Estimating Optimal Conservation Fees in the Presence of Land Restitution in the Kgalagadi Transfrontier Park between Botswana and South Africa

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Abstract

As the aim of this paper is to estimate the demand function for the Kgalagadi Transfrontier Park (KTP), information about substitutes and compliments is included. Our study assumes that Kruger, Augrabies Fall and Pilanesberg national park pass as either substitutes or compliments for visitors to the KTP. To achieve this, we conducted contingent behavior experiments at all the four parks. Our analysis shows that there is a wide variation in the elasticities of demand between the parks. The cross-price estimates indicate that there is substitutability in visitation demand between parks despite offering different attractions. Most importantly, our study demonstrates that there is a possibility to raise conservation fees. Given such an opportunity, the modes of making tourists pay more can vary from a mandatory conservation fee raise to an additional voluntary donation. Moreover, the sharing of conservation revenue with communities surrounding parks could address South Africa's heavily skewed distribution of income. The validity and credibility of the revenue-maximizing conservation fees of which the community-bound donation estimate is dependent on can practically only be tested by implementing these fees at the point of entry at the parks. This is practically not possible; hence the only realistic way to test the consistency and credibility of these estimates is to look at them in the context of the general pricing structure of recreational sites in South Africa.

Keywords: Contingent behavior, conservation fee, demand, land claim, national park.

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Introduction

The Khomani San and the Mier community made a land claim for land inside the KTP in 1995. The local communities were awarded land and resource rights both inside and outside the KTP. Out of 22 national parks managed by South African National Parks (SANParks), about 6 parks have been affected by the land claims. According to Kepe (2008) land restitution in protected areas is a highly debated issue, and one that continues to challenge many affected governments, agencies, individuals and communities around the world. From the point of view of the park agency, the critical question is whether land restitution within protected areas will inevitably compromise some conservation objectives. In fact, SANParks are concerned about further challenges at the post-restitution phase, and want to know how to move forward. What we don't know about this model is whether it archives its twin objectives: of meeting the country's conservation as well as developmental objectives, particularly where the co-owners are indigenous people?

The focus of this study is on one particular place (the KTP) where there is focus also from policy makers. The key challenge facing the Kgalagadi area in particular the KTP due to the land claim is how to balance the integrity of conservation and beneficiaries rights to land and natural resources. According to Fay (2009) while the duties linked with land ownership expanded considerably, the land rights given to land claimants were quite limited as they did not include a share of tourism revenue and were merely limited to rental income.

In our view, for the land claim not to compromise conservation objectives, the Park should contribute to improving the lives of surrounding communities who now have land rights in the Park. In this spirit, the aim of this paper is to estimate optimal conservation fees[2] which should be charged at the KTP to generate sufficient revenue. The park pricing policy can be crafted to achieve a number of different objectives, which include revenue maximization. Of course, conservation fees can also be set to achieve other different objectives (e.g. increasing environmental education & reducing congestion). Co ownership of the park by local communities and the park agency, and the need for the park to contribute towards local's livelihoods is the main reason why our paper advocates for revenue maximization as the main primary goal at the KTP when determining the optimal conservation fees.

[2] The term 'conservation fee' was officially adopted with effect from the 2nd of April 2003 over 'admission/ entrance fee' due to the fact that the former better describes the park agency's mission more appropriately (McKinsey Pricing Policy, 2005).

This paper attempts to contribute to a very topical and policy relevant question in South Africa. The results from the analysis can be a very useful input into the process of setting and reviewing conservation fees particularly in Southern Africa where historical imbalances with regards to land ownership make the issue of land rights and access to benefits from use of land a very pertinent policy issue.

This paper is structured so that the next section discusses the land restitution issue at the KTP, followed by a section on the structure of the South African park system. The rest of the other sections discuss the proposed pricing reform, literature review, methodology and research findings.

1. Background on the Kgalagadi Transfrontier Park

a) The Kgalagadi Transfrontier Park

The Botswana and South African governments signed a bilateral agreement on April 7, 1999 to merge the Gemsbok National Park (in Botswana) with the Kalahari Gemsbok National Park (in South Africa) into a single ecological area now called the KTP. The creation of this Transfrontier Park made it possible for the wildlife to freely move between the two countries. The size of the park makes it one of the biggest conservation areas in the world (SANParks 2006).

The park is probably less accessible than most other parks in South Africa, with the closest airport located in Upington, which is 260km from the park. However, the park has a landing strip for small aircraft. The park is approximately 904km from Johannesburg (commercial city of South Africa where most visitors both local and international are likely to visit the park from) and around 1080km away from Cape Town (arguably the biggest tourist metropolitan).

The IUCN classification list distinguishes between six categories of protected area's (IUCN 1994a). The KTP is classified as a category 2 park (Sandwith, Shine, Hamilton and Sheppard 2001). According to Grossman and Holden (2003) a category 2 park is defined as "an area of land or sea designated to protect the ecological integrity of one or more ecosystems for present and future generations, to exclude exploitation or occupation inimical to the purpose of the designation of the area and to provide a foundation for spiritual, scientific, educational, recreational and visitor opportunities, all of which must be environmentally and culturally compatible".

b) The land claim inside the Transfrontier

Figure 1 below shows the map of the KTP indicating the different use areas and areas of jurisdiction[3] after the land claim.

