National Parks, Harare and Bulawayo. Before the country's independence, tourism was governed by the Development of Tourism Act of 1975, which was mandated by the Rhodesia National Tourist Board (RNTB) that fell under the Ministry of Information, Immigration and Tourism. At independence, the RNTB was transformed into the Zimbabwe Tourist Board (ZTB) whose mandate oversaw regulation and commercial operations. In 1984, the Development of Tourism Amendment Act was introduced. The Act provided for the establishment of the Zimbabwe Tourist Development Corporation (ZTDC), a government parastatal. ZTDC subsequently superseded ZTB. ZTDC was so hamstrung by financial constraints that its operations were compromised.

Following the Tourist Act Chapter 14.20 of 1996, the Zimbabwe Tourism Authority (ZTA) was established. Its main functions include the promotion of the country as a prime tourist destination to the overseas, regional and domestic market. Following the inclusive government in 2009, the Ministry of Tourism and Hospitality industry was created. Even though the tourism sector is essential, it had been operating without a guiding policy framework until August 2012, when the National Tourism Policy was introduced. Some of its objectives are the creation of an enabling environment for the development and management of the tourism sector, the promotion of image perception in the country, sustainable tourism development, attraction of investment on new and existing tourism products as well as the promotion of domestic tourism.

In October 2013, the government introduced an economic blueprint- the Zimbabwe Agenda for Sustainable Socio-Economic Transformation (ZIMASSET) whose theme is "Towards an Empowered Society and a Growing Economy". The economic policy runs from October 2013 to December 2018. During the plan period, the economy is expected to grow by an annual average rate of 7.3%. However, the economy's performance seems to contradict the growth

plan. For instance, in 2016, Gross Domestic Product (GDP) was projected to grow by 6.5% but it was relatively meagre at 0.6%.

ZIMASSET has got four clusters one of which is the Social Services and Poverty Eradication Cluster. The cluster's thrust is the creation of employment for the youths and women so as to improve the standards of living of the populace. The tourism sector was identified as one of the key drivers of the projected growth targets and the four clusters. The ZTA and the National Conventions Bureau (NCB) were given the mandate of ensuring the sustainable contribution of the tourism sector to the country's GDP. Table 1.1 shows the expected role of tourism in spearheading ZIMASSET.

Table 1.1: Expected role of Tourism under ZIMASSET

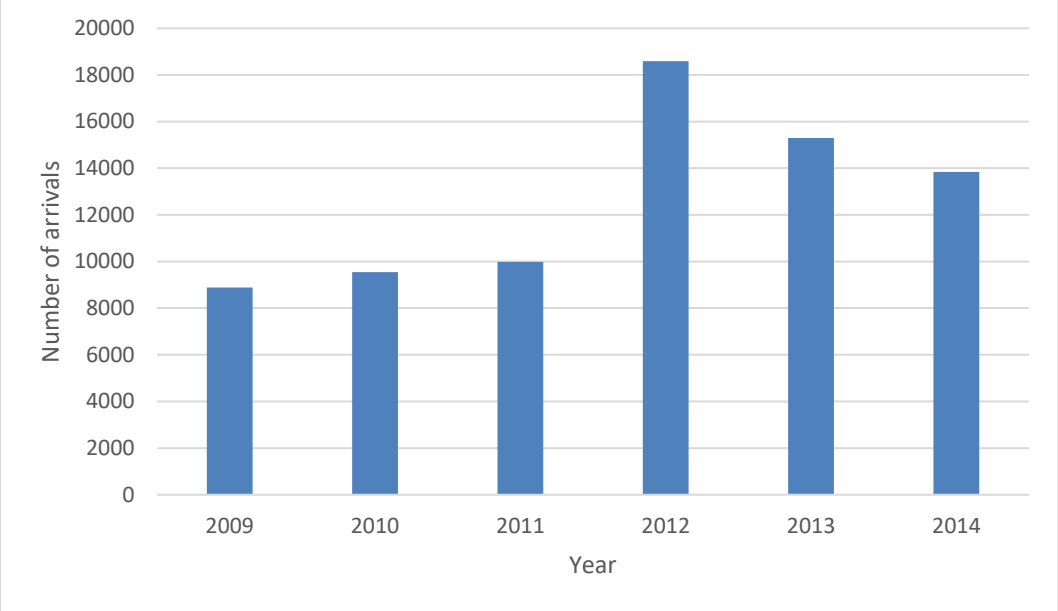
Cluster Key Result Area	**Cluster Outcomes**	**Cluster Outputs**	**Strategies**
Tourism Promotion	Improved marketing Destination Promotion and Tourism facilitation	Increased tourism receipts Increased destination preference and accessibility Visas liberated	Open new source markets Open Visitors bureaus Undertake feasibility study and implement pilot project on UNIVISA
Domestic Tourism development	Increased Community Based Tourism Enterprises (CBTEs)	Community Based Tourism Enterprises resuscitated	Increased support for CBTEs Raise awareness on Civil Servants Visitor Scheme

Source: ZIMASSET (2013)

Despite its critical role of stimulating economic growth, the country's tourism sector has been experiencing upward and downward swings. Annual tourist arrivals in Zimbabwe averaged 1641,354 between 1980 and 2015, reaching an all-time high of 2508,255 in 2007 and an all-time low of 237,668 in 1980. The country experienced hyperinflation that peaked 231 million percent in 2008, high unemployment, low standards of living, drought, and bad international publicity after year 2000's fast track land reform program, inconsistent economic and political

policies and liquidity crisis. Such harsh socio-economic and political factors probably explain the tourism sector's current debilitation. Domboshava Hill and Cave is one such resort area that seems to be suffering from a host of problems plaguing the tourism sector. Recently, the restaurant and lodges have been experiencing low revenue, indicative of low tourist turnout and low expenditure on complementary recreational facilities.

Figure 1.1: Annual tourist arrival at Domboshava Hill and Cave



According to the National Museums and Monuments of Zimbabwe (2018) as illustrated by Fig 1.1 above, the area attracted 8,883 visitors in 2009 before the number increased to 9,540 in 2010. 9,987 tourists came in 2011 before the number increased by 86.2% to 18,594 in 2012. However, in 2013, visitors decreased by 17.74% to 15,295. The downward trend continued in 2014 as 13,842 tourists visited the area representing a 9.5% decline from the previous year's statistics. The average number of visits for those six years was 12,700 per year. The annual average number of tourists in the whole country during the same period was 1600,000. This means that tourists to Domboshava accounted for about 0.8% of the average number of tourists in Zimbabwe. The recreational area, is therefore significant to the tourism industry, though to a lesser extent.

Domboshava Hill and Cave is located about 27 kilometres north of the capital, Harare. Such close proximity to Harare is a big pull factor to tourists most of whom reside in Harare. A few tourists, however, come from abroad. The name Domboshava literally translates to red rock. The recreational area is under the custodianship of the National Museums and Monuments of

Zimbabwe. The significance of the site lies in the fact that it is a source of livelihood to sculptors, vendors and the people employed by the local businessman who owns a restaurant and picnic facilities at the foot of the Hill. On the Domboshava Hill and Cave, tourists are provided parking space, ablution facilities, picnic shelters and braai stands.

The price structure of the site pegs entrance fee for local adult visitors at US$4, US$1 for school children, US$10 for non-Zimbabwe residents and US$5 for non-resident children. Entrance fees together with transport cost and other expenses incurred in visiting the site, comprise travel cost which is a proxy for the price of visiting the site. Investigating the impact of travel cost on demand for visiting the site would be of significance to policy makers in stimulating demand for the site. The travel cost theory suggests that travel cost is a push factor in recreational demand.

1.2 Problem Statement

The promotion of the tourism industry in Zimbabwe has focused more on the well-known tourist destinations such as the Victoria Falls, Hwange National Park and Inyangani Mountain and less on the many lesser known sites such as the Mtarazi Falls, Domboshava Hill and Cave and Ngomakurira that are scattered all over the country. As a result, little is known about their contribution to the growth potential of tourism in Zimbabwe and to the achievement of the ZIMASSET tourism sector objectives such as increased tourism receipts and increased destination preference and accessibility. Also, there is a dearth of both theoretical and empirical literature on the factors that determine the demand for recreational visits to the lesser known tourist sites. National policy making on the tourism development could stand to benefit by a better understanding of these factors. Such factors include consumer surplus and recreational benefit. The magnitude and sign of these factors are of essence to policy makers. The National Museums and Monuments might have been setting entrance fees without carrying out a proper feasibility study to determine consumer surplus and recreational benefit for the site. As such, unsound decisions not based on scientific studies, could have been made. This study seeks to estimate the consumer surplus and recreational benefit for the Domboshava Hill and Cave. The policy and research neglect of the richness and diversity of the lesser known tourist attractions and destinations in Zimbabwe is cause for concern. This provides motivation for this study.

Time and resource constraints, however, precluded a survey of all lesser known tourist destinations but rather dictated that this research adopt a case study approach to the investigation of these issues. A pilot visit to Domboshava Hill and Cave recreational area in

October 2017 convinced the author of its suitability for a case study. Discussions with the sculptors and the restaurateur at the site revealed that they were experiencing declining and sluggish sales of their products and services which are a key indicator of the demand for the site on the local economy. This further increased the author's desire and motivation for a deeper understanding of the determinants of demand for this site in the hope that it would generate insights into broader issues raised in this problem statement. Theoretical and empirical literature on the Travel Cost Method (TCM) recreational demand suggests that travel cost is a major determinant of recreational demand while other determinants are income, education and age. This study seeks to examine whether such factors as embodied in the theoretical and empirical framework, hold true for the Domboshava Hill and Cave context. This will narrow the existing literature gap since to the best of my knowledge, such a study has never been done before.

1.3 Research Objectives

The broad objective is to estimate the recreational demand for Domboshava Hill and Cave.

Specifically, this study seeks to:

(i) Determine determinants of demand for the Domboshava Hill and Cave recreational site
(ii) Estimate the impact of trip price on the recreational demand
(iii) Estimate the recreational benefit for the site
(iv) Estimate the consumer surplus for the site

1.4 Research Questions

Closely related to the objectives stated above, the research questions brought forth by the study are:

(i) What are the determinants of demand for the Domboshava Hill and Cave recreational site?
(ii) What is the impact of trip price on the recreational demand?
(iii) What is the recreational benefit for the site?
(iv) What is the consumer surplus for the site?

1.5 Research Hypotheses

In relation to the above formulated research objectives and questions, hypotheses below were formulated.

(i) Travel cost, income, age and educational level are the determinants of demand

(ii) There postulates an inverse relationship between trip price and demand for the site

(iii) There is positive recreational demand

(iv) There is positive consumer surplus

1.6 Significance of the research

Without the study, suboptimal economic decisions for the site may be made. Also, the Domboshava tourism area employs a number of local people who have been negatively affected by the fall in the volumes of business. As such, the study will seek to address the challenges being experienced. The study is significant because job losses may continue unabated if no research is undertaken.

The Individual Travel Cost Method (ITCM) as well as the Count Data Model that will be used are also relatively new in developing countries in general and Zimbabwe in particular. The enrichment of the body of literature will benefit policy makers, students and the local community. Closely related to the above is the fact that tourism studies in the country have been skewed in favour of international tourism while domestic tourism has-to a larger extent-been neglected, notwithstanding the broad spectrum of benefits it gives to the country and the communities. This study focuses on domestic tourism and will draw the attention of policy makers whose mandate is to come up with vibrant policies that will benefit the community and the country at large especially in light of the need to be in line with the ZIMASSET goals.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This section reviews both theoretical and empirical literature with focus on the estimation of recreational demand for Domboshava Hill and Cave. The theoretical literature section will give emphasis pertaining to the underlying theoretical framework for the Travel Cost Method (TCM) of valuation of environmental resources. In the empirical literature section, relevant empirical studies on the area of study will be extensively reviewed.

