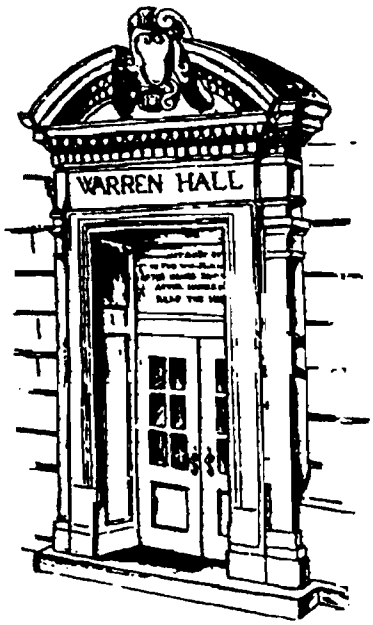

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ECOTOURISM DEMAND AND DIFFERENTIAL PRICING OF NATIONAL PARK ENTRANCE FEES IN COSTA RICA

by

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ABSTRACT

Ecotourism presents developing countries with growing opportunities for attracting foreign exchange and enhancing economic growth, but also raises some pressing management challenges for national parks and other protected areas. This paper presents a framework for analyzing the impacts of increasing user fees on visitation at national parks in Costa Rica. Data are collected at three national parks using a contingent behavior methodology designed to elicit information on foreign tourists' park visitation behavior at alternative entrance fee levels. This methodology employs surveys of subjects responding to hypothetical scenarios involving various pricing and visitation options. Park visitation demand functions and own-price, cross-price, and income elasticities are estimated. Based on these estimates, revenue-maximizing fee levels are calculated and the implications of applying differential pricing principles to park management are discussed. The results suggest important conclusions for national park user fee policies, particularly in developing countries.

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I. Introduction

A growing body of literature has emphasized the role of user fees in the management of protected areas, including national parks and wilderness areas, primarily in developed countries.[1] In developing countries seeking to balance environmental and economic growth objectives, the challenges facing policymakers and managers of protected areas are particularly great. Government funds are typically in short supply and enforcement of environmental regulations lax or non-existent. Many of the visitors to protected areas, including national parks, are foreign visitors who incur few of the costs but enjoy many of the benefits stemming from resource conservation efforts. Tourism revenues, rather than being earmarked for park maintenance or resource conservation efforts, are often merged with other sources of general revenues. Yet, without user fees to effectively capture revenues, alternative land uses that provide greater short-run returns -- such as logging, agriculture and cattle grazing -- will typically be pursued, on public as well as private lands. The result is often deforestation, soil erosion, watershed degradation, and irreversible loss of biodiversity (Southgate and Whitaker 1994). Since the market typically fails to reflect these environmental and economic costs, less wilderness is preserved than is optimal (Dixon and Sherman 1991).

Under these circumstances, the potential benefits from charging user fees and differentially pricing access to protected areas are significant. User fees are one vehicle to capture for the public the benefits of ecotourism which often accrue primarily to the private sector. They also provide the ability to limit visitation in areas which suffer from overuse and accompanying ecological damage. The more radical policy of differential pricing for outdoor recreation is beginning to receive some attention; however, the focus has been primarily theoretical (Wilman 1988). Differential pricing to increase both revenues and efficiency is commonly practiced for many

commodities, such as airline fares, electrical rates, and time-of-day telephone pricing. Although differential pricing for outdoor recreation has been the subject of some experimentation (Bamford *et al.* 1988), these experiences have been limited and there are practical difficulties in convincing policymakers to allow for such experiments. Little experience thus exists, particularly in developing countries, to guide natural resource managers in designing effective pricing strategies for protected areas. Analyses assessing the impacts of user fees and differential pricing are needed so that appropriate policies can be devised and implemented, and resources can be managed in an optimal manner.