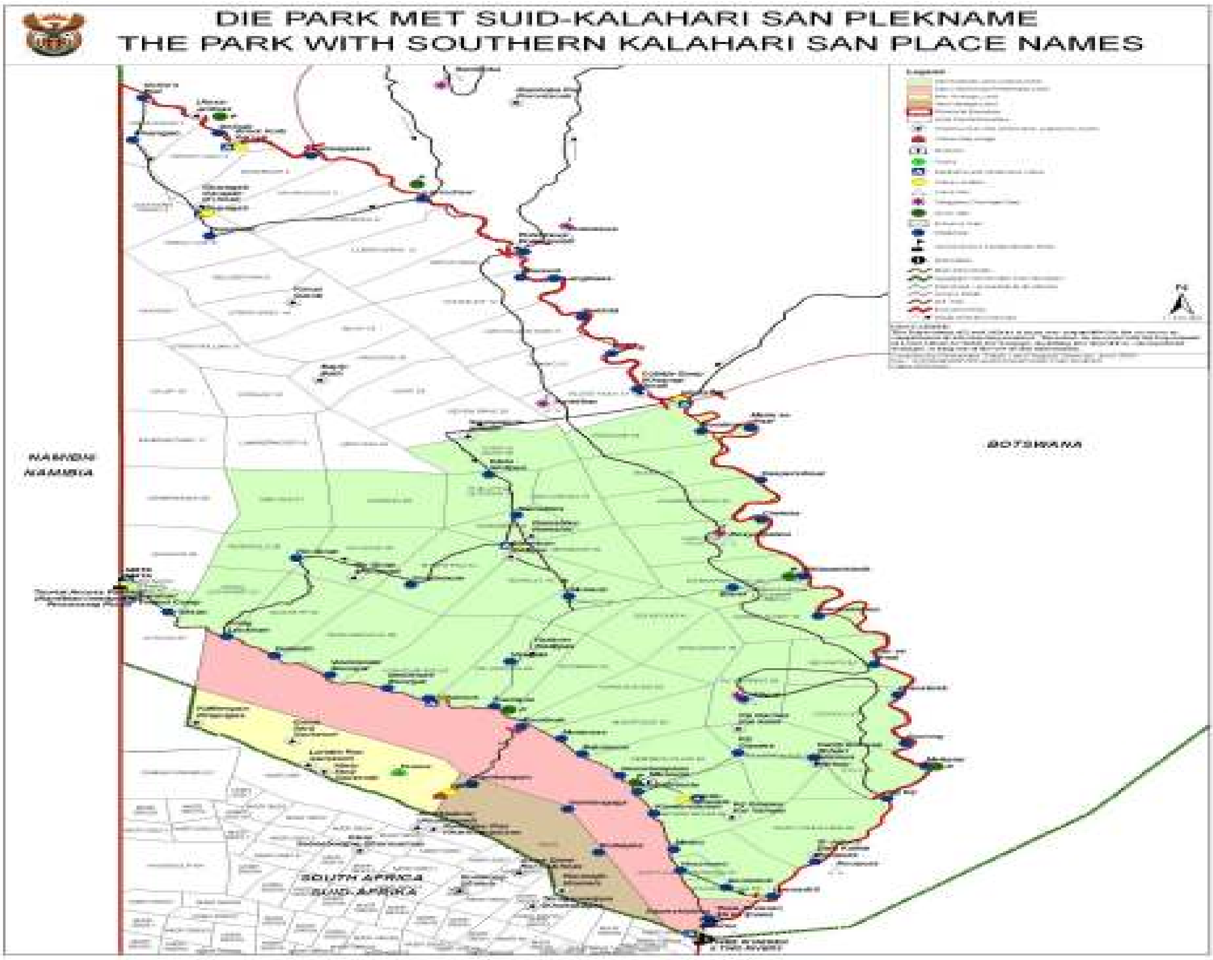

Figure 1: Map of the Kgalagadi Transfrontier Park

Source: Hirshveld, 2009.

The Brown section in the map is the Khomani San contractual park; the light yellow area is the Mier contractual park; the pink section is the V-zone (Khomani San commercial preferential zone); the blue area is the S-zone (Khomani San symbolic and cultural zone) and the white section is the other side of the park including on the Botswana side.

The conservation benefits are to accrue to the Khomani San through specific commercial activities in partnership with SANParks - as allowed within the designated V

[3] The Khomani San people were awarded exclusive rights in the remainder of the park because they lost more land in comparison to the Mier community during the establishment of the Park. The special rights include commercial development and undertaking of cultural activities (Bosch and Hirschfeld, 2002).

zone (designated for commercial ventures - such as the development of a community lodge[4]). The cultural and symbolic benefits including sustainable resource use and other activities such as 'walk abouts' allowed inside the designated S zone (designated for cultural and symbolic activities) of the park are to also accrue to the Khomani community. The development of contractual parks is an indication that local communities have a more prominent role to play in the operation of a park.

2. Structure of nature-based tourism in South Africa - particularly of parks

In South Africa there is a choice between the well-run national parks managed by SANParks with reasonable charges, provincial game reserves and the private game reserves. Privately owned parks prominence in nature-based tourism is on the increase. Private game reserves are often luxurious and offer exclusive game viewing. This seems to suggest that they are expensive relative to national and provincial parks, and therefore target mainly international and affluent local visitors (Peacock 2009).

According to Pienaar (1990) the imposition of conservation fees at parks was firstly introduced when the first national park (Kruger National Park) was proclaimed in 1926. The first visitors at the Kruger National Park arrived in 1926 after it was opened to the public for a year. The records from the park show that 3 cars that visited the park in 1927 were the first to be charged conservation fees. The 3 cars were each charged a conservation fee of £1 (equivalent to R2 at the time). Following the first charging at the Kruger Park, South Africa has a long tradition of charging conservation fees for its protected areas such as national parks.

Although fees have been charged for access to South African protected areas since Kruger National Park imposed a visitor fee in 1927 (Pienaar 1990), its only as recent as 2nd of April 2003 that SANParks adopted a new pricing structure. The recommendations of McKinsey Business Consultants were used as guidelines to implementing a system of differential pricing for entry into all parks. The revised pricing structure was done for three primary purposes. Firstly, the fact that there was no form of differentiation in prices to parks, park fees were found not to be market related relative to parks across Africa and that park fees were not charged on a daily basis for visitors that stayed inside the park yet they used park facilities on a daily basis (McKinsey Pricing Policy 2005). Conservation fees were

[4] The two local communities (Khomani San and Meir) together with SANParks jointly own !Xaus lodge inside the park – arguably one of the most luxurious and exclusive accommodation that you will ever find in SANParks operated parks.

announced as to be payable "daily". For easier administration however, they would be payable for every night spent in a particular park.

3. Proposed Reform of the Pricing Criteria

a) Visitation demand at SANParks national parks

South Africa has experienced a significant increase in local and international visitors over the years, due in large part to the uniqueness and attractiveness of its national parks. Unlike many other African countries that boast of a relatively more significant international tourism market, South Africa has a relatively larger domestic market. As such, the domestic tourism market is SANParks' core target market. Though small, the South African international tourism market is mature.

South African residents account for approximately 80percent of total number of visitors, with international visitors making-up the remaining portion (SANParks 2010). Despite the KTP being one of the three renowned parks in South Africa, it accounts for a small proportion of total visits – at less than 1 percent. The visitation demand at the KTP – which is the focus of this study, should be understood in the context of the park's remote location.

Thus, visitations at the KTP, Kruger, Augrabies and Pilanesberg parks are the subject of this study. Based on the discussion above, our study assumes that Kruger, Augrabies Fall and Pilanesberg national park pass as either substitutes or compliments for visitors to the KTP.

Given the high levels of (income) inequality in South Africa a more pressing problem is related to distribution of resources, park profits included. Our study seeks to address the question of whether the benefits to the Khomani San communities could be improved primarily from a more equitable (and transparent and accountable) redistribution of Park profits (even before raising the Park fees). Another concern has to do with what guarantee is there that given the current redistribution concerns in South Africa, that the increased profits following the increased Park fees will actually reach and benefit the adjacent communities.

b) Possibility of raising the conservation fees

In a case where the estimated optimal fee is higher than the current fee, an increase in fees will serve two main purposes, namely to capture a share of the benefits and to raise awareness on research on user fees. This implies that determination of optimal conservation fees at parks could be the source of additional revenue that parks require so they can substantially contribute towards uplifting local communities' developmental state and demonstrate that conservation and ecotourism can indeed lead to tangible benefits accruing to local communities surrounding parks.

A higher estimate of the optimal fee would suggest that there is a need to reform the current pricing strategy. This paper argues that two possibilities can be pursued to reform conservation tariffs to help communities extract more benefits for their participation in conservation. One way of doing this is for SANParks to revise the conservation fees to an optimal level and share the increased revenue with the communities.

Alternatively, the entailed increment could be designated as a community-bound donation. The structure of the donation would be such that it would not negatively affect the parks visitation trends relative to other national parks- both nationally and regionally. It is for this very reason that the estimation of the optimal conservation level should take into consideration the substitution effects among the parks. The fact that parks charge different tariffs makes it easy for conservation fee reforms to be incorporated into the Kgalagadi park charge structure.