Direct valuation methods comprise the contingent valuation method (CVM) as one of the stated preference methods. Basic concepts behind CVM are the creation of a hypothetical and yet realistic market situation for non-market resources, communication to people about the contingent market and the collection of their responses to this hypothetical market. Contingent, as the name suggests, derives from asking people that what they would be willing to pay is dependent or contingent upon some hypothetical change in the state of an environmental resource. Respondents are directly asked to tell, for example, their WTP for some changes in environmental amenities. The information can then be used to estimate economic benefits associated with the provision of these resources. Currently, CVM is the only existing method for valuing existence, bequest and option values of environmental resources.

When compared to the TCM, the CVM has got an advantage given that it estimates both use and non-use values. However, it also has got disadvantages. Some of the limitations are that individuals may fail to understand the values of the recreational site being valued. Also, individuals may misrepresent their beliefs and this may lead them to give answers that are at variance with their opinions. There might also be a tendency to please the interviewer, thus giving him or her answers that the respondent might expect the interviewer to desire.

Unlike the CVM, the TCM is a survey based approach that is premised on the actual observation of the behaviour of individuals and as such, the biases associated with the CVM are minimised. This study will therefore use the TCM in estimating the demand for Domboshava Hill and Cave.

2.1 Recreational Demand Theory

2.1.1 Theory of Travel Cost Method (TCM)

The TCM assumes that consumers combine market goods with environmental goods in their consumption set. The initial idea behind the TCM was attributed to Hotelling (1949). Hotelling suggested that costs incurred by visitors to a recreational site could be used to model a measure of the recreation value of the sites visited. Nevertheless, it was Clawson and Knetsch (1966) who were the first to develop empirical models.

Basically, TCM is a survey technique where a questionnaire is usually prepared and given to a sample of visitors at a recreation site in order to know their places of residence, demographic and attitudinal information, and the frequency of visit to the site and other related sites as well as trip information such as associated costs, length and purposefulness. Using this data, visit costs can then be calculated and related to other relevant factors so that a demand relationship may be established. The demand function may then be used to estimate recreation value of the whole site.

The basic travel cost theory assumes that visitors visit only a single site. The basis of the theory according to Freeman (1979) and Bateman (1993) is as follows:

An individual's utility depends on the total time spent at the considered site, the quality of the recreational area and a bundle of other commodities. The individual visitor would maximize the following utility function:

Max: u(X, r, q)…… (1)

where,

X = Bundle of other commodities

r = Number of visits to the site

q = Quality of the site

In the maximization of the above utility function, the individual is constrained by the following factors:

$M+pw.tw=X+c.r$ …….. (2)

where,

M = Exogenous income

pw= Wage rate

tw = Hours of work

c = Monetary cost of a trip

$t*=tw\ t1+t2\ r$..... (3)

where,

t* = Total discretionary time

tw = Hours of work

$t1$ = Round trip travel time.

The model is based on the following assumptions:

1. r and q are compliments in the utility function while $t2$ = Time spent at site

2. An individual is free to choose the time spent at work and work does not convey utility or disutility directly

3. Monetary cost to the recreational area has got two components, namely the entrance fee and the monetary cost of travel. The monetary cost is pd.d where pd is per kilometer cost and d is distance.

Substituting (3) into (2),

$M+pw.t*=X+[c+pw\ t1+t2\ ]$..... (4)

Equation (4) shows that an individual's income is spent totally on consuming a bundle of other commodities and a visit to the recreation site. The income has two components which are exogenous income and potential income which could be generated by allocating all the available time to work.

The utility maximization problem of the individual can be shown as;

max: u (X, r, q)

$st.M+pw.t*=X+r\ [f+pd.d+pw\ (t1+t2)]$..... (5)

The Lagrangian function of the maximization problem is:

$L=u\ (X, r, q) + (M+pw\ t*- [X+r\ [f+pdd+pw\ (t1+t2)]$..... (6)

where f = Entrance fee

pd= Cost per kilometer

d = Travel distance in kilometers.

The first order necessary conditions from the Lagrange function are:

$\partial U/\partial x=\lambda$..... (7a)

$\partial u/\partial r =\lambda\ \{f+pdd+pw\ (t1+t2\}$..... (7b)

$M+pw.t*=X+r\ f+pd.d+pw\ t1+t2$..... (7c)

where λ is the marginal utility of money income.

Maximization of the utility equation subject to the constraint results in the individual's demand function for visits.

r = r (pr (f, pd, d, pw, t1, t2), M, q)…… (8)

The model is derived for an individual and estimating the demand function requires time series data on the number of visits by each visitor. Due to the difficulty of collecting such a data set, an alternative method is used. The country is divided into zones and the visit rate from each region is calculated instead of the visit rate of the individuals. It is assumed that the visitors from one region have the same characteristics. The regional visit rate is assumed a proxy for the quantity demanded for recreation. Visitors from a shorter regional distance to the site are expected to have a higher visit rate from a greater regional distance since the travel and the time cost are lower for closer regions. The visit rate and the travel cost have a negative relation in congruence with the law of demand.

The estimated demand function can be used in calculating consumer surplus, which is the value of the national park as given in equation (9).

$V = r\ [pr, (f, fdP2P1, d, pw, t1, t2), M, q]$…… (9)

Where, V = value of national park

P1 = Lowest total price of recreation

P2 = Highest total price of recreation

The TCM is premised on calculating the ordinary demand curve consumer surplus (Bateman, 1993). According to Hueth and Strong (1984), the TCM has got distinct advantages. To begin with, the data is easily collected. More so, the method is cheap to use, relatively simple and straightforward to apply. The TCM also applies demand theory in estimation as well as in explaining the recreational value. Parsons (2003) argues that individual single site models function like classic downward sloping demand functions and are useful when estimating the access value of a recreation site. The travel cost analysis has got three main dimensions of the demand for the environmental good with the first dimension being concerned with how demand depends on the good's quality. The second dimension is related to the number and duration of trips during a period of time such as a year while the third aspect pertains to the treatment of substitute sites.

Key assumptions of TCM:

(i) Admission fees-which are often low or non-existent to recreational areas- are in most cases an inadequate measure of the value of a visit to recreation site. On the other hand, the cost of round-trip travel is often used as a proxy for one's WTP to visit a site. Recreation site users are assumed to react to changes in gate fees in the same way that they react to changes in travel cost.

(ii) The basic TCM method assumes the case of a pure visitor, which regards the trip to the site as solely for visiting the site. However, in real life, the pure visitor case is one of several possible cases. The other possibility is that the visit to the site is only a component of the trip program or that the visit is explained by other interests such as visiting relatives. The travel cost and time should therefore be allocated among different purposes.

(iii) The other assumption is that a recreational site does not produce either utility or disutility, which means that the journey itself gives no value. However, there is a possibility that the trip itself produces some benefits to the traveller. As a result, the travel cost would be overestimated.

(iv) One model assumes that there is only one site to visit. This means that there are no substitute sites. In the real world, however, visitors normally have the possibility to choose among different substitute sites. In this case, the number of visits that consumers take to the site surveyed will not only depend on its implicit price but also on the implicit prices of substitute sites. If these are not taken into account, parameters will be biased.

(v) The weak complementarity relationship between an environmental asset and the private good, such as visits to the site, is assumed to measure how visitation rates to the site change as an environmental quality of the site changes. The weak complementarity assumption between an environmental asset and consumption expenditure suggests that when consumption expenditure is zero then the marginal utility of the public good is also zero. If travelling to a recreation site becomes expensive, no-one will visit the site anymore and the marginal social cost of a decrease in the quality of that site will also be zero. The TCM, therefore, cannot estimate non-use values.

Given the basic assumptions of TCM, the costs of travel and the value of travel time are used as proxy for outdoor recreational sites WTP. According to Clawson and Knetsch (1966), travel cost is the sum of distance travelled costs, entrance fees costs and time taken costs. To be

specific, the total sum of expenditure of services obtained from a site visit comprises four elements as listed below.

(i) Direct travel expenses, for example expenditure on fuel transport, hotels and so forth.
(ii) Time cost of travel. This is the opportunity cost of travel time.
(iii) Cost of time spent at the site.
(iv) Entrance fee to the recreational site.

It is further assumed that a sampled visitor's utility function is separable in the recreation activity being modelled.

The TCM allows the estimation of a negatively sloped demand curve because the observations on individual travel cost and number of visits varies inversely across the population of visitors. The variation allows estimation of the Marshallian demand curve for the recreation site by which consumer surplus is measured. Consumer surplus as a welfare measure is however not without limitations. It only measures substitution effect, which is the change in quantity demanded due to change in price. The income effect, which reflects the indirect loss of income, is neglected. The consumer surplus concept to a larger extent depends on the measurability of utility. However, since tastes and preferences differ from one individual to another, one cannot accurately measure surplus. Also, although the consumer surplus concept is premised on the notion of diminishing marginal utility and constant utility of money, marginal utility has got a tendency to decline when the stock of money increases.

Despite the weaknesses of the welfare measure as highlighted above, this study will use it. This is because a policy maker, which in this case is the National Museums and Monuments of Zimbabwe, must make a trade-off between consumer surplus reduction and revenue increase at the time of imposing entrance fees. An entrance fee that reduces surplus to a smaller degree while maximizing revenue to a larger amount will be desirable. Best social decisions also depend on the consumer surplus concept.

Zonal Travel Cost Method (ZTCM)

The TCM can be subdivided into zonal and individual. The zonal travel cost method (ZTCM) was developed by Clawson and Knetsch (1966) and its name derives from the grouping of travellers living at similar distances from a site into zones. To adjust for differences in population sizes of the zones around the site, visits are divided by the population yielding visits

per capita. The adjustment provides one way to cater for the effect of population density on observed participation at a site. The zonal grouping's distinct assumption is that tastes and preferences should be similar on average, across all the distance zones. The steps involved in estimating ZTCM are summarized below.

(i) First, the data on the number of visits made by households in a period and their origin is collected via-on-site surveys.
(ii) The area encompassing all visitor origins is subdivided into zones of increasing travel cost as well as the total population.
(iii) Household visits per zone is calculated by allocating sampled household visits to their relevant zone of origin.
(iv) The household average visits in each zone is calculated by dividing the number of household visits in each zone by the zonal population.
(v) The zonal average cost of a visit is calculated with reference to the distance from the trip origin to the site.

Critique of the ZTCM

The advantage of ZTCM is that by dividing by the population, the reduced rate of participation at higher travel costs is automatically catered for. Actually, observed visits per capita are a product of two independent individual decisions which are the decision to participate, which is observed as a probability of participation, and the number of visits taken by participants. Even though employing visits per capita as the dependent variable accounts for both of these effects, it does so by estimating only one coefficient for each explanatory variable to account for both decision processes. Most researchers have recently been employing the Maximum Likelihood estimation techniques such as the probit, tobit and logit techniques to model these two decisions separately.