This paper uses a contingent behavior (CB) methodology to generate experimental data to assess the effects of differential pricing of entrance fees to national parks in Costa Rica. The paper describes the design and estimation results of a survey methodology capable of surmounting practical obstacles involved in prior contingent valuation (CV) studies. The next section briefly describes the current status of ecotourism in Costa Rica, associated problems, and recent changes in park pricing strategies. Then, alternative approaches that can be used in the valuation of ecotourism are discussed. The following section presents a theoretical framework for estimating price and income elasticities of ecotourism demand. This section also discusses the approach used in this study to collect primary data on tourists' responses to hypothetical changes in national park entrance fees, as well as the random effects probit and Tobit models used in the empirical estimation. Next, estimates of park visitation demand are presented and discussed. Unconstrained own-, cross-price, and income elasticities of demand are estimated in order to gauge visitors' sensitivities to changes in entrance fees and income levels. Revenue-maximizing entrance fees are calculated and discussed. Finally, the empirical results are reviewed in the

context of Costa Rica's tourism policy and the implications of recent and potential policy changes are examined.

II. Ecotourism in Costa Rica

Costa Rica, one of the world's richest countries in biodiversity, has experienced one of the highest rates of deforestation among tropical countries in recent decades (World Resources Institute 1994). Primarily through the conversion of forests to agricultural uses, the country lost half its forest cover between 1950 and 1990 (Wallace 1992). In recent years, however, this trend has slowed, with the growth of a renowned national parks system, which, over the last two and a half decades, has preserved over ten percent of the country's primary forests (Bermúdez 1995a). Today, Costa Rica has over two dozen national parks, reserves and wildlife refuges distributed throughout the country (see Figure 1).

In large part due to the attractions of its national parks system, Costa Rica has enjoyed an enormous expansion in foreign tourism in recent years, and has become one of the few developing countries that has publicly recognized the potential of ecotourism to generate revenues while encouraging the conservation of natural resources[2]. Between 1987 and 1993, visitation by foreign tourists to Costa Rica's national parks is estimated to have increased by almost 500 percent (Bermúdez 1992, 1995b). By 1993, tourism had overtaken bananas and coffee to become Costa Rica's largest single source of foreign exchange earnings (Instituto Costarricense de Turismo 1994a). In 1994, sixty-five percent of tourists from the United States, Canada, and Europe visited national parks during their vacations in Costa Rica (Instituto Costarricense de Turismo 1994b).

Despite its rapid growth, tourism is distributed unequally throughout the country and its parks, reserves and protected areas. The three most popular national parks, whose visitation was

the subject of this study, account for approximately two-thirds of visits by foreign tourists; these are Manuel Antonio, Volcán Poás, and Volcán Irazú (Aylward *et al.* 1996). Manuel Antonio is a beach park located on the Pacific Coast, about five hours from the capital city, San José. Its attractions include beaches, lowland tropical forests, and abundant wildlife. Poás and Irazú offer different attractions from Manuel Antonio but are themselves quite similar; both are active volcanoes located approximately two hours from San José, and the principal attractions in both cases are views of the craters.

Ecotourism is often acknowledged to have the potential to be an important contributor to sustainable development by providing direct economic incentives to encourage the conservation of protected areas. Yet, in many developing nations, the reality is different. In Costa Rica, despite the growth and reputation of its parks system, financial resources have not been effectively channeled to support the National Parks Service. In addition, as visitation at national parks has increased exponentially over the past decade, environmental problems and overcrowding have resulted in some parks.

The combination of financial pressures and the need to decrease visitation in some of the parks recently led the Costa Rican National Parks Service to increase the entrance fees to national parks for foreign visitors. On September 1, 1994, daily entrance fees for foreign visitors to all of Costa Rica's national parks were increased by 1,100 percent, from 200 *colones* (roughly $1.25 U.S.) to 2400 *colones* ($15). Fees for residents remained at 200 *colones*. Because of protests from the tourism industry, exceptions were made so that foreign visitors on tours paid 800 *colones* ($5) and those who bought their tickets in advance paid 1600 *colones* ($10) as daily entrance fees.

Even with these exceptions, the fee increase created considerable controversy among park officials, the ecotourism industry, and local groups. For example, the community outside Cahuita

National Park on the southern Caribbean coast held demonstrations and took control of the local park entrance, refusing to allow the collection of any fees. The administrators of several parks were not in agreement with the new fee structure and adjusted the rules to better suit their desired levels of visitation. Some parks charged $15 as a one-time fee, regardless of how many days a visitor stayed in the park; other parks charged a uniform fee of $10, even when visitors had not bought their tickets in advance. Throughout Costa Rica, local black markets for the discounted tickets developed. Tickets were available to tourists through certain travel agencies, hotels, restaurants, and taxi drivers for prices anywhere from $5-$10. In some areas, such as the communities surrounding Manuel Antonio, a thriving market for the discounted tickets developed; in other areas, including Poás and Irazú, there was no evident black market nearby, but discounted tickets could be purchased in San José. Park officials were likely aware of the abuse surrounding the markets for discounted tickets, but tended to ignore it; they did not appear to benefit from the existence of the black market.