4. Literature Review

A general consensus with regard to how to address the significant increase in demand on recreation among economists is that of pricing (Baumol and Oates 1975; Rosenthal et al. 1984; Cullen 1985). Pricing is considered efficient relative to other rationing concepts such as lottery and queuing – refer to Fractor 1982 for a detailed discussion. There is a growing volume of literature that emphasizes the role of charging conservation fees in the management of national parks (Chase, Lee, Schulze and Anderson 1998).

Although many studies have been undertaken to value national parks, most have focused on estimating park visitors WTP. Although there has being some work on determining the elasticity demand at some national parks, work in this regard has being limited. As far as we are concerned, the number of studies that attempt to estimate optimal conservation fee using experimental techniques are relatively few – see Chase et al, 1998; Naidoo and Adamowicz, 2005; Alpizar, 2006.

In order to determine the "optimal" conservation fees to be charged at any national park, one needs to know the preferences of the visitors to that park and other parks. This information can be extracted from the visitation demand functions of national parks. Visitation demand functions can be estimated based on historical observations or experimental data.

A study by Alpizar (2006) used historical data to compute the "optimal" common entrance fees for national parks in Costa Rica. A study by Naidoo and Adamowicz (2005) simulated fee increases and estimated entrance fees that maximized tourism revenue to Mabira Foresty Reserve in Uganda. Chase et al. (1998) investigated the "optimal" entrance fees at the time Costa Rican national parks had introduced differentiated fees. As there was not enough historical data for this pricing regime, the study used experimental data. Studies on park pricing in South Africa have to take into account price discrimination and differentiation and the lack of an adequate time series of data.

Determination of optimal fees using experimental data or optimal pricing rules adds value to research on park pricing as it mimics the real markets by incorporating potential substitutes and compliments into the estimation procedure, which should enhance the reliability of the estimates. It is on this basis that experimental data is not only gathered at the main study area – KTP, but also at three other parks – Kruger, Augrabies Fall and Pilanesberg national parks.

The estimation of optimal conservation fees at the KTP is important as may contribute towards developing effective pricing strategies in the context of South Africa's national park system. It is for this reason that this study is critical as it unravels ways in which conservation fees can be set at optimal levels to the benefit of the local communities surrounding parks who often incur the highest cost of conservation, and yet they experience the least benefits. This implies that our study assess if the increase in conservation fees at the KTP, Kruger, Augrabies Fall and Pilanesberg national parks is a viable option from the visitor's point of view.

The findings of this study will provide the decision makers with the necessary information so that informed decisions' that strive to achieve environmental and economic growth objectives are taken. In addition, our research is vital as it sheds light on whether the current conservation fees at the KTP, Kruger, Augrabies Fall and Pilanesberg parks are at optimal levels.

5. The Contingent Behavior Method

A CB is commonly applied to evaluate quality or price changes at recreational sites. Implementation of such a technique entails respondents been asked to reveal their intended behavior (e.g. visitation to a site) given the proposed change (e.g. in site quality, access or price). In contrast to a CVM approach which elicits a value of statement, a CB approach estimates changes in behavior or levels of use for a nonmarket good (Grijalva, Berrens, Bohara and Shaw, 2002) The technique makes it possible to generate variation in conservation fees by asking respondents in our case park visitors, how they would vary their recreational trips - number of days spent visiting a specify park in a year, if the conservation fees were to be increased only at one park. The CB questionnaire seeks to gather data on how the park visitors would respond to changes in conservation fees in terms of varying their length of stay during the year.

This paper incorporates relevant assumptions about the way SANParks operates into the estimation of revenue maximizing conservation fees. The basis for these assumptions are that: (i) parks are unique and have different degrees of appeal to users; (ii) the park has competition from other parks in which case it helps to know the substitution effects between parks.

The concept of demand is based on the theory of consumer choice, where an individual is faced with a constrained optimization problem. In such a case, the individual aims to choose a combination of goods/services that maximizes utility. Following Freeman (1993) an assumption that is usually made is that a park visitor maximizes utility (u), which is influenced by the consumption of private goods and the levels of public environmental resources (national parks). In a CB market setting, the ability of a park visitor to reveal visitation demand given different conservation fees suggests that a park visitor can be assumed to maximize a utility function u=U(x,q) in x and q, subject to P_xX+P_QQ =M where P_xX is an n-vector of market prices of private goods, P_QQ is the virtual price of the conservation fees for visits to parks, and M is the individuals disposable income. Solving of this maximization problem would give a set of Marshallian demand functions. Aggregation of these individual demand curves yields a market demand curve for Q: Q= Q(M, P_xX, P_QQ).

The main approach that is applied for estimating the demand for public goods such as many environmental amenities, including estimation of optimal conservation fees at national parks is survey-based and was firstly implemented by Bergstrom et al (1982), who estimated elasticities of demand for public schools in the United States (Khan 2007). There have been a growing number of studies since then that make use of this approach, our study is no different in that regard.

Based on previous studies, aggregate demand at SANParks managed parks is expected to be a function of each individual park's conservation fee as well as fees at other substitute and complimentary parks, income levels, socio-economic characteristics and trip related expenditure. Based on other empirical studies and given that the KTP is in a remote arid location, income is not expected to be significant in the tourism demand model as visitors are already incurring high costs to visit that particular park. The CB model in this paper was drawn from Chase et al. 1998 paper. The demand function for the four parks can be written as follows:

$$Q = \int (P_1, P_2, P_3, P_4; M; Z) \quad \textbf{(1)}$$

Where Q is park visits by all tourist at each park (in days); P is the vector conservation fee at the park (in Rands): where P_1 is the park conservation fee at the park under review and P_2, P_3, P_4 are conservation fees at competing parks; M is the visitors disposable income and Z is the socio-economic and trip-related characteristics. The demand function represented by equation 1 assumes that the individual allocates their disposable income between a composite commodity Z and a recreational good. The allocation is partially dependent on the price of the recreational service.

The demand for visits at parks will be derived from the experimental data generated from the CB survey undertaken on visitors at the KTP, Kruger, Augrabies Fall and Pilanesberg national parks.

A random sample of visitors was interviewed on a 'next to pass' basis. Respondents were sequentially shown the relevant column in the payment card and were each time asked to state how often (in days) they would stay at the four parks, as well as their planned trips based on the fees indicated. Firstly, they were asked to state the fee at which they would visit other parks instead? This was followed-up by a question asking respondents to name parks that they considered as substitutes.

This was then followed by the following question, 'we would like to know how your visitation would be affected if the park agency was to decide to increase conservation fees? Please assume that the fee change is only at a single park – not at other parks. Based on these changes, how many days will you visit the park at the daily conservation fees shown in the chart below" The parks that respondents will indicate as substitutes will also be included in the choice set. For illustration purposes, table 1 below shows an abstract from the questionnaire regarding the question asked above:

Table 1. Conservation fee levels posed to respondents (In Rands)

South African Residents

Name of Park	Actual		Hypothetical Increases					
	Fee[5]	*Days*	*Fee*	*Days*	*Fee*	*Days*	*Fee*	*Days*
Kgalagadi Transfrontier Park	R45		R90		R45		R45	
Kruger National Park	R45		R45		R90		R45	
Augrabies Fall National Park	R25		R25		R25		R50	
Pilanesberg National Park[6]	R45		R45		R45		R90	

One of the criticisms against a CB survey format such as the one shown in table 1 is that respondents cannot reliably identify true statements about their intended visitation (Cicchetti and Peck, 1989). Nonetheless, this difficulty is not encountered in this study is as a significant number of respondents were either regular visitors and / or familiar with the four parks. Thus, respondents had little difficulty in revealing their intended visitation.