However, the ZTCM has got its own limitations. A major statistical problem often associated with any sort of per capita specification as is the case with the ZTCM, occurs when the units of aggregation have different sizes of aggregation. In this case, zones of origin may have populations ranging from a few hundred to several thousand leading to heteroskedasticity of the estimated demand curves. The suggested solutions are specifying population as an independent variable, weighting observations by the square root of the population as well as proper selection of functional forms in order to minimize the effects of heteroskedasticity.

The other limitations of the ZTCM relate to its statistical inefficiency due to loss of information resulting from using highly aggregated data and the inability to separate out the influence of travel time from travel cost (Georgiou *et al.*, 1997). Brown and Nawas (1973) also concur that estimates of the travel cost coefficient from zonal models are often statistically inefficient and therefore tend to reduce the degree of accuracy of the important price variable relative to the use of disaggregated data. The limitation arises from aggregating information on income, price of substitutes, tastes and preference which leads to precious information that could serve as demand shifters, being lost. Also, although it is important to cater for the influence of travel time in the estimation of the effects of the price on use, it is difficult to do so in the ZTCM because aggregating tourists by similar distances tends to create a high correlation between travel cost and travel time.

The Individual Travel Cost Method (ITCM)

In the 1970s, the individual single site approach addressed some of the weaknesses of the zonal method by collecting primary data from visitor survey results, thereby providing more detail and flexibility in the analysis. The ITCM was developed in the 1970s by Brown and Nawas (1973) and Gum and Martin (1974) as a response to the criticisms of the ZTCM. The ITCM accounts for estimating the individuals' recreation demand functions. Under their framework, quantity consumed is defined as the number of trips taken per year or per season by each sampled individual or household. The quantity is then regressed on the individual's or household's unique travel cost, travel time or distance as well as on socioeconomic characteristics.

According to Gum and Martin (1974), the ITCM can be specified as: V_{ij}= f (C_{ij}, E_{ij}, S_i, A_i, Y_i, H_i, N_i, M_i) where;

V_{ij}= number of visits made per year by individual i to site j

C_{ij}= individual i's total cost of visiting site j

E_{ij}= Individual i's estimate of the proportion of the day's enjoyment which was contributed by the visit to site j

S_i= dummy variable of individual i's assessment of the availability of substitute sites.

A_i= age of individual i

Y_i= income of individual i's household

H_i= size of individual i's household

N_i= size of individual i's party and

M_i= dummy variable, that is whether individual i is a member of an outdoor or environmental organization.

Step by step procedure for ITCM

1. Sample selection and survey: Random sampling is considered appropriate but seasonality must also be taken into account to obtain representative sample.

2. Exposition of calculated variables as well as statistical description of data. Descriptive statistics allow one to get a rough idea of the nature of the data collected.

3. The choice of functional form for the individual demand curve. Relevant statistical tests need to be conducted for the researcher to select a better specification among available functional forms.

4. Estimation of the recreational service demand function

V = f (TC, X)

5. Calculation of the individual consumer surplus (CS) observation by observation

Formulas of CS rely on the specific functional form selected for the demand in the previous step.

6. Calculation of the average sample CS

This is simply the average of individual CS

7. Aggregation of sample CS and further elaboration of CS

To compute this, sample CS per visit must be multiplied by the total annual number of visits to the site during the period under study.

8. Interpretation of results

Critique of the ITCM

Since no aggregation occurs, multicollinearity that is associated with zonal TCM is reduced and the precision of the estimators is increased. However, in the event that the tourist takes only one trip a year or per season, it is usually difficult to estimate an individual observation TCM demand curve because visits per season are equal to one. Also, the probability of participation as a function of distance is neglected. Brown and Nawas (1973) proved that when the proportion of non-participants increases with distance from the site, the individual observation TCM may overstate the consumer surplus estimates.

The study will use the individual travel cost method where only single purpose trips will be considered. The ITCM has been selected over the zonal travel cost method because of its statistical efficiency and its closer link to the utility maximization microeconomic theory. Casey *et al*. (1995) argue that multi-purpose visits may be excluded because their treatment is complicated as it is difficult to allocate cost shares as relating to the recreational activities. Therefore, only single purpose trips will be considered by the study.

The model as developed from the ITCM theoretical framework is demonstrated below:

r_i= f (tc_i,y_i, z_i)..... (1)

with r_i- the number of trips taken- being the dependent variable. The explanatory variables are tc_i, y_i and z_i with tc_i being the expenses such as entrance fees and travel costs incurred when undertaking the trip to Domboshava while y_i is the income and z_i is a vector of socio-economic variables which are satisfaction (sat) (binary variable 1= satisfied, 0 otherwise), education level (edu), family size (famsiz), age and marital status (ms). tc_i is the most important explanatory variable since it is where the estimated consumer surplus is dependent upon. Although education is not included in the ITCM conceptual framework, it has been included in the study because empirical work done by other researchers such as Kateregga (1998) found the variable to be significant in determining recreation demand.

2.2 Empirical Literature Review

Empirical literature on estimation of recreational demand is scant for Zimbabwe but relatively abundant in other developing countries and developed countries. Mixed results have been found in the estimation of recreational demand while different methodologies having been applied. This section discusses the TCM studies in both developing and developed countries.

2.2.1 Application of TCM in Valuing Outdoor Recreation Sites in Developing Countries

A few studies have looked into the valuation of different recreational sites in Ethiopia. Mahmud (1998) carried out a research to estimate the economic valuation of Sodere recreation area and found that the total revenue that the authorities were collecting through entrance fees from visitors failed to reflect the actual Sodere social recreational benefit. Mahmud (1998)'s empirical work is relevant to this study since there will be estimation of the economic valuation of Domboshava Hill and Cave. In Mahmud (1998)'s study, 232 sample visitors in different recreational activities such as Main Swimming Pool, Little Swimming Pool, Common Bath and Abader Bath were used. Then, simple random selection was used in interviewing individual visitors in each stratum. Both objective questions as well as visitors' opinion were used in the interviews. Using the ITCM and the ordinary least square estimation technique (OLS), a linear demand curve was estimated.

One of the weaknesses of the study was that there might not have been need to cluster samples of visitors for different type of recreational activities at the site since TCM basically measures the demand for visits to the site as a whole. This study aims to improve on the weakness by estimating the demand for visits as a whole instead of clustering. The other weakness is that the OLS estimation technique was used despite the fact that when applied to count data, it produces biased estimates. This study shall use the truncated Poisson regression method or the truncated negative binomial method if there is over-dispersion in the Poisson model. Such count data models produce estimates that are unbiased and accurate.

Kassaye (2017) conducted a study to estimate the recreational value of parks in Addis Ababa. Although the study used the ITCM like Mahmud (1998), it differed in the methodology used. The study applied the Poisson regression which is effective for count data for it produces unbiased results provided the variance-mean ratio is unity. The study utilized 180 randomly selected sample visitors of Hamle 19 and Future Park recreation sites. The recreational value for Hamle 19's site was estimated to be Birr 18,239,782.05 while the value for Future Park was found to be Birr 18,239,782.05. One limitation of the study was its adherence to recreational value only while excluding other use and non-use values. Also, the study could have utilised an even more accurate regression model, the Truncated Poisson model that truncates data at zero since positive counts were observed (Haab and McConnell, 2002).

Terefe (2000) differed from Kassaye (2017) by employing the negative binomial methodology in the investigation of the economic value of Tis-Abay Waterfalls using the ITCM. In an

attempt to measure the outdoor recreation value for the site, samples of 40 visitors were used. The samples were grouped by residence on the basis of distance from the site. The respondents were interviewed on their socio-economic, demographic and attitudinal information. Total visitors per year and the population in each zone, were determined using this information on the percentage of sampled visitors from each of the zones. The study took travel cost, income, availability of substitute sites, tastes, quality and population to explain visitation rate per thousand population at zero admission fee. Afterwards, the TCM was estimated using the negative binomial estimation technique having dropped insignificant variables. However, the study could have obtained more accurate results had it utilised the truncated negative binomial estimation technique having truncated at zero since positive counts of visitors were observed. The study indicated that the optimal gate fee was Birr 40 with the maximum expected revenue for the site being Birr 85,812,000 (=40x21378) 21378 being the number of total visits per year. Based on the demand curve, the park's annual economic value was estimated at Birr 2,181,998,095.

Kateregga (1998) utilized the ZTCM to estimate the value of Kaazin Camping Site in Uganda. In an effort to estimate the total benefits of the site, 200 adult visitors who came from five different zones were used as samples. Children visitors were excluded from the sample due to the possible lack of independence in decision making of whether to visit the site or not. Interviews were carried out only on weekends because of very low visitor turnout during weekdays. Data on zonal average travel costs as well as visit rate in relation to each zonal population densities, was used to construct the site's recreational services demand curve. Total annual visit rates from each district were found by multiplying the average frequency of visits from each district by the number of respondents from each zone. The total benefits of recreational services at the camp were estimated by integrating the area under the demand curve.

Using the model's demand equation, the study found various consumer surpluses that accrued to each and every marginal visit per 100,000 population from the five zones. The obtained consumer surplus values for the zones under study were then used to calculate a weighted average consumer surplus, which was found to be 88,889.5 shillings. The total consumer surplus was 17,777,900 shillings per year, which was calculated as 88889.5, the weighted average consumer surplus, multiplied by 2000, which was the average number of people who visited the site per year.

In the estimation of the recreation demand function, the Ordinary Least squares (OLS) estimation technique was employed. However, since the dependent variable is both censored and truncated, OLS estimates of demand parameters tend to be biased which implies that the independent variables are correlated with the error term (Smith *et al.,* 1983). The Maximum Likelihood (ML) estimation techniques such as the Poisson model should have been used since they ensure that demand parameter estimates are unbiased. In addition to that, estimates obtained by ZTCM are usually less precise and hence inefficient as compared to those of ITCM (Georgiou *et al.,* 1997). This study aims to improve on the efficiency of the method used by utilizing the more precise ITCM. Also, count data methodology will be used for better estimates of parameters. However, the exclusion of children from the survey will be adopted since they are often incapable of making their own independent decisions.

Enyew (2003) researched on the recreational benefit for Wabi Shebele Langano in Addis Ababa with the main objective of estimating the recreational benefit for the site. The ITCM method and the Truncated Poisson Regression Methodology were used. Travel costs, visitors' income, age, level of education, family size, acquaintance with the site, experience on other sites and being head of family were found to be major determinants for visits to the site. It was also found that site authorities collected only 20.87% of the annual recreational benefit of US$1,009,974. Enyew (2003)'s study is relevant because the correct methodology was used while the ITCM used is also more precise than the ZTCM. The study's objective of estimating recreational benefit is also one of the objectives of the Domboshava Hill and Cave study.