Costa Rica's steps toward the use of differential pricing to generate revenues and reduce visitation in areas of overcrowding hold great potential not only as a source of domestic economic growth and as a vehicle for preserving natural areas, but also as an example for other developing countries looking for guidance in managing parks and protected areas. However, the way the recent fee increase was enacted has created numerous conflicts and variable experiences from park to park. Moreover, national park administrators and policymakers did not fully use the experiences of other protected areas (Aylward *et al.* 1996) as well as data and information on foreign visitors' demand preferences which could help guide pricing and other policy decisions. For example, estimates of own- and cross-price elasticities of park visitation demand in response to hypothetical changes in park entrance fees and analysis of the factors influencing willingness to

pay for entrance fees can be used to develop park management strategies for simultaneously generating revenues while reducing overcrowding in specific parks. Managing ecotourism more efficiently can help to both preserve natural resources and generate a broader and more equitable distribution of associated economic benefits.

III. Valuing Ecotourism in Developing Countries

There is a nascent, though growing, body of literature that focuses on valuing ecotourism and wilderness areas in developing countries. The primary approaches used in these studies -- travel cost (TC) and contingent valuation (CV) -- were both pioneered in the U.S. and have only recently been applied in developing country contexts, where data constraints are typically greater and eliciting consumers' valuations of environmental amenities has proven more problematic (Schultz *et al.* 1997). The travel cost approach derives a demand curve for recreational use values in a specific protected area based on travel expenses for a vacation in that park. It is expected that there will be more tourists visiting from nearby and fewer coming from greater distances where travel costs are higher. Thus a demand curve for a park can be derived based on the relationship between travel costs and the corresponding amounts of visitation. This method, though long used in developed countries, has limitations, particularly in applications to multiple destination trips (Pearse 1968), as is the case in this study. In addition, the assumption that visitors from each origin are homogeneous in marginal costs and preferences and other assumptions of the method are questionable (Wennergen 1964). To circumvent such limitations, studies that have estimated use values of protected areas in developing countries have often excluded non-residents (Durojaiye and Ipki 1988; Tobias and Mendelsohn 1991), or if foreign visitors are included, restrictive simplying assumptions have been imposed (Mungatana and Navrud 1994). While studies using TC have provided useful insights into the value of ecotourism in protected areas in

developing countries, they have typically focussed more on estimating consumer surplus than on evaluating user fees as a guide toward designing improved park pricing strategies, the primary objective of this study.

By comparison, contingent valuation relies on surveys containing hypothetical scenarios in order to place values on goods that cannot be priced directly through a market (Cummings *et al.* 1986). Thus, CV has more flexibility than TC in that a survey can be designed to elicit many different types of values, not only the use value of a specific area such as a national park. Although CV has been applied to developing countries less often than TC (Lindberg and Johnson 1994), there is growing recognition of the importance of these applications, particularly when results have direct implications for natural resource management and policy. CV has been used to measure total preservation value, which includes both use and non-use components (Echeverría *et al.* 1995). Use values have been examined through analyses of the explanatory factors influencing willingness to pay (WTP) for increases in entrance fees and trip costs as well as improvements in park amenities (Abala 1987; Baldares and Laarman 1990; Moran 1994; Schultz *et al.* 1997).