7. Data Collection

To achieve the objective of this study, a questionnaire that seeks to understand park visitor's sensitivity to their visitation behavior contingent upon various conservation fee levels was administered at all the four parks. A face-to-face questionnaire survey was randomly assigned only to park users. The survey was performed over-weekends and during the week during the months of March and April in 2011. Due to the vast size of the four parks, the surveys were mainly carried out at the main entry gates, within the gate's vicinity, at the accommodation facilities and the designated resting sites inside the park.

A total of 480 tourists were surveyed. The number of valid samples is 463 respondents in total, which includes both local and international visitors. Of these, 123 visitors were

[5] US$ 1 = South African Rand (R) 7.85 at the time the paper was written.

[6] Pilanesberg national park charges a weekly conservation fee of R45 per week. The other three parks charge daily fees. Furthermore, Pilanesberg charges an additional R20 for each vehicle entering the park.

surveyed at the KTP (104 local visitors and 19 international visitors), 148 visitors at Kruger National park (116 local visitors and 32 international visitors), 70 at Augrabies Fall national park (49 local visitors and 21 international visitors), and 122 visitors at Pilanesberg national park (116 local visitors and 6 international visitors). Approximately 16.85 percent of the visitors were international residents. Our sample size is in-line with the national park visitor patterns in South Africa, where local residents account for an overwhelming majority.

Data on socio-economic characteristics such as gender, household size, age, income, education, family size and attitudes towards conservation fees were also gathered. The socio-economic and trip related costs variables are also incorporated into the demand function. In addition, information on whether the visitors made use of a travel agent, visiting other parks and their main reason for visiting the park was also collected to shed some light on park visitor's preferences.

The crucial data concerning visitors 'actual and hypothetical response to increments in conservation fees was also solicited. Furthermore, visitor's sentiments regarding what they consider to be 'a fair conservation fee' were also gathered. Although what constitutes a 'fair' conservation fee is a political decision, it is still important that the views of visitors in this regard are known. Despite the fact that it is clear that in the end politically driven rather than economical driven decisions are adopted, studies such as the one we have undertaken may provide policy makers with alternative strategies. It is hoped that by providing such useful information decision makers will know that sound alternative strategies exist and as a result that they can make informed decisions.

Table 2: Descriptive statistics (averages) of the 463 respondents interviewed

Variable	**Kgalagadi Park**		**Kruger Park**		**Augrabies Fall Park**		**Pilanesberg Park**	
	South African Residents (n=104)	*International (n=19)*	*South African Residents (n=116)*	*International (n=32)*	*South African Residents (n=49)*	*International (n=21)*	*South African Residents (n=116)*	*International (n=6)*
Visit Frequency to Parks	2.48	1.79	2.65	1.69	2.69	1.86	2.58	1.33
First Visit	35.58%	52.63%	14.66%	37.50%	40.82%	80.95%	18.10%	66.67%
Travel Agent	2.88%	26.32%	6.03%	21.88%	8.16%	47.62%	0.86%	100.00%
Multi-trip	23.08%	36.84%	9.48%	43.75%	57.14%	90.48%	15.52%	33.33%
Household Size	3.40	2.47	3.31	3.34	3.16	3.24	4.03	3
Actual Fee Paid	R45.00	R180.00	R45.00	R180.00	R25.00	R100.00	R45.00	R45.00

Actual Daily Fee (Including Wild Card)	R295.82	R753.95	R256.98	R682.97	R286.94	R580.24	R51.61	R 50.36
Daily Fees (Excluding Wild Card)	R156.28	R427.50	R129.31	R562.17	R63.33	R261.11	R51.61	R 50.36
Total Fee Expenses	R949.62	R1 718.95	R1008.41	R2 331.25	R320.61	R804.05	R217.41	R 196.67
Fair Fee	R50.63	R171.58	R71.03	R170.63	R36.43	R93.81	R 51.59	R 80.83
WTP Over and Above Actual Fee Paid:								
Raised Fee	R59.66	R111.67	R36.49	R104.00	R50.00	R55.88	R 59.60	R100.00
Voluntary Donation	R65.06	R96.67	R43.40	R115.00	R72.02	R51.47	R 65.40	R 58.33
No Visit Fee	R116.94	R286.32	R169.61	R322.42	R85.33	R274.29	R106.83	R158.33
Accommodation costs	R3 137.86	R1 726.05	R2 802.07	R4 835.78	R1209.29	R2352.95	R 1 711.12	R 2 774.33
Total Trip Costs	R7 565.51	R17 404.00	R7 521.90	R21 780.00	R4 635.20	R11 885.24	R 3 852.76	R 10 056.67
Household Annual Income	R340 144.20	R281 578.90	R300 259.00	R325 312.50	R274 795.90	R197 142.90	R287 456.90	R282 500.00
Actual Number of Nights	7.76	3.79	10.28	6.06	1.96	1.71	5.47	5.33
Number of Nights at no fee	8.39	4.79	11.06	6.88	2.94	1.95	6.51	6
Number of Nights at Increased Fee (25%-125% increase)	7.83	3.94	9.57	5.23	1.93	1.6	5.44	5.13
Age (years)	49.28	49.42	49.70	48.03	50.53	52.62	44.48	54.33
Male-Respondents	62.50%	68.42%	67.24%	56.25%	59.18%	47.62%	67.24%	83.33%
Occupation:								
Formal Employment	47.12%	57.89%	48.28%	56.25%	48.98%	61.90%	56.90%	33.33%
Self Employed	26.92%	10.53%	28.45%	15.63%	26.53%	4.76%	19.83%	16.67%
Unemployed	4.81%	10.53%	4.31%	3.13%			5.17%	16.67%
Student	0.96%		3.45%				2.59%	
Retired	8.65%		8.62%	3.13%	12.24%	33.33%	11.21%	33.33%
Other	11.54%	21.05%	6.89%	21.88%	12.24%		4.31%	
Education:								
Primary				3.13%		4.76%		
High School	12.50%	5.26%	19.83%	9.38%	8.16%	4.76%	14.66%	
Certificate	4.81%		9.48%	6.25%	14.29%	19.05%	15.52%	50.00%
Diploma	23.08%	26.32%	16.38%	15.63%	22.45%	14.29%	21.55%	33.33%
Degree	25.00%	36.84%	31.03%	46.88%	30.61%	28.57%	24.14%	

Post Graduate	33.65%	31.58%	18.10%	18.75%	24.49%	23.81%	22.41%	16.67%
Other Training	0.96%		5.17%			4.76%	1.72%	
Race:								
Black	0.97%		7.76%	3.13%			1.72%	
White	97.09%	100%	92.24%	87.50%	100%	100%	98.28%	100.00%
Coloured	1.94%			3.13%				
Indian/Asian				6.25%				
Nationality:								
South African	100%		93.10%	3.13%	97.96%		96.55%	
Germany		26.32%	0.86%	6.25%		14.29%		16.67%
Switzerland		20.52%		9.38%				
Netherlands		15.79%		6.25%	2.04%	9.52%	0.86%	16.67%
UK		10.53%	3.45%	21.88%		33.33%	2.59%	66.67%
USA		5.26%		21.88%				
Australia		5.26%		6.25%		38.10%		
Canada		5.26	0.86%	6.25%				
Italy		5.26	0.86	6.25%				
India				6.25%				

Furthermore, we carried out statistical two-tailed tests assuming unequal variances and a 5 percent significance level to assess the magnitudes of the stated mean WTP preferences between the two hypothetical scenarios. We conclude from these tests that the difference between "raised fee" and "voluntary donation" WTP is statistically significant only for local visitors in Kruger and Augrabies.