Enyew (2003)'s model is shown below:

$$Ln V_{ij} = \alpha_0 + \alpha_1 TC_i + \alpha_2 AG_i + \alpha_3 Y_i + \alpha_4 FZ_i + \alpha_5 ED_i + \alpha_6 AQ_i + \alpha_7 GP_i + \alpha_8 DGD_i + \alpha_9 DMS_i + \alpha_{10} DPC_i + \alpha_{11} DHD_i + \alpha_{12} DOC_i + \alpha_{13} DBMSS_i + \alpha_{14} DBGSS_i + \alpha_{15} DABSS_i + \varepsilon_i$$

where:

V_{ij}= individual's number of visits

TC_i= visitor's travel cost

AG_i= visitor's age

Y_i= visitor's monthly income

FZ_i= visitor's family size

ED_i= visitor's level of education as dummy variable, with 1 for number of years > 12 and 0 for number of years < or = 12

AQ_i= visitor's acquaintances with the site in number of years

GP_i= number of visitors in a group

DGD_i= visitor's gender as dummy with, 1 for male and 0 for female

DMS_i= visitor's marital status, with 1 for married and 0 otherwise

DPC_i= visitor's mode of transport, with 1 for own car and 0 otherwise

DHD_i= visitor as head of family, with 1 for head and 0 otherwise

DOC_i= visitor's occupation as dummy variable, with 1 for government employee and 0 otherwise

$DBMSS_i$= Bekele Mola substitute site as dummy variable, with 1 for visits to it and 0 otherwise

$DBGSS_i$= Bishan Gari substitute site as dummy variable, with 1 for visits to the site and 0 otherwise

$DABSS_i$= Adule Basuma substitute site as dummy variable, with 1 for visits to the site and 0 otherwise

Enyew (2003) estimated the opportunity cost of visiting the site by directly asking respondents the amount of money they would request their employers to pay them were they asked to cancel their trips. However, as Fletcher *et al*. (1990) argue, the cost of travel time remains an unsolved empirical puzzle since there is no developed method to accurately estimate it.

In Sudan, Sharawi (2000) conducted a research using TCM to value the recreational services provided by Khartoum Sunt forest. Data for the study was collected by visiting the forest six times during the weekends of the dry season since the forest was often inaccessible during the rainy season. A systematic random sample of 60 actual visitors to the site were interviewed about their socio-demographic and economic characteristics that comprised place of residence, distance from the forest, transport mode, cost of transport and so forth, using structured questionnaires. Distance cost to the site was estimated for the different modes of travel. For

those who used public transport, for example the bus, the existing value of round trip ticket was used while for those who used private cars, the cost of travel in terms of only the fuel expenditure, was computed for individuals. The method will be used by this study in calculating travel costs because it is simple and accurate.

Meanwhile, the opportunity cost of time was estimated by two different ways to arrive at the best-fitted model. One way was giving it a zero value with only the distance cost being used as a proxy for price. Alternatively, the mean wage per hour for each occupation group was calculated from the mean income and then added to travel cost. The study's results were that the average number of visitors for the six-months of the year during which the forest had been accessible was 3,619.5 visitors and the mean number of visits was 12.83 per year. The estimation of individual consumer surplus was calculated using the formula N/-B with N being the average total number of visits per individual and B being the coefficient of the travel cost as estimated in the equation. In the study, the opportunity cost of time was set to zero for it was hypothesized that adding it to travel cost did not yield satisfactory results.

Poor and Smith (2004) carried out a travel cost analysis of St Mary's city of Maryland using the ZTCM. Three years of visitor sample data was used in the estimation. The study's objectives were to estimate the annual individual consumer surplus and the average annual benefit estimates which were found to range between $8.00 and $19.26 and $75,492 and $176,550 respectively. The methodology used was the Poisson regression method after both the mean and the variance were found to have equal dispersion. To critique the study, it can be argued that the ZTCM used has a tendency to produce less accurate results. The ITCM might have led to more precise results. However, the correct methodology was applied since count data was being analysed. The objectives of Poor and Smith (2004)'s empirical work as well as the methodology used are of interest to this study since they are similar.

2.2.2 Application of TCM to Developed Countries

Taylor and McKean (2000) carried out a research using the ITCM to measure the economic value of Snake River Basin outdoor recreation site in Moscow. For the study, mail surveys were employed and 190 completely important responses were considered as good sample to generate the linear demand curve for the TCM. The TCM survey was designed in such a way that it included money and time costs of on-site purchases, on-site time as well as the money and time costs of other activities on the trip. Taylor and McKean (2000) considered Bockstael *et al.* (1987)'s travel cost model and utilized truncated negative binomial regression for the

appropriate demand curve estimation. Essentially, either truncated Poisson or truncated negative binomial regression is appropriate for dependent variables with count data. This is because both Poisson and negative binomial regression functional forms are mathematically equivalent to the dependent variable's logarithmic transformation. In Taylor and McKean (2000)'s study, the negative binomial regression functional form was preferred to the Poisson regression model after conducting Cameron and Trivedi (2005)'s over-dispersion pre-estimation test.

Taylor and McKean (2000)'s study is relevant because the presence of over-dispersion implies that the t-statistics are biased away from zero which means that there is heteroskedasticity. This study shall first test for over-dispersion of the model by testing for the significance of alpha. When alpha is significant, the null hypothesis that there is no over-dispersion will be rejected and over-dispersion will be concluded. In that case, the Truncated Negative Binomial regression will be utilised. Taylor and McKean (2000) applied the Truncated Negative Binomial regression and found out that consumer surplus per recreationist per trip was US$87.24 with the average recreationist trips per year in the sample being 2.76. The total surplus per recreationist per year was US$241.

Unlike Taylor and McKean (2000) who used the ITCM, Hackett (2000) conducted a research using the ZTCM to estimate the recreational economic value of the Eastern Trinity Alps Wilderness in North Western California. A data set of 69 observations from 69 country zones of origin on 4473 individual visitors to the Trinity Alps Wilderness was employed to estimate the recreational resource demand curve. In the study's statistical analysis, a two-stage process was employed. In the first stage, the statistical technique of OLS multiple regression analysis was used to estimate a linear demand function for recreational use of the site under study. The dependent variable was the natural logarithm of per-capita country visitation rates while the independent variables was composed of per capita income by country, the travel cost price of visiting the site as well as the travel cost price of visiting other two substitute recreation areas vis Yosemite and the Three Sisters Wilderness by country zone of origin.

Hackett (2000) found out that an individual visitor to the Trinity Alps Wilderness spent an average of US$75.93 while the statistical analysis estimated an average of US$29.38 in consumer surplus or net benefits from each individual's wilderness recreational experience or a total of US$131,417 in net benefits from the visitors' wilderness recreational experience. It can be argued that the ZTCM used by Hackett (2000) gives less accurate results due to loss of

information resulting from highly aggregated data and the inability to separate the influence of travel time from travel cost (Georgiou *et al.*, 1997). This is also corroborated by Brown and Nawas (1973). A more accurate method such as the ITCM might have given more precise results.

Also, the study used the OLS multiple regression analysis unlike the truncated Negative Binomial regression method used by Taylor and McKean (2000). The limitation of OLS regression lies in its assumption that residual error follows normal distribution. While this may be true for continuous data, this does not hold true in the case of responsible variable of interest being categorical or discrete as is the case with count data. Application of OLS in such a case could lead to the generation of negative predicted values, which would be meaningless and at variance with the Travel Cost theory. In that respect, the methodology used by Taylor and McKean (2000) can be considered more appropriate.

CHAPTER THREE

METHODOLOGY

3.0 Introduction

This chapter outlines the econometric methodology applied, guided by the literature and theoretical framework in the preceding chapter specifying the recreational demand model with the aim of achieving the study objectives as mentioned in Chapter One. Thus, this chapter outlines the research design, study and sample population for this study. This chapter also presents the study's empirical model, definition and justification of variables as well as data sources used and diagnostic tests carried out.

3.1 Research Design

This study seeks to estimate the recreational demand for Domboshava Hill and Cave. The research procedure is the Truncated Poisson Regression to determine the determinants of demand for the site while the semi-log demand estimation is used to estimate the recreational demand function relating number of visits to travel cost.

3.2 Data Sources

The econometric analysis uses cross-sectional data collected on-site from mid-March to early April 2018.

3.3 Model Specification

To estimate the recreational demand function, this study examines factors that determine demand for the site by adopting Enyew (2003)'s procedure as follows:

$$LnV_{ij} = \alpha_1 + \alpha_2 TC_i + \alpha_3 Y_i + \alpha_4 E_i + \alpha_5 H_i + \alpha_6 G_i + \alpha_7 MS_i + \alpha_8 MT_i + \alpha_9 A_i + \varepsilon_i$$

where: LnV_{ij}= the natural logarithm of number of individual i's visit to site j.

TC_i= individual i's total cost of visiting site

Y_i= income of individual i's household

E_i= number of years of formal education of individual i

H_i= size of individual i's household

G_i= gender of individual i

MS_i=individual i's marital status

MT_i= mode of transport to the site of individual i

A_i= individual i's age.

Opportunity cost, which Enyew (2003) estimated by directly asking respondents about the amount of money they would be willing to accept to forgo the recreational visit, has been ignored by this study because opportunity cost is a concept that is difficult to measure with precision (Fletcher *et al.*, 1990) and respondents will be asked on public holidays and weekends, minimising chances for them to be at work.

3.4.0 Truncated Poisson Regression Model

The Poisson regression model implies that the actual number of trips an individual decides to take is a variable randomly drawn from a distribution that allows only non-negative integers. According to Cameron and Trivedi (2005), a number of estimators can be used to obtain estimates for β, for example the Maximum Likelihood (ML) and the Pseudo Maximum Likelihood. Given a sample of *K* observations, the Poisson regression model log- likelihood function is given by:

$$L = \sum_{i=1}^{k} \ln f(Y_i/X_i) = \sum_{i=1}^{k} Y_i X_i\beta - exp(X_i\beta) - lnY_i!$$

where Y_i is the dependent variable, X_i is a vector of explanatory variables and β is a vector of explanatory variable coefficients. The ML estimator is both consistent and asymptotically normally distributed provided the data generating process is Poisson.

To obtain the welfare measures, the expected number of trips for an individual is the mean of the Poisson regression model for that distribution. In this case, the mean is λ_i and it is usually specified as a semi-log function of the explanatory variables. Kealy and Bishop (1986) argue that no functional form can be considered better than the other.

Since tourist arrivals are integer values, the count data travel-cost model will be used as suggested by Chakraborty and Keith (2000). A count data model is truncated if the distribution is not observable over the entire range of non-negative integers. This study shall employ a truncated at zero count data distribution which is also referred to as truncation from below or

left truncation since only positive counts are observed. Shaw (1988) says that a truncated at zero distribution normally arises in on-site sampling.

The travel cost method is much more efficiently estimated using count data estimators so as to account for the fact that the individual trips to a site are non-negative integers (Hellerstein, 1992; Loomis, 2005). The two main count data models are the Poisson regression model and the negative binomial regression model. The Poisson regression model assumes that mean and variance have got equal dispersion. However, in the event that such an assumption is not met, in particular when the conditional variance exceeds the conditional mean, there is over-dispersion and its availability nullifies the applicability of the Poisson regression model. In such a case, the negative binomial model automatically becomes the alternative.

The Truncated Negative Binomial results will first be tested for over-dispersion. Over-dispersion is defined as the conditional variance of the dependent variable, which in the study is the number of visits per year made by individual i to Domboshava Hill and Cave, being greater than its conditional mean. This gives a variance- mean ratio exceeding unity. Over-dispersion is a form of heteroskedasticity. Grogger and Carson (1987) argue that although estimates of the parameters will be consistent, standard errors will have downwardly biased estimates leading to unreliable confidence intervals and hypotheses testing.

The negative binomial (NB) is a hybrid of the Poisson distribution as well as the Gamma distribution also known as the generalized factorial function. Whereas the Poisson is characterized by its mean, μ, the NB distribution is a function of both μ and α. The NB distribution's mean is still μ but its conditional variance is $\mu(1+\alpha\mu)$. As can be seen, as α tends to zero, the distribution becomes Poisson. Using Stata 13, command *nreg* is used to run a regression, with *nreg* standing for negative binomial regression. The Likelihood- Ratio test of alpha = 0 is then either accepted or rejected. If it is rejected, the null-hypothesis that the errors do not exhibit over-dispersion will be rejected. Subsequently, the Poisson regression model will be rejected in favour of its more generalized version, the NB regression.