8. Estimation Technique

This section discusses the appropriate estimation technique given the nature of the collected data. Many statistical analysis involving individual data have a censored dependent variable (Greene 2008). In a case where the dependent variable is censored for a significant proportion of the observations, parameter estimates obtained through conventional regression techniques such as the Ordinary Least Squares (OLS) are biased. In that case, the technique proposed by Tobin (1958) yields consistent estimates. This proposed technique is widely referred to as a Tobit model, and is a special case of the more general censored regression model (Henningsen 2010).

Tobit models are commonly used in the context of cross sectional or panel data. Thus, autocorrelation in a Tobit model is likely to be an issue in a case of panel, rather than in a univariate time series. With panel data, the model should ideally allow for individual observations that define a cross-sectional unit of data to differ systematically in the value of the dependent variable for reasons unobserved to the econometrician. In the case of the Tobit model, such individual specific observation, time-variat effects are modelled as a random effect. A fixed effects model is not desirable as it is plagued by incidental parameters problems (Wooldridge 2002).

Given the panel nature of our CB generated experimental data and the fact that our respondents were randomly interviewed, a random effects model is appropriate. Thus, we derail from the standard practice in econometric analysis of starting with a standard model and only moving to a more sophisticated model in a case where we suspect or encounter problems with the standard model because of the importance of the panel data nature. This implies that the random effects model using the full data set is preferred over the standard tobit model.

For this reason, the Random effects tobit models is used to estimate visitation demand at the four parks. However, upon running the random effects we encountered estimation problems. The random effects estimates yielded erratic results, as some own-price coefficients had unexpected positive signs, a clear violation to the law of demand.

For this reason, standard tobit model is used on a random full data set. Our study found that standard tobit form was the best fit model for our survey data. The standard tobit model yields expected results, with the expected signs at all the four parks. In the case of the standard tobit model (Tobin 1958), the dependent variable Q is left censored at zero:

$$Q_i^* = x_i^{'}\beta + \varepsilon_i \quad \textbf{(2)}$$

$$Q_i = \begin{cases} 0, \ if \ Q_i^* \leq 0 \\ Q_i^*, \ if \ Q_i^* < 0 \end{cases} \quad \textbf{(3)}$$

Where N refers to the observation; Q_i is an unobserved variable, χ_i is a vector of independent variables, β is a vector of unknown parameters and ε_i is a disturbance term. The censored regression model is a generalized standard tobit model. In such a case, the dependent variable can be either left-censored, right-censored, or both left-censored and right-censored, where the lower and/or upper limit of the former variable could take any value (Henningsen 2010):

$$Q_i^* = x_i^{'}\beta + \varepsilon_i \quad \textbf{(4)}$$

$$Q_i = \begin{cases} a, \ if \ Q_i^* \leq a \\ Q_i^* \ if \ a < Q_i^* < b \\ b \ if \ Q_i^* \leq b \end{cases} \quad \textbf{(5)}$$

Where a indicates the lower limit and b the upper limit of the regressed variable. In a case where $a = -\infty$ or $b = \infty$, the regressed variable is not left-censored or right-censored, respectively.

The response to the CB question indicates quantity of visits associated with each proposed price. Therefore, our CB question primarily focuses on relationship between changes in conservation fees and changes in quantity of visits; hence we conclude that our analytical technique is entirely in-line with the format of the question. The empirical demand specification in linear form is as follows:

$$D_1 = \ \alpha + \beta P_1 + \beta P_2 + \beta P_3 + \beta P_4 + \beta Y + \varepsilon \quad \textbf{(6)}$$

$E_{Q1,P1} = \beta_1 \frac{P_1}{Q_1}$	$E_{Q1,P2,3,4} = \beta_{2,3,4} \frac{P_{2,3,4}}{Q_1}$	$E_{Q1,M} = \beta_y \frac{M}{Q_1}$
Price elasticity	Cross elasticity	Income elasticity

Where D is the visitation demand, P_1 is the conservation fee at site 1, $P_2 - P_4$ is the conservation fee at alternative parks and Y is the individual's disposable income. Each coefficient indicates an estimate of the change in quantity demanded associated with a one unit change in the given duration of stay, *ceteris-paribus*. The β estimate is equal to the partial derivate of the demand function.

In a case where the sample data is clustered over a narrow price (and visitation demand) range, a log-linear demand may be better choice than a linear model (Thomas and Maurice 2008). This is indeed the case with our survey data; hence the log-linear model is preferred. In order to estimate the log-linear demand model, equation 6 is converted to natural logarithms. For the empirical analysis, we specify the functional form for the CB data in a double log-functional form as follows:

$$\ln D_1 = \ \alpha + \beta \ln P_1 + \beta \ln P_2 + \beta \ln P_3 + \beta \ln P_4 + \beta \ln Y + \varepsilon \quad \textbf{(7)}$$

Own elasticity: β_1

Cross elasticities: $\beta_{2,3,4}$

Income elasticity: β_y

When the visitation demand at national parks is log-linear, the elasticities are simply the coefficients of the corresponding logarithm. The double log function form of the above model is used to estimate (own- and cross) price and income elastcicities of visitation demand of the four parks. Our model depicts the duration of stay during the year at each of the four parks as a function of its own-price, prices at other parks and income, including socio-economic characteristics. Based on the tobit regression analysis results, the estimated visitation demand function for park recreational services is given by the equation 7. From the tobit regression output, the demand curve can be estimated from which optimal fees may be estimated.

9. Theoretical Basis for Park Pricing

There are generally four pricing objectives that are evident in protected areas such as national parks. Charging at parks aims to impute value to visitation, manage parks at economically efficiency levels, operate within ecological carrying capacity limits and achieve social equity. According to Laarman and Gradersen (1996) national parks are valued for their existence and their use. The demand for preservation is captured by the existence values, while the demand for visiting a recreational site is explained by the use values. The choice of whether to visit a recreational site or not is influenced by an individual's WTP for it bearing in mind the competing uses of a visitors income.

Should the market exist for the good in question, as is the case with SANParks managed parks then it is possible to assess the value attached to the site in monetary units (Bull 1995). According to Hanley, Shogren and White (1997) to achieve this, the consumers' WTP for the site should be measured. In the same context as in a market situation, the principle behind the WTP for such non-market goods and services is based on the same principles of rational choice and utility maximisation.

To emphasise this point, any change in a non-market good (for example, due to environmental improvements or co-ownership of the park) by which a person is of the view that they are better off in some way or feel that its justifiable, that individual may wish to pay higher amounts in order to secure this change or to reflect their endorsement of the changes, and so their WTP would be a reflection of their economic valuation of the good in question (Hanley et al. 1997).

As has being mentioned before, price discrimination has the potential to increase revenue as compared to imposing a single conservation fee, in addition to satisfying equity issues from the social point of view, and bringing about local community stability. Price discrimination among users can enable resource use in different sites, among different time periods and among different user profiles (South African residents and non-residents).

Discriminatory pricing as applied by SANParks, is based in the fundamental principle of price discrimination, as described in detail in the context of ecotourism applications by Baldares and Laarman (1990) and Lindberg (1991). The rationale for charging different fees is based on the fact that parks are unique and have different degrees of appeal to users. This uniqueness is reflected by the visitor's preferences for some parks over others; hence some parks are more popular than others.

These differences are reflected by the difference in their visitation demand curves and demand elasticities. Own- and –cross price elasticity are critical components for national park pricing policy. Optimal park pricing is dependent on the reliability of the demand elasticities (Chase et al. 1998). The park agency (SANParks) is able to engage in price discrimination because the market can fairly easily be segmented – which enables visitors with varying elasticities of demand to be identified and subsequently treated differently. The park agency sets the fees at all the national parks that they manage. The idea behind the pricing policy adopted by SANParks is that the price elasticity of visitors is not only a function of the preferences of these tourists for the park itself, but also a function of the relative prices in other parks.

SANParks have in principle adopted a pricing policy that seeks to strike a balance between the four pricing objectives mentioned earlier, with effect from when it revised its pricing strategy in 2003. Nonetheless, it is unclear what criterion is used to determine conservation fees. Despite a few price increments at South African national parks, there seem to be little or no formal criteria with regard to determination of conservation fees. In an attempt to improve the fee setting strategy, a better understanding of demand elasticities is required.

10. Empirical Results

The data gathered on park demand preferences resulted in a data set consisting of five observations for each of the 463 respondents. A point to note is that the demand functions for South African residents and international visitors are different, our descriptive statistics reinforce this notion. By changing the pricing policy to one that discriminates based on nationality, SANParks recognises this. Both the South African and international visitor's estimates make use of Tobit regression with a log-linear model. Table 3 and 5 presents the results of the standard Tobit model estimation to analyze factors that determine visitation demand by South African residents, based on the CB generated experimental data at the four parks.

Table 3: Standard tobit model to ascertain determinants of park visitation demand of South African residents

Variable:	*Estimates: Coefficient*			
	Kgalagadi Transfrontier Park	**Kruger National Park**	**Augrabies Falls National Park**	**Pilanesberg National Park**
Price – Kgalagadi (R/night)	-1.081 *** (.128)	0.010 (.118)	0.318* (.151)	0.213 (.174)
Price – Kruger (R/night)	0.225 (.128)	-1.030*** (.118)	0.314* (.151)	0.183 (.174)
Price – Augrabies (R/night)	0.387*** (.093)	-0.000 (.084)	-0.052 (.109)	0.373** (.129)
Price – Pilanesberg (R/night)	0.307** (.117)	-0.009 (.107)	0.183 (.137)	-0.378* (.159)
Income (R)	0.086** (.026)	-0.026 (.024)	0.085** (.031)	0.123*** (.036)
Interview site	0.404*** (.064)	-0.037 (.059)	-0.410*** (.075)	-0.530*** (.087)
Visit frequency	0.050 (.015)	0.066*** (.013)	-0.053** (.017)	0.089*** (.020)
First	0.118 (.066)	-0.165** (.061)	0.235** (.078)	0.061 (.090)
Travel Agent	-0.073 (.142)	-0.019 (.130)	-0.064 (.167)	0.235 (.193)
No of H/H members on trip	-0.036 (.0213)	-0.061** (.020)	0.014 (.025)	0.096*** (.029)
Total fees on conservation fees	0.000*** (.000)	0.000*** (.000)	0.000 (.000)	0.000* (.000)
Total accommodation costs	0.000 (.000)	0.000*** (.000)	0.000 (.000)	0.000 (.000)
Total trip costs	0.000 (0.000)	-0.000 ** (.000)	0.000 (.000)	0.000 (.000)
Multi-trip	0.074 (.067)	0.219*** (.062)	-0.299*** (.079)	0.005 (.092)
Male dummy	0.039 (.058)	0.027 (.053)	-0.039 (.068)	-0.036 (.078)
Age (years)	-0.004 (.002)	0.004 (.002)	-0.007** (.003)	-0.002 (.003)
Family size	0.041 (.021)	0.010 (.020)	-0.006 (.025)	-0.010 (.029)
Education (years)	-0.051* (.021)	0.002 (.020)	-0.083*** (.025)	-0.083** (.029)
Occupation:				
Formal Employment	0.781 (.530)	0.453 (.487)	0.533 (.623)	0.452 (.719)
Self Employed	0.806 (.531)	0.452 (.488)	0.418 (.625)	0.071 (.721)
Unemployed	0.445 (.544)	0.273 (.499)	0.315 (.639)	0.113 (.738)
Student	0.652 (.567)	0.501 (.521)	0.696 (.667)	0.631 (.770)
Retired	1.079 (.534)	0.362 (.490)	0.094 (.6282)	0.440 (.725)
Other	0.852* (.538)	0.454 (.494)	0.870 (.632)	0.165 (.730)
Constant	0.350 (1.316)	5.219 (1.202)	-3.091 (1.543)	-2.307 (1.79)
Log-Likelihood	-2990.75	-2833.26	-3282.89	-3529.37

Chi-squared	269.73	244.43	130.26	155.23
No. Of. Observations	1890	1890	1890	1890

Source: Field Survey, 2011

legend: * p<0.05; ** p<0.01; *** p<0.001

As expected, own-price coefficients are negative at all the four parks, although only significant in the Kgalagadi and Kruger national parks. This implies that an increase in conservation fees would result in visitation declines. The cross-price coefficient of demand is both positively signed and significant, implying that Augrabies Fall and Pilanesberg are substitutes to the Kgalagadi. Thus, a fee increase in Kgalagadi would be expected to lead to a decline in its visitation accompanied by an increase in visitation at the two parks. This is particularly important given that the two arid parks (Kgalagadi and Augrabies) are close enough to each other.

isitation demand at Augrabies is a significant determinant at Pilanesberg, hence a fee increase at the latter would push visitation demand at the former. The fact that conservation fee changes in Kruger and Augrabies does not impact on visitation demand given the availability of alternative parks is proof that parks have different degrees of appeal to users.

The income coefficient is both positive and significant in the Kgalagadi, Augrabies and Pilanesberg. This suggests that income does indeed impact on the length of stay at these parks. Other socio-economic characteristics are also included in the estimated demand equations. The number of household members in the trip influences the duration of stay at Kruger and Pilanesberg, although negatively signed in the former. The visit frequency variable is both positive and significant in Kruger and Pilanesberg. Although it is also statistically significant at Augrabies, it is negatively signed. Given the limited attractions at Augrabies, being a regular visitor has no impact on the duration of stay. The negative and significant first time coefficient in Augrabies suggest that being a first time visitor has no impact on the duration of stay. A dummy variable to test whether the respondent's feedback might be influenced by the location that the interview was conducted is also included in the analysis. The coefficient of this variable is statistically significant in Augrabies and Pilanesberg, although negative in the Kgalagadi park. Its positive sign indicates that the location of the interview mattered in the Kgalagadi and Pilanesberg. The coefficient for total trip expenditure is both negative and significant in Kruger. The variable representing education is negative and significant in Augrabies and Pilanesberg. The multi-trip coefficient is statistically significant in Kruger and Augrabies. It is positively signed at the former and negatively signed at the latter. Finally, the age estimate is negative and statistically significant only in Augrabies.