For this study, either the Poisson regression model or the NB model will be used depending on the Likelihood ratio test thereof. Whichever model will be used, the dependent variable-number of visits- will be regressed against price, income and socio-economic characteristics of the respondents.

Haab and McConnell (2002) argue that truncation at one trip can lead to an overestimation of the sample mean willingness to pay. As such, the truncated Poisson or NB will be estimated by running a standard Poisson or NB regression of (r-1) on the number of trips taken by an individual, thus correcting for the overestimation of willingness to pay.

3.4.1 Definition and Justification of Variables

In this study, the dependent variable is number of visits made per year by individual i to Domboshava Hill and Cave while the independent variables are travel cost, income of individual i, age of individual i, household size, gender, marital status and mode of transport.

Number of visits made per year by individual i to site j (V_{ij})

This is the number of trips that an individual took to Domboshava Hill and Cave between May 2017 and April 2018.

Travel Cost (TC_i)

In this study, Travel Cost is associated with the Domboshava Hill and Cave round trip. Travel cost comprises total expenditures incurred in visiting the site. Transport cost is calculated by directly asking respondents about the transport cost they would have incurred in accessing Domboshava Hill and Cave. In TCM, travel cost is considered as an appropriate price for number of visits undertaken. Therefore, it is expected that there be an inverse relationship between travel cost and the number of visits made to the recreation site.

Income of individual i's household (Y_i)

Visitor's income level refers to the individual's total household monthly income. Since income reflects one's ability to pay for visits to a recreation site, the number of trips to Domboshava Hill and Cave recreation site and the site visitors' income are expected to have a positive relationship given an assumption that the place is a normal good. Sharawi (2000) and Kassaye (2017) found out that income has got a positive relationship with the number of visits to a recreational area. Income is included because it is one of the determinants of demand under the ITCM.

Age of individual i (A_i)

Visitor's age is measured in years. Age has been found to influence the demand for different types of recreation activity (Taylor and McKean, 2000). Intuitively, one can imagine that as

people get older, they are less willing to travel long distances for recreation purpose. Therefore, age is expected to be negatively related to the number of visits to a site.

Education of individual i (E_i)

The more years of education one has, the greater the expected chances of the individual to an improved understanding of the importance and benefits of visiting a recreation site. Also, the more educated a person is, the greater the expected income levels since higher education is compensated by higher wages due to higher productivity at work. As such, a positive relationship is expected between the educational level of visitors and the number of visits. Kateregga (1998) and Enyew (2003) found out that there is a positive relationship between education and visitation of recreation area.

Household size (H_i)

A visitor's household size is measured by the total number of persons in the household. Generally, it is expected that as the family size increases, the visitors' income that could be allocated to recreational purpose decreases and this in turn negatively affects the number of visits that a visitor could take. As such, it is expected that there postulates an inverse relationship between a visitor's family size and the number of visits.

Gender (G_i)

A visitor's sex is included as a dummy variable. The expected relationship between gender and number of visits cannot be determined a priori. For this study, values of 1 for male and 0 for female are assigned to investigate whether or not gender is a significant determinant of the number of visits to Domboshava Hill and Cave recreation site.

Marital Status (MS_i)

Visitor's marital status is expected to influence the number of visits. A new marriage might increase visit frequency to a recreation site as the couple will be going sight-seeing. However, as couples get married, they are more likely to be engaged in social activities and subsequently make less visits to recreation sites. Hence, the relationship between a visitor's marital status and the number of visits is indeterminate a priori. Marital Status is incorporated in the study as a dummy variable for which a value of 1 is assigned for the married and 0 for the single.

Mode of Transport (MT_i)

Visitors either use their own car or public transport to access a recreation site. Should they use their own transport, transport cost may be more expensive than had they taken public transport (Kateregga, 1998) although visitors would be expected to be more comfortable with their own car. For this study, a visitor's mode of transport used to get into the Domboshava Hill and Cave recreation site is included as a dummy variable, with a value of 1 being assigned for own car and 0 otherwise.

3.4.2 Diagnostic tests

Likelihood ratio test

This pre-test will test for over-dispersion. Over-dispersion refers to the presence of greater variability in the data than would be expected. This enables an assessment of the fit of the chosen model. Grogger and Carson (1987) posit that even though estimates of the parameters will be consistent, standard errors will have downwardly biased estimates. This study shall test for over-dispersion of the truncated negative binomial regression and if it will be present, the truncated Poisson regression will be discarded while the truncated negative binomial regression will be used. In testing for over-dispersion, if the likelihood ratio is greater than the level of significance used, there will be presence of over-dispersion.

Multicollinearity test

Gujarati (2004) defines multicollinearity as a perfect linear relationship among explanatory variables in the regression model. The pairwise correlation matrix is used to test for multicollinearity among all the variables. If two variables are correlated, that is if the correlation coefficient is greater than 0.8, one of the variables should be dropped. Multicollinearity has a tendency of increasing the standard errors of coefficients leading to some variables being made statistically insignificant even though they would be significant.

Heteroskedasticity test

Heteroskedasticity refers to a situation where the dependent variable's variance varies across the data and this often associated with cross-sectional data. When heteroskedasticity is present, the estimators are still consistent and unbiased but the estimators' variances are underestimated. Moreover, standard errors are biased, leading to bias in hypothesis testing and confidence intervals (Asteriou and Hall, 2014). In this study, heteroskedasticity will be tested using the

Breusch-Pagan-Godfrey test whose null hypothesis is that there is constant variance. The null hypothesis will be rejected if the p-value will be less than the level of significance used.

3.4.3 Study Population, Sampling Procedure and Sample

This study utilised an on-site survey research methodology where questionnaires were administered to tourists using the stratified sampling technique. Every 4th tourist was given an objective questionnaire. Due to time and budget constraint, this study utilised 59 questionnaires. 50 questionnaires are about 5% of the total population that normally visits Domboshava during the period of survey. The survey period was mid-March and early April during the Easter and Independence holidays and weekends.

CHAPTER 4

ESTIMATION, PRESENTATION AND INTERPRETATION OF RESULTS

4.0 Introduction

This chapter presents and analyses the empirical results of the model described in the previous chapter. Results are represented starting with descriptive statistics while multicollinearity, model diagnostic tests and regression results follow. The chapter concludes with the interpretation of results.

4.1 Summary of Descriptive Statistics

4.1.1 Household socio-economic characteristics

The survey data was collected from a sample of 59 visitors to the site. During the survey period, 95% of visitors came from Harare. The respondents were government employees, the self-employed and the unemployed. About 56% of respondents were male while about 64% were married. The percentage of married women was 23.70% while the percentage of married men was 40.00%. The rest of the respondents, 36.30% were single. Seventy-three per cent of the respondents were heads of their households.

Distribution of age of sample visitors

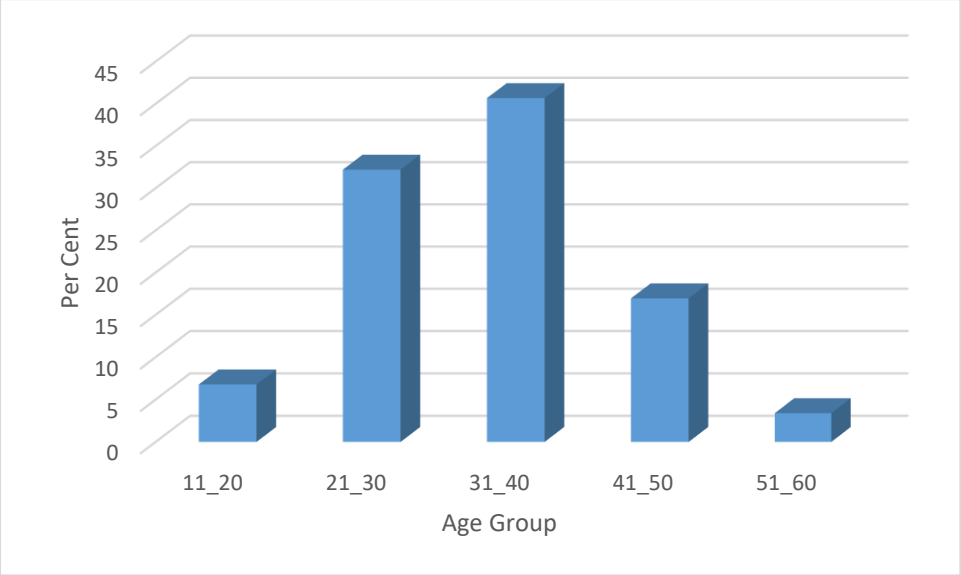
Table 4.1: Age distribution of sample respondents

Age Group	Frequency	Relative Frequency	Cumulative Frequency
10-20	4	6.78	6.78
21-30	19	32.20	38.98
31-40	24	40.68	79.66
41-50	10	16.95	96.61
51-60	2	3.39	100.00
Total	59	100.00	

Source: Survey result

Table 4.1 and Fig 4.1 show the age distribution of the sample

Figure 4.1: Age distribution of sample respondents



The mean age of the respondents is 33.19 years. The number of visitors in each age category increases from a low of 6.78% in the below 21 years group to 32.8% in the 21-30 year age category before reaching a peak of the distribution in the 31-40 year age group (40.68%) and decreases thereafter as shown in the table. About 80 per cent (79.66%) of the visitors are 40 years and below which is consistent with an intuitive a priori expectation that younger people are more likely to travel and visit recreational sites.

Table 4.2: Household Size of Visitors

Household Size	Frequency	Relative Frequency	Cumulative Frequency
1	9	15.25	15.25
2	11	18.65	33.90
3	13	22.03	55.93
4	11	18.65	74.58
5	9	15.25	89.83
6	5	8.48	98.31
7	1	1.69	100.00
Total	59	100	

Source: Survey result

As indicated by Table 4.2, about 15.25% of sample visitors had no other members in the family. About 33.90% of visitors had no more than 2 members in their family. It is shown

that as the number of members in a family increases, the number of visitors to the site decreased. The suggestion is that people who had larger family size are less likely to take more visits to the recreation site. The average household size of the sample visitors was 3.32 households.

Table 4.3: Education level of Sample Visitors

Education Level (In number of years)	Frequency	Relative Frequency	Cumulative Frequency
9-12	4	6.78	6.78
13-15	9	15.25	22.03
16-18	26	44.07	66.10
>18	20	33.90	100.00
Total	59	100.00	

Source: Survey result

Figure 4.2: Education Level of sample visitors

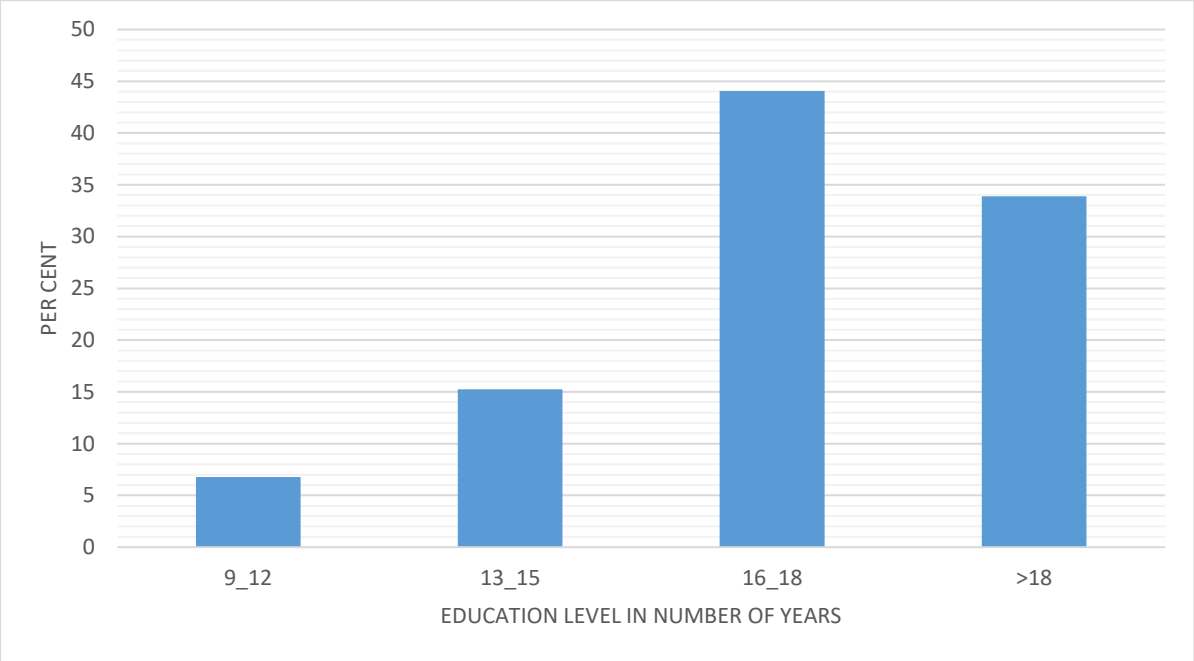


Table 4.3 and Fig 4.2 show that a good proportion of visitors had education at college or university level. About 93.22% of sample visitors had completed their college or university education. The mean age of education was 17.27 years.

Table 4.4: Monthly Income of Visitors in US $

Income Range	Frequency	Relative Frequency	Cumulative Frequency
100-300	6	10.17	10.17
301-500	24	40.68	50.85
501-700	13	22.03	72.88
701-900	11	18.65	91.53
901-1100	3	5.09	94.92
1101-1300	1	1.69	98.31
>1300	1	1.69	100.00
Total	59	100.00	

Source: Survey result

Table 4.4 shows that about 49.15% of the sample visitors had monthly income exceeding US$500. Average monthly income was US$575.76 suggesting that on average, relatively high income earning people visited the area during the period under review.

Table 4.5: Number of Visitors in a Group

Number of visitors in a group	Frequency	Relative Frequency	Cumulative Frequency
1	1	1.69	1.69
2	15	25.43	27.12
3	12	20.34	47.46
4	11	18.65	66.11
5	18	30.51	96.62
6	1	1.69	98.31
7	1	1.69	100.00
Total	59	100.00	

Source: Survey result

Only 1.69% (1 visitor) was observed traveling alone during the survey period. Many visitors (71.19%) came to the site in groups of 3-6 people. On average, each group had a number of 4 people while 5 was the modal group. Table 4.5 indicates that the number of visits increased as the number of people in a group increased from 1 to 5 and then decreased afterwards.

Table 4.6: Number of Years of Acquaintance to the Site

Years of Acquaintance	Frequency	Relative Frequency	Cumulative Frequency
0	5	8.48	8.48
1-5	19	32.20	40.68
6-10	10	16.95	57.63
11-15	12	20.34	77.93
16-20	10	16.95	94.92
21-25	3	5.08	100.00
Total	59	100.00	

Source: Survey result

As shown by Table 4.6, 8.48% of visitors did not know about the site before while 91.52% of the respondents had known the site before the survey period. This implies that the more acquainted visitors are to the site, the greater their chances of visiting it. The average age of acquaintance was 9.10 years.

The survey result also showed that more than 90% of the respondents had a plan in the previous year to visit the site but had not come as exactly planned. Some of the reasons cited were income constraints, preference for other sites as well as work commitments.

Visitors were also asked to reveal their future plan to visit the site, which is the number of trips they would be willing to visit the site for the next 12 months provided their travel costs remained the same. The survey showed that about 40% of the respondents are going to have at least one more additional trip to the site while 42% are going to maintain their number of trips. 18% were undecided. The average number of visits for the next 12 months will be 7 visits. Considering that the average number of visits for the period under review was 6, this is a good indication that the site will have more visits for the next 12 months under the existing travel costs.

The respondents also revealed the site they would prefer visiting next time. 50.85% (30) said they would visit Ngomakurira while 35.59% (21) expressed preference for Domboshava Hill and Cave. 6.78% (4) revealed that they would visit Pasichigare. Most respondents did not know about Pasichigare site while a few had never heard of Ngomakurira before.

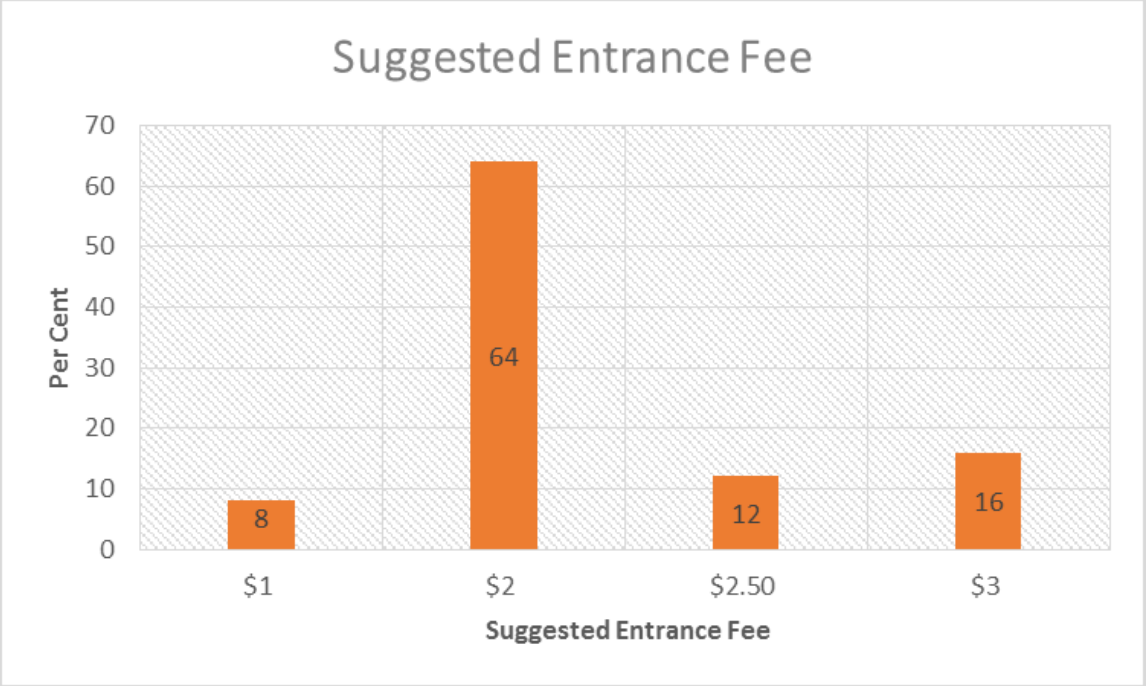
Three respondents remarked that there ought to be more bins at the site so that litter can be properly disposed of. There was broken glass at the site especially near the beacon, posing danger to tourists.

Table 4.7: Suggested Entrance Fee (US $)

Suggested Entrance Fee	Frequency	Relative Frequency	Cumulative Frequency
$1	2	8.00	8.00
$2	16	64.00	72.00
$2.50	3	12.00	84.00
$3	4	16.00	100.00
Total	25	100.00	

Source: Survey result

Figure 4.3: Suggested Entrance Fees (US $)



Respondents were also asked whether they were satisfied with the US$4 entrance fee. Out of the 59 respondents, 25 (42.37%) were dissatisfied and listed their preferred entrance fees as illustrated by Table 4.7 and Fig 4.3. It is shown that 64% of those dissatisfied would want an entrance fee of US$2.

On willingness to spend on on-site items such as sculptures, about 52.54% of the respondents (31) indicated that they would be willing to spend at least $5 while 28 (47.46%) revealed that they would not be willing to spend any amount on onsite items. Some of the reasons they cited were income constraints and lack of taste and preference for sculptures.

4.1.2 Household's response to visitation

The TCM's basic assumption is that people reflect their willingness to pay for a site by the amount of money they spend in traveling to the site. The total number of annual visits and travel costs are the two crucial elements used to estimate the demand curve for out-door recreation on site.

Table 4.8: Number of Annual Visits

Number of Annual Visits	Frequency	Relative Frequency	Cumulative Frequency
1	2	3.39	3.39
2	1	1.69	5.08
3	2	3.39	8.47
4	7	11.87	20.34
5	11	18.65	38.99
6	9	15.25	54.24
7	5	8.48	62.72
8	9	15.25	77.97
9	9	15.25	93.22
10	2	3.39	96.61
>10	2	3.39	100.00
Total	59	100.00	

Source: Survey result

As indicated by Table 4.8, about 62.72% had visited the site 7 times or less for the last 12 months. The average number of annual visits was estimated at 6 times while the 5 visits had the most frequency.

Table 4.9: Travel Costs (TC) for Individuals (US$)

TC Range	Frequency	Relative Frequency	Cumulative Frequency
10-20	8	13.56	13.56
21-30	13	22.03	35.59
31-40	12	20.34	55.93
41-50	8	13.56	69.49
51-60	9	15.25	84.74
61-70	4	6.78	91.52
>71	5	8.48	100.00
Total	59	100.00	

Source: Survey result

Table 4.9 shows that travel cost range US$ 21-30 had the most frequent visitors with 22.03%. About 8.48% of the visitors incurred travel cost exceeding US$71. The travel cost was estimated from the entrance fees, transport expenses as well as the other costs such as food and drinks that were associated with the visits. On average, the travel cost was US$39.95.

4.2.0 Presentation of Econometric Results

The model to be estimated was specified in Chapter 3 and is as follows:

$$LnV_{ij} = \alpha_1 + \alpha_2 TC_i + \alpha_3 Y_i + \alpha_4 E_i + \alpha_5 H_i + \alpha_6 G_i + \alpha_7 MS_i + \varepsilon_i$$

4.2.1 Pre-estimation using the Likelihood ratio test

Table 4.10: Likelihood Ratio Test

```
Truncated negative binomial regression          Number of obs   =         59
Truncation point: 0                             LR chi2(8)      =      43.15
Dispersion     = mean                           Prob > chi2     =     0.0000
Log likelihood = -114.25423                     Pseudo R2       =     0.1588
```

V	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
TC	-.0160858	.0036814	-4.37	0.000	-.0233012	-.0088704
Y	.0003275	.0002019	1.62	0.105	-.0000683	.0007233
E	.0071726	.0185334	0.39	0.699	-.0291521	.0434974
H	.0294852	.0335728	0.88	0.380	-.0363162	.0952866
G	.0672086	.1160001	0.58	0.562	-.1601474	.2945647
MS	-.1442052	.1274882	-1.13	0.258	-.3940775	.1056671
MT	-.1607049	.135117	-1.19	0.234	-.4255295	.1041196
A	.0050636	.0065197	0.78	0.437	-.0077147	.017842
_cons	2.040122	.4116769	4.96	0.000	1.23325	2.846994
/lnalpha	-18.41528	466.9224			-933.5664	896.7358
alpha	1.01e-08	4.69e-06			0	.

```
Likelihood-ratio test of alpha=0:  chibar2(01) = 0.0e+00 Prob>=chibar2 = 0.500
```

The p-value for the likelihood-ratio of alpha is 0.500, which is greater than the 1% level of significance. Therefore, there is no over-dispersion. This implies that the Poisson regression model is the more appropriate one to use. The results above are also displayed in appendix D.