Empirical evidence shows that elasticities of park visitation demand for any park can be determined from the marginal effects associated with the estimated demand coefficients. Econometrically, quantity demanded is regressed on the own price and cross-price, as well as on income, see table 4. As is customary, the elasticities are valid at the point of the means of each independent variable.

Table 4: Marginal effects after standard tobit model to ascertain determinants of park visitation demand of South African residents

Variable:	**Kgalagadi Transfrontier Park**	**Kruger National Park**	**Augrabies Falls National Park**	**Pilanesberg National Park**
Price – Kgalagadi (R/night)	-1.081 ***(.128)	0.010 (.118)	0.318* (.151)	0.213 (.174)
Price – Kruger (R/night)	0.225(.128)	-1.030*** (.118)	0.314* (.151)	0.183 (.174)
Price – Augrabies (R/night)	0.387*** (.093)	-0.000 (.084)	-0.052 (.109)	0.373** (.129)
Price – Pilanesberg (R/night)	0.307**(.117)	-0.009 (.107)	0.183 (.137)	-0.378* (.159)
Income (R)	0.086**(.026)	-0.026(.024)	0.085** (.031)	0.123*** (.036)

Source: Field Survey, 2011

legend: * p<0.05; ** p<0.01; *** p<0.001

Own-price elasticities of visitation demand for the four parks are located on the main diagonal. The own-price elasticities in all the four parks conform to expectations (negative relationship). Own-price elasticities are statistically significant at the 5 percent or better in the Kgalagadi and Kruger. The own price elasticity of demand at the two parks is nearly unit elastic. The positive and significant Augrabies and Pilanesberg cross-price elasticity indicates that there are substitutes to the Kgalagadi park. Finally, the estimates for income are statistically significant income inelastic in the Kgalagadi, Augrabies and Pilanesberg.

The main policy objective of this paper is to estimate the optimal conservation fees necessary to maximize park revenue. We know from economic theory that the park agency can maximize revenue by setting the conservation fee that makes demand unit elastic, which is given by:

$$e_p = (\partial Q_D/\partial Q_P)(P/Q_D) = -1 \quad \textbf{(8)}$$

Alternatively, revenue-maximizing conservation fees can be determined given the following conditions:

$$\frac{\partial TR}{\partial Q} = 0, i.e., first - order\ condition\ for\ revenue\ maximization \quad \textbf{(9)}$$

$$\partial^2 TR/\partial Q^2 < 0, i.e., second - order\ condition\ for\ revenue\ maximization \quad \textbf{(10)}$$

Where Q the duration of stay in the national park, and $P\ (TR = P * Q)$ is the conservation at each respective park. Solving the first-order condition yields quantity demanded and subsequently the optimal conservation fee. Equation 9 & 10 show the two approaches that can be used to derive revenue-maximizing fees. However, setting the elasticity to unity implies that we are dealing with a case for a monopoly's good without a substitute. As mentioned before, in our case the parks are substitutes of each other so the condition for optimality would have to change. The correct way to compute the optimal prices is through using the optimal k-park pricing rule:

$$\left[\frac{Pi-(dC_i/dXi)}{Pi}\right] = \frac{1}{\varepsilon_{ii}} - \left[\sum_{j\neq i}^{k} \frac{Pj-(dC_j/dXj)}{PFi.Xi}\frac{Xj.\varepsilon_{ij}}{\varepsilon_{ii}}\right] \quad (11)$$

Where ε_{ii} and ε_{ij} is the own and cross price elasticities, and C_i *is* SANParks total costs of recreation. As is the case in Alpizar's study, we assume that C_i is a constant marginal cost of recreation. Regrettably, SANParks does not have information about what the costs of tourist might be. The park agency indicates that this is due to its financial model which does not distinguish expenditure between overnight and day visitor guests. In the absence of this information, our optimal conservation fees estimates assume a case of zero marginal costs (C_i=0).

Solving equation 11 for Pi given the demand elasticities and the average actual conservation fees for the sample data set (illustrated in **table 2**) suggests that the revenue accruing to the park agency is maximized at the following daily levels:

Table 5: Optimal conservation fees for South African residents, year 2011 South African Rand

	Kgalagadi Transfrontier Park	**Kruger National Park**	**Augrabies Falls National Park**	**Pilanesberg National Park**
Optimal Fees	109.56	28.79	104.07	89.22

The estimates in table 5 indicate that the optimal fees could be increased at three of the parks, with the exception at Kruger. The optimal estimates are 143.47, 316.28 and 98.27 percent higher than the actual fees at Kgalagadi, Augrabies and Pilanesberg respectively. In the case of Kruger, the optimal fee is 36.02 percent lower than the actual fee. Let's now examine the international visitation demand at the four parks. The regression output for all the parks is presented below:

Table 6: Standard tobit model to ascertain determinants of park visitation demand of international visitors

Variable:	*Estimates: Coefficient*			
	Kgalagadi Transfrontier Park	**Kruger National Park**	**Augrabies Falls National Park**	**Pilanesberg National Park**
Price – Kgalagadi (R/night)	-0.877*** (.253)	-0.391 (.280)	-0.053 (.216)	-0.198 (.376)
Price – Kruger (R/night)	-0.037 (.250)	-1.673*** (.277)	0.012 (.214)	0.043 (.372)
Price – Augrabies (R/night)	0.485** (.174)	-0.244 (.189)	-0.611*** (.146)	0.002 (.253)
Price – Pilanesberg (R/night)	-0.016 (.224)	-0.172 (.248)	-0.072 (.192)	-0.513 (.333)
Income (R)	-0.089 (.053)	0.079 (.059)	-0.010 (.046)	0.296*** (.078)
Interview site	0.305 (.168)	-0.356 (.194)	3.977*** (.500)	1.199** (.385)
Visit frequency	0.041 (.047)	0.076 (.052)	0.133** (.041)	0.025 (.071)
First	0.216 (.161)	0.696*** (.177)	0.468*** (.136)	-0.342 (.239)
Travel Agent	-0.356 (.187)	-0.179 (.207)	0.383* (.163)	-0.887** (.283)
No of H/H members on trip	-0.039 (.057)	-0.103 (.064)	-0.050 (.049)	-0.076 (.089)
Nationality:				
European	-0.150 (.295)	-0.231 (.348)	-2.171*** (.269)	-2.099*** (.421)
United States	-0.691* (.340)	-0.871* (.378)	-2.358*** (.301)	-1.582** (.511)
Canadian	0.423 (.583)	0.314 (.659)	-1.622** (.493)	-1.799* (.823)
Australian	0.196 (.349)	-0.529 (.393)	-1.193*** (.305)	-1.627** (.504)
New Zealand	-0.835 (.728)	-1.138 (.815)	-2.760*** (.602)	0.131 (1.041)
Indian	0.720*** (.193)	0.204 (.223)	-3.613*** (.472)	0.065 (.282)
Total fees on conservation fees	0.000 (.000)	0.000*** (.000)	0.000 (.000)	0.000 (.000)
Total accommodation costs	0.000* (.000)	0.000** (.000)	0.000** (.000)	0.000*** (.000)
Total trip costs	0.000* (.000)	0.000 (.000)	0.000 (.000)	0.000*** (.000)
Multi-trip	-0.631*** (.144)	-0.199 (.156)	-1.043*** (.125)	0.578** (.207)
Male dummy	-0.262 (.130)	-0.548*** (.143)	-0.181 (.111)	0.426* (.193)
Age (years)	0.006 (.005)	0.009 (.006)	-0.016** (.005)	-0.011 (.008)
Family size	-0.061 (.054)	-0.066 (.061)	0.022 (.047)	0.093 (.0836)
Education (years)	0.091 (.058)	-0.169** (.063)	0.186*** (.050)	0.436*** (.084)
Occupation:				
Formal Employment	0.211 (.215)	0.168 (.234)	-0.734*** (.203)	-0.515 (.320)
Self Employed	0.273 (.250)	-0.264 (.273)	-0.554* (.214)	0.729* (.366)
Unemployed	0.680* (.322)	0.211 (.363)	-0.821** (.283)	0.655 (.486)
Student				
Retired	-0.859*** (.293)	-1.017** (.320)	-1.991*** (.2518)	-0.315 (.457)