Table 4.11: Summary of the Truncated Poisson Regression Results

Variable	**Coefficient**	**Robust Standard Error**	**t-statistic**	**Prob**
TC	-0.0160858	0.0020907	-7.69	0.000
Y	0.0003275	0.0000957	3.42	0.001
E	0.0071726	0.0105725	0.68	0.490
H	0.02944852	0.017009	1.73	0.083
G	0.062086	0.0541855	1.24	0.215
MS	-0.1442052	0.0558646	-2.58	0.010
MT	-0.1607049	0.0660940	-2.43	0.015
A	0.005063	0.0028104	1.80	0.072
C	2.040122	0.2049429	9.95	0.000

Pseudo R-squared = 15.88% Probability (F-statistic) = 0.0000

The results shown in Table 4.11 above indicate that the model is significant at the 1% level of significance. Therefore, it has got predictive power. The pseudo r-squared is of little significance and so is its interpretation.

The results of the robust Truncated Poisson Regression Model are shown in greater detail in appendix E. Out of the 8 variables regressed, 6 were found to be significant in explaining visits to the recreational area. Education and gender were found to be insignificant in explaining visits to Domboshava Hill and Cave and they will not be commented on.

4.3.0 Discussion of Truncated Poisson Regression Results

4.3.1 Marginal Effects

Travel cost is significant at 1% and shows that it has got an influence on the number of visits to the site. A US$1 increase in travel cost is associated with a 1.6% decline in visits to the recreation area. This is consistent with the travel cost theory which predicts an inverse relationship between travel cost and number of visits to the site. The negative influence of travel cost on visits is also supported by empirical studies by Sharawi (2000), Enyew (2003) and Kassaye (2017).

Income is significant at 1% and this shows that it has got influence on the number of visits to the site. A US$1 increase in income is associated with a 0.03% increase in number of visits to the site. This is consistent with the travel cost theory which postulates that income has got a positive influence on the number of visits. In their empirical works, Taylor and McKean (2000) and Kassaye (2017) found out that income had a positive influence on number of visits.

Household size is significant at 10% and this shows that it has got influence on the number of visits to the site. A unit increase in the household size is associated with a 2.9% increase in the visits to the site. Perhaps, this result needs to be examined further. It is at variance with Enyew (2003) who found out that there was an inverse relationship between household size and number of visits to Wabi-Shebele Langano recreational site.

Marital status is significant at 1% and this indicates that marital status has got influence on the visits to the site. Being married reduces the chance of visiting the site by 14.42%. This result suggests that the single are more likely to visit Domboshava Hill and Cave than the married. One of the reasons could be that once married, couples seldom go out together as they will prioritise more pressing marriage issues.

Mode of transport is significant at 5% and this shows that mode of transport has got an impact on the visits to the site. Owning a vehicle decreases chances of visiting the site by 16.07%. The sign is however unexpected and is inconsistent with other findings such as by Terefe (2000) and Enyew (2003).

Age is significant at the 10% level of significance. An additional year is associated with a 0.5% increase in the number of visits. This suggests that the older people get, the greater their chances of visiting Domboshava Hill and Cave. This result perhaps needs to be examined further, taking into account Age square to test the linearity relationship of age with the dependent variable

4.4.0 Diagnostic tests results

4.4.1 Multicollinearity

Table 4.12: Correlation matrix

	V	TC	Y	E	H	G		MS	MT	A
V	1									
TC	-0.7672	1								
Y	0.4797	-0.2821	1							
E	0.2738	-0.1398	0.2766	1						
H	0.1913	-0.0562	0.1593	0.0036	1					
G	-0.0140	-0.0690	-0.2283	-0.1344	-0.0135	1				
MS	-0.3562	0.2468	-0.0307	-0.0887	0.1061	0.1958		1		
MT	-0.2380	0.0005	-0.0118	0.0313	-0.1022	0.2658		0.3789	1	
A	0.0355	0.0044	0.0932	0.0637	-0.1144	0.1694		0.3236	0.2786	1

Table 4.12 indicates that there is no perfect multicollinearity as all partial correlations are less than absolute 0.8. Therefore, there is no exact linear relationship among the independent variables. As such, they can be considered as explaining the dependant variable (Gujarati, 2004).

4.4.2 Heteroskedasticity test results

```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of V

         chi2(1)      =     0.10
         Prob > chi2  =   0.7464
```

The results for heteroskedasticity obtained using the Breusch-Pagan-Godfrey test show that the probability value of 0.7464 is greater than the 5% level of significance. Hence, we fail to reject the null hypothesis that the errors are homoscedastic.

4.5.0 Demand function and recreational benefit estimation

The demand function for visits to Domboshava Hill and Cave recreational site is constructed by relating visitors' travel costs (TC) to number of visits to the site (V). The typical linear semi-log travel cost model is $Ln\ V_{ij} = \alpha_0 - \alpha_1 TC_i + \varepsilon_i$ …….....4.1

where:

V_{ij} is individual i's number of annual visits to site j, TC_i is the travel cost incurred by individual i and α_0 is the sum of the values of all other significant variables.

Per person's annual recreation benefit for the site is then estimated by calculating the area under the demand curve. First, equation 4.1 is transformed into an exponential function and then the inverse demand function is integrated between 0 and the average travel costs visits (Enyew, 2003).

Using E Views 9 (Appendix F), the demand function estimated for visitation to Domboshava Hill and Cave is summarised by Table 4.13 below:

Table 4.13: Summary of the semi-log estimation of the demand function

Variable	Coefficient	Std. Error	t-statistic	Prob
TC	-0.021503	0.002323	-9.254785	0.0000
C	2.625452	0.101323	25.91164	0.0000

R-squared= 60.04%

Adjusted R-squared= 59.34% Prob (F- statistic) = 0.0000

TC is significant at the 1% level of significance. The model shows that about 60% of the variation in the whole model is due to variation in travel costs. Since only 40% of the variation is being explained outside the model, this is a model of good fit. The 59.34% adjusted r-squared, which is a qualitative measure, is within the range of the simple coefficient of determination. The whole model as shown by the F-statistic is valid and has got predictive capacity since its p-value is significant at 1%.

4.5.1 Discussion of the semi-log regression results

This implies that ceteris paribus, if TC increases by US$1, number of visits to the site would decrease by 2.15 units. In this case, TC is a proxy for price of visit.

4.5.2 Estimation of recreational benefit and consumer surplus

Integrating the inverse demand function between 0 and the travel cost corresponding to the average number of visits, 6.423729, which is US$35.5975, yields the site's recreational benefit of US$53.50 per visit per person.

The total annual on-site recreational benefit at the site can then be calculated as the total number of visitors to the site for the 12 month period before the survey was made (with such statistics being provided by the National Museums and Monuments of Zimbabwe) multiplied by US$53.50, the recreational benefit of the site per visit per person.

Using the exponential demand function (equation 4.2), the consumer surplus for the semi-log model is then calculated as the inverse of the absolute travel cost coefficient. This method was also used by Loomis (2005). The consumer surplus of the site per visit person is US$$46.51. The aggregate consumer surplus will then be calculated by multiplying the total number of visitors who visited the site in the past 12 months by US$46.51.

4.6 Conclusion

This chapter gave the estimation, presentation and the analysis of results. Given the study findings, it can be concluded that factors that determine the demand for Domboshava Hill and Cave recreational site are travel cost, income, household size, marital status, mode of transport and age. Education and gender were found to be insignificant in influencing demand for the site. The next chapter summarizes the entire study and gives policy recommendations based on the study findings before suggesting areas for further study.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND POLICY RECOMMENDATIONS

5.0 Introduction

This chapter contains a summary and conclusions of the study, as well as the policy recommendations that derive from the study findings. Also outlined in this chapter are suggested areas of further study.

5.1 Summary and Conclusions of the Study

The study was undertaken to investigate the key determinants for the recreational demand for Domboshava Hill and Cave as well as examine the impact of travel cost on demand for the site. The study used the Truncated Poisson Regression analysis on cross sectional data collected on-site in mid-March and early April 2018 to establish the determinants of demand for the site. The study then used the semi-log demand function to estimate the consumer surplus, the recreational benefit and the impact of trip price on demand for the site. Stata 13 was used for the Truncated Poisson Regression while EViews 9 was used for the estimation of the semi log demand function.

The main findings of the research are that travel cost-as a proxy for the price of a visit-, being married and using one's own personal vehicle have the effect of reducing the number of visits to the Domboshava Hill and Cave while household income and household size have the opposite effect, that is the number of visits increases in these variables. Age weakly but positively matters, meaning that older visitors frequent the site more often than younger people. The consumer surplus per visit per person is US$46.51 and the aggregate consumer surplus for the site is estimated by multiplying the total number of visitors who visited the site in the past 12 months from May 2017 to April 2018. The recreational benefit per visit per person is US$53.50.

5.2 Policy Implications and Recommendations

In light of the large amount of consumer surplus and recreational benefit of the site, the National Museums and Monuments should allocate substantially large budgetary allocations for the preservation of the site. Comparison needs to be made between the true economic recreational benefit of the site and the actual revenue being collected. If it is a case of true recreational benefits of the site for the 12 month period exceeding revenue collected, there will be an underestimation of the conservation benefits of the site. There will thus be need for conservation and improvement of the site's quality.

Also, future economic decisions that have to be made in future, have to be based on the economic value of the site. This will allow sound decisions that are based on scientifically based research. The authorities should also encourage research to estimate the site's total economic value. This study was based on the estimation of on-site recreational benefits, which is only a subset of the true economic benefit. Use values such as option and quasi-option values, as well as non-use values of the site such as bequest value and existence value altogether complement the on-site value to give the total economic benefit.

There is also need for publicity campaigns so that more people can know about the existence of the site. Some people interviewed had never heard of the site before their maiden visit to it. Media that can reach a wide target such as radio, television and magazines can be used to make people aware of the place.

5.3 Suggestions for future research

This study recommends a full economic research to include both use and non-use values so that the full economic benefits can be estimated. This would help in the crafting of sound policies for the site. There is also need to investigate further the impact of education on recreational demand since the insignificant result obtained by this study was unexpected.

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APPENDICES

Appendix A: Raw Data

V	TC	Y	E	H	G	MS	MT	A
12	10	750	22	2	0	0	0	41
7	32	400	13	3	1	0	0	20
10	15	500	18	6	1	1	1	27
8	40	475	17	4	1	1	1	37
10	21	600	19	4	1	0	1	43
8	16	375	17	4	1	1	1	24
6	42	500	17	4	1	1	1	31
5	42	450	13	2	1	1	1	49
6	30	720	17	6	0	0	1	23
8	27	530	18	4	0	0	0	26
4	60	400	24	2	0	1	1	36
4	65	550	17	3	0	0	0	25
3	63	420	17	3	1	1	1	34
8	23	500	17	1	1	0	1	25
12	35	1000	20	4	1	0	0	40
5	55	400	12	2	0	0	1	17
4	40	200	18	5	1	1	1	23
9	30	380	17	1	0	0	0	38
4	86	350	17	4	1	1	0	34
5	20	800	13	3	1	1	1	46
6	34	500	21	2	0	0	1	23
9	25	600	18	1	1	0	1	41
9	15	620	17	3	0	1	1	36
1	93	420	19	3	0	1	1	27
4	70	270	11	5	1	1	1	38
9	34	650	13	7	0	0	0	19
8	30	480	16	1	0	0	0	21
5	60	375	13	1	1	1	1	37
9	25	800	19	5	1	1	1	38

8	28	720	11	6	0	0	0	20
6	56	740	17	3	0	0	1	53
5	43	550	13	3	1	1	1	33
9	16	700	17	4	0	1	1	27
2	60	370	21	4	0	1	1	37
3	50	275	11	2	1	1	1	31
7	47	640	17	3	0	1	1	29
5	59	760	13	2	1	1	1	31
9	38	1000	12	5	0	1	1	35
7	48	720	17	5	1	0	1	25
5	33	100	16	3	1	1	1	33
6	25	375	17	1	1	1	1	45
9	19	1100	17	6	1	1	1	48
5	50	470	12	5	0	1	1	42
6	30	210	14	1	1	0	1	39
4	51	300	19	5	1	1	1	40
6	20	600	13	1	0	0	1	25
5	50	350	13	5	0	1	0	45
8	34	780	17	6	1	0	0	23
8	30	1800	21	3	0	1	1	27
5	50	500	17	2	1	0	1	31
6	28	720	17	3	1	1	1	33
5	54	620	13	3	1	1	1	32
8	40	1300	19	2	0	1	1	51
6	36	450	13	4	1	1	1	38
4	52	325	11	4	0	1	1	43
9	35	840	21	5	0	1	0	29
7	34	380	11	2	1	1	0	30
1	69	560	13	1	0	1	0	25
7	34	700	17	2	1	1	1	39

Appendix B: Correlation Matrix

(obs =59)

	V	TC	Y	E	H	G	MS	MT	A
V	1.0000								
TC	-0.7672	1.0000							
Y	0.4797	-0.2821	1.0000						
E	0.2738	-0.1398	0.2766	1.0000					
H	0.1913	-0.0562	0.1593	0.0036	1.0000				
G	-0.0140	-0.0690	-0.2283	-0.1344	-0.0135	1.0000			
MS	-0.3562	0.2468	-0.0307	-0.0887	0.1061	0.1958	1.0000		
MT	-0.2380	0.0005	-0.0118	0.0313	-0.1022	0.2658	0.3789	1.0000	
A	0.0355	0.0044	0.0932	0.0637	-0.1144	0.1694	0.3236	0.2786	1.0000

Appendix C: Heteroskedasticity test

```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of V

         chi2(1)      =     0.10
         Prob > chi2  =   0.7464
```

Appendix D: Likelihood Ratio Test for alpha (Using Stata 13)

Command**:** tnbreg V TC Y E H G MS MT A, II(0) dispersion(mean)

```
Truncated negative binomial regression          Number of obs   =         59
Truncation point: 0                             LR chi2(8)      =      43.15
Dispersion     = mean                           Prob > chi2     =     0.0000
Log likelihood = -114.25423                     Pseudo R2       =     0.1588
```

V	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
TC	-.0160858	.0036814	-4.37	0.000	-.0233012	-.0088704
Y	.0003275	.0002019	1.62	0.105	-.0000683	.0007233
E	.0071726	.0185334	0.39	0.699	-.0291521	.0434974
H	.0294852	.0335728	0.88	0.380	-.0363162	.0952866
G	.0672086	.1160001	0.58	0.562	-.1601474	.2945647
MS	-.1442052	.1274882	-1.13	0.258	-.3940775	.1056671
MT	-.1607049	.135117	-1.19	0.234	-.4255295	.1041196
A	.0050636	.0065197	0.78	0.437	-.0077147	.017842
_cons	2.040122	.4116769	4.96	0.000	1.23325	2.846994
/lnalpha	-18.41528	466.9224			-933.5664	896.7358
alpha	1.01e-08	4.69e-06			0	.

```
Likelihood-ratio test of alpha=0:  chibar2(01) = 0.0e+00 Prob>=chibar2 = 0.500
```

1. H_0: alpha =0 (Var (V_i) = E(V_i))

   H_1: alpha > 0 (Var (V_i) =E(V_i) + αV_i

   α (level of significance) = 0.01

2. Reject H_0 iff p value< 0.01
3. P value= 0.500
4. Since p-value (0.5000) is greater than 0.01, we may fail to reject H_0 and conclude that alpha is not statistically different from zero. Therefore, there is equal dispersion of mean and variance, justifying the use of the Truncated Poisson regression model.

Appendix E: Truncated Poisson Regression Model (Using Stata 13)

Command**:** tpoisson V TC Y E H G MS MT A, II(0) vce(robust)

```
. tpoisson V TC Y E H G MS MT A, ll(0) vce(robust)

Iteration 0:   log pseudolikelihood =  -114.2796
Iteration 1:   log pseudolikelihood = -114.25423
Iteration 2:   log pseudolikelihood = -114.25423

Truncated Poisson regression                    Number of obs   =         59
Truncation point: 0                             Wald chi2(8)    =     164.11
                                                Prob > chi2     =     0.0000
Log pseudolikelihood = -114.25423               Pseudo R2       =     0.1588
```

V	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
TC	-.0160858	.0020907	-7.69	0.000	-.0201835	-.0119881
Y	.0003275	.0000957	3.42	0.001	.00014	.000515
E	.0071726	.0105725	0.68	0.498	-.013549	.0278943
H	.0294852	.0170009	1.73	0.083	-.003836	.0628064
G	.0672086	.0541855	1.24	0.215	-.0389929	.1734102
MS	-.1442052	.0558646	-2.58	0.010	-.2536978	-.0347126
MT	-.160705	.0660948	-2.43	0.015	-.2902484	-.0311615
A	.0050636	.0028104	1.80	0.072	-.0004447	.010572
_cons	2.040122	.2049429	9.95	0.000	1.638441	2.441803

Appendix F: Semi-log Travel Cost model estimation (E VIEWS 9)

Dependent Variable: LNV

Method: Least Squares

Date: 04/23/18 Time: 15:44

Sample: 1 59

Included Observations: 59

Variable	Coefficient	Std. Error	t-statistic	Prob
C	2.625452	0.101323	25.91164	0.0000
TC	-0.021503	0.002323	-9.254785	0.0000

R-squared	0.600424	Mean dependent var	1.766417
Adjusted R-squared	0.593413	S.D. dependent var	0.489428
S. E. of regression	0.312080	Akaike info criterion	0.542193
Sum squared resid	5.551437	Schwarz criterion	0.612618
Log likelihood	-13.99469	Hannan-Quin criterion	0.569684
F-statistic	85.65105	Durbin-Watson stat	1.913251
Prob (F-statistic)	0.000000		

Appendix F: Questionnaire for the Survey

QUESTIONNAIRE

Date ----------

Interviewer code ----------

Interview started ----------

Interview ended ----------

Interviewee number ----------

Supervisor Dr. C. Mumbengegwi

Much thanks for giving me your time. My name is Madzudzo Valentine. I am a final year MSc Economics student with the University of Zimbabwe. This survey aims to gather information from the Domboshava Hill and Cave recreation area visitors on uses of the site as well as their opinions about their visitations. It is important that accurate information be obtained from your responses.

Your responses could be used in helping policy makers make well informed decisions about the recreation area. Some questions are formulated to draw historical information from your experience while others require your opinion and attitude. Please, feel free to answer as no answer can be classified as right or wrong. Please note that the information you will give will remain confidential and as such, your identity will remain anonymous. All your responses will be purely for academic research process.

PART I

Respondents' Personal Data

1. Place of residence: From which place did you come to visit Domboshava Hill and Cave?

2. How many kilometres is your place of residence from Domboshava Hill and Cave recreation site?

_____kilometres.

For the following questions, please encircle the appropriate letter

3. Gender (a) Male (b) Female

4. Marital status (a) Single (b) Married (c) Divorced /Separated

5. Age _____ **years**

6. How many years have you spend in formal education _____**years**

7. What is your current occupation?

(a) Formal (b) Informal (c) Unemployed

If (b). State the Sector

8. Household Size: How many people are in your household?

Number of adults (those who are 18 years and above)

Number of children (those below 18 years)

9. What is your gross income per month? **$**_____

PART 11

Respondents' opinion on the site and their visitations

The objective of this section is to know the respondents' attitude towards Domboshava Hill and Cave recreation site, which will be useful to gather the historical data about your visitation.

2. Did you visit the site alone or in group?

(a) Alone (b) In group

If you came in group:

2.1. What is the number of people in your group? _____

3. If you had not taken this trip today, what would you most likely be doing?

(a) Working at job (b) Housework or shopping (c) Other

If your answer above is (a):

3.1. How much would you ask your employer to pay you were you to be asked to be at your job now? **$/hr.**

4. When did you come to know about Domboshava Hill and Cave?

4.1. How many years have you recreated at Domboshava Hill and Cave? _____**years.**

4.2. How many trips to the Domboshava Hill and Cave did you plan to take in the past 12 months? _____**trips**

4.3. How many trips to the Domboshava Hill and Cave did you take for the past 12 months?

_____**trips**

4.4. Is there a difference between the number of trips you planned to take to the Domboshava Hill and Cave recreation site and the actual trips you took during the last 12 months?
1. Yes 2.No

If yes, what was the cause of this difference?

1. Due to income constraint 2. Due to preference of other similar sites 3. Other reasons (please specify) _____

4.5. How many trips to the Domboshava Hill and Cave would you take in the next 12 months? _____**trips**

5. On which days do you usually come to the site?

(a) Working days (Monday-Friday) (b) Weekends (Saturday and Sunday) (c) Public Holidays

6. In the past, did you visit other similar sites?

(a) No (b) Yes

6.1. If the answer to the above question is yes, which site/s did you visit?

7. Following your trip this time, which site would you visit were you asked to visit one of these sites?

(a) Ngomakurira (b) Pasichigare (c) Domboshava Hill and Cave

8. Usually, how many days per year are you on recreation trips to Domboshava? ___**days per year**

9. Usually, how many days per year are you on recreation trips to similar sites? ___**days per year**

10. What is the one way distance from your place of residence to your most preferred alternative recreation site if you did not recreate in Domboshava? _____**kilometres one way**

11. Which mode of transport did you use to and from Domboshava Hill and Cave? (Please circle the letter corresponding to the mode of transport used)

(a) Own vehicle (b) Public Transport (c) Others (Please specify) _____

12. What is the cost you incurred for the transport in question above? Please specify money expenditure on fuel or tariff per round trip **$_____**

13. How many kilometres do you usually travel to and from Domboshava Hill and Cave? _____**kilometres round trip (total kilometres from place of residence to Domboshava Hill and Cave and then back to place of residence)**

14. Approximately how many hours do you usually travel to and from Domboshava Hill and Cave recreation site? _____**hours (total number of hours spent traveling from place of residence to Domboshava Hill and Cave and then back to place of residence)**

15. What is the total cost to you of a trip to the Domboshava Hill and Cave recreation site including **round trip** transportation and entrance fee **$_____ cost to you**.

16. How much money would you be willing to spend on items sold onsite such as sculpture? **$_____**

17. Do you think the entrance fee you paid was worth the recreational experience?

(a) Yes (b) No

17.1. If your answer to the above question is no, how much money would you be willing to pay to visit the recreational area? **$_____**