Other				
Constant	3.969 (3.208)	13.507*** (3.536)	6.445* (2.74)	-0.070 (4.759)
Log-Likelihood	-572.85	-613.13	-514.77	-703.30
Chi-squared	129.81	125.53	232.67	173.36
No. Of. Observations	390	390	390	390

Source: Field Survey, 2011

legend: * p<0.05; ** p<0.01; *** p<0.001

Economic theory (law of demand) predicts that there is an inverse relationship between price and quantity demanded; this is indeed the case as the own-price estimates at all the four parks are negatively signed. However, the own-price estimate in Pilanesberg is not statistically significant. Only the coefficient for the Augrabies cross-estimate is statistically significant in influencing visitation demand in the Kgalagadi. It's positively signed, which is an indication that the former is a substitute to the latter. This implies that a fee increase in the Kgalagadi would most likely lead to an increase in visitation demand at Augrabies. Interestingly, conservation fee changes at Kruger, Augrabies or Pilanesberg respectfully have no influence on visitation at the three parks given the availability of alternative parks.

The income coefficient is both positive and significant only in Pilanesberg. This implies that income does indeed impact on the length of stay in Pilanesberg, which is not surprising given the wider availability of alternative recreational sites in the area. A closer look at socio-economic characteristics shows that age and visit frequency variables are both positive and significant only in Kruger. The education coefficient is significant at all the parks, except in Kgalagadi. Given that the Kgalagadi is the least accessible in the country and requires specialized equipment, the fact that total fee expenditure, accommodation and total trip costs do not play an important role in the duration of stay there is logical.

The estimated elasticities output associated with own-price, cross-price and income variables are presented below:

Table 7: Marginal effects after standard tobit model to ascertain determinants of park visitation demand by international visitors

Variable:	**Kgalagadi Transfrontier Park**	**Kruger National Park**	**Augrabies Falls National Park**	**Pilanesberg National Park**
Price – Kgalagadi (R/night)	-0.877*** (.253)	-0.391 (.280)	-0.053 (.216)	-0.198 (.376)
Price – Kruger (R/night)	-0.037 (.250)	-1.673*** (.277)	0.012 (.214)	0.043 (.372)
Price – Augrabies (R/night)	0.485** (.174)	-0.244 (.189)	-0.611*** (.146)	0.002 (.253)
Price – Pilanesberg (R/night)	-0.016 (.224)	-0.172 (.248)	-0.072 (.192)	-0.513 (.333)
Income (R)	-0.089 (.053)	0.079 (.059)	-0.010 (.046)	0.296*** (.078)

Source: Field Survey, 2011

legend: * p<0.05; ** p<0.01; *** p<0.001

As expected, all the own-price elasticities are negatively signed at all the four parks. The own-price elasticities are statistically significant at the 5 percent level or better, except in Pilanesberg. The elasticity ranges from elastic in the case of Kruger to inelastic in the other three parks – with the Kgalagadi estimate the closest to unitary elasticity. The positive and significant Augrabies price variable implies that it is a substitute to the Kgalagadi park. This may be due to the fact that Augrabies is the only closest park to the Kgalagadi. Although statistically insignificant, our results suggest that Kruger and Pilanesberg are compliments to the Kgalagadi park. In the case of income elasticity estimates, it is statistically significant only in Pilanesberg where it is inelastic.

The optimal k-pricing rule (equation 11) is once again used to estimate the conservation fees for international visitors, the results of which are shown below:

Table 8: Optimal conservation fees for international park visitors, year 2011

	Kgalagadi Transfrontier Park	**Kruger National Park**	**Augrabies Falls National Park**	**Pilanesberg National Park**
Optimal Fees: South African Rand (R)	373.00	547.08	81.20	542.98
Optimal Fees: Converted to American Dollars (US$)	47.46	69.61	10.33	69.09

The results above indicate that revenue could be maximized by reducing the conservation fees only at Augrabies, by 18.80 percent. As for the rest of the other parks, the fees would have to be hiked by 107.22, 203.93 and 1106.62 percent at Kgalagadi, Kruger and Pilanesberg[7] respectfully. Our optimal fee estimates are significantly more than the current fees charged to international visitors at these three parks.

11. Conclusion

Our analysis for both local residents and international visitors shows that there is a wide variation in the elasticities of demand between the four national parks. One interesting trend that emerges is the contrasting sensitivity at the Kgalagadi Transfrontier Park, local visitors are sensitive to conservation fee changes whereas international visitors are not. The trends

[7] A point to note is that Pilanesberg charges a weekly rate; hence our estimate reflects the optimal weekly fee. In the case of other parks, we estimate daily optimal conservation fees.

between the two groups at the other three parks are consistent. The cross-price estimates indicate that there is substitutability in visitation demand between parks despite offering different attractions.

Interestingly, our results suggest that revenue could be maximized by increasing conservation fees for local tourists at three of the four parks, with the exception of Kruger national park. This is an interesting outcome given that Kruger already accounts for a significant number of total visits to South African parks. Intuitively, an optimal fee suggested at Kruger would lead to even higher visitation which would in turn exert pressure on its ecological carrying capacity. Perhaps Kruger optimal fees might be significantly larger if the carrying capacity is taken into consideration.

Furthermore, our findings imply that the conservation fees charged to international visitors are significantly lower than optimal, with the exception of Augrabies. As expected, the optimal fees for international visitors are significantly higher than for local visitors. This indicates that both local and international park fees could be raised. Overall, our results suggest that there is a dramatic undervaluation of South African park systems, which implies that there is room for improvements in conservation fee policy. Our results are consistent with empirical studies of nature-based ecotourism that estimate higher conservation fees or WTP. The implication of our results is that park agencies (SANParks & NWPTB) can charge higher conservation fees (up to optimal levels) without jeopardizing park revenues.

Our findings imply that there is a possibility to raise the conservation fees at the four parks without any significant adverse consequences on the park's ability to generate maximum revenue for all stakeholders concerned, particularly in rural areas where the pace of development is very slow as is the case in the Kgalagadi area. The opportunity to increase fees primarily for benefit sharing with communities would represent a bold step in which a world renowned Transfrontier Park could contribute tangible benefits to the local community – Khomani San, who happen to also be co-owners of the park.

The validity and credibility of the revenue-maximizing conservation fees of which the voluntary community-bound donation estimate is dependent on can practically only be tested by implementing these fees at the point of entry at the parks. This is practically not possible at this early stage of this kind of research, hence the only realistic way to test the consistency and credibility of these estimates is to look at them in the context of the pricing structure of recreational sites in South Africa in general (both state and privately owned).

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