Due to their focus on Costa Rica, a couple of recent papers are particularly relevant to this study, even though their focus is on WTP estimates, a matter only peripherally related to the focus of this research. Baldares and Laarman (1990) examined visitors' WTP for entrance fees to protected areas in Costa Rica, including Monteverde, a popular private reserve where the fee was less than $3.00 per day. This nonetheless seemed high by comparison with fees at national parks, at the time of their study, approximately $0.30 per day. Results showed that WTP was influenced most by resident/non-resident status and by whether the visit was to the private reserve or a national park. WTP was higher for non-residents and for visits to the private reserve. The

authors speculated that the higher fee charged at the private reserve may have influenced the increased WTP. This was perhaps due to the actual fee acting as a reference point from which visitors base judgements of WTP (see discussion below). More recently, Shultz *et al.* (1997) applied standard CV estimation techniques to estimating WTP for entrance fees to two national parks (Manuel Antonio and Poás) in Costa Rica. They estimated mean WTP values of $11-$13 per day for residents and $14-$23 per day for foreign visitors. These results suggest some scope for increasing fees for both categories of visitors, given the lower entrance fees charged at the time of this study (1995). Schultz *et al.* also concluded that, while conventional CV methods can be useful for estimating WTP, certain limitations exist, including limitations with sampling methods and locations, biases due to variations in cultural backgrounds, and the frequent lack of specific information given in hypothetical questions.

An additional limitation is addressed in this study. Using conventional CV survey techniques, it has often not been possible to collect the data necessary to estimate an unrestricted system of demand equations -- including cross-price elasticities -- which can then to be used in designing effective differential pricing policies (Brown 1994). To accomplish this, a contingent behavior approach is employed in this study to generate experimental data to assess the effects of differential pricing of entrance fees to national parks in Costa Rica. The CB approach has been applied in several previous studies, including those by Ward (1987), Loomis (1993), Adamowicz *et al.* (1994), and Layman *et al.* (1996). A stated preference approach to the estimation of visitation demand can be used that presents respondents with an array of sites and characteristics and asks them which site they would visit (Adamowicz *et al.* 1994). Demand can then be estimated based on a random utility model using multinomial logit. However, this approach does not account for visits of varying length, a significant issue in our study. Alternatively, the CB approach used in

our study specifies a change in entrance fees at one park and asks how visitation patterns would change at all parks. The responses provide data that allow for the estimation of own- and cross-price elasticities, which could not previously be estimated. While the CB approach represents a methodological improvement by allowing for the collection of previously unavailable data, the CV and TC studies discussed above provide a foundation for estimating use values in developing countries and especially Costa Rica. In this study we have employed a variation of the CB methodology so that prices of complementary and substitute attractions can be incorporated in the estimation of demand functions. This is necessary in order to fully understand the effects of differential pricing on park visitation patterns.

IV. Estimating Park Visitation Demand

A. Theoretical Background and Survey Methodology

Price differentiation, as applied here to the setting of national park entrance fees at different parks, is based on the same principle as price discrimination, which is described in terms of ecotourism applications by Baldares and Laarman (1990) and Lindberg (1991). Figure 2 illustrates a situation where the demand for visitation at Park A is less elastic than visitation demand at Park B. Charging a higher price (e.g., entrance fee) at Park A will reduce visitation (and fee revenues) to a lesser extent than the same percentage increase in price at Park B. Charging different fees at Parks A and B may thus increase total revenue generation and simultaneously allow visitation numbers to be tailored to address site-specific characteristics and concerns -- for example, reducing environmental degradation arising from excessive levels of tourism.

A commonly used model of resource valuation posits that a representative consumer maximizes a direct utility function (U)= U(X, Q), subject to $M = P_xX + P_QQ$, where: X is a vector of commodities; Q is the quantity of an environmental amenity (in this case, visits to national parks

in Costa Rica); M is consumer income; P_x is a vector of commodities' prices; and P_Q is a price vector of entrance fees for visits to national parks. Maximization of the above constrained utility function yields individual demand curves, and aggregation across the market yields the aggregate demand curve for Q: $Q = Q(M, P_x, P_Q)$.

Based on theory and past empirical studies, aggregate demand curves for national park visitation in Costa Rica are expected to be a function of each park's entrance fee as well as the entrance fees at other parks and attractions, park visitors' incomes, demographic characteristics, and trip-related factors. The demand functions for the three national parks in Costa Rica which were studied (Poás, Irazú, and Manuel Antonio) can be written in general form as:

$$Q_j = Q_j (P, M, Z) \qquad [1]$$

where Q_j = visitation at Poás, Irazú, or Manuel Antonio National Parks (in days),

P = vector of entrance fees at each of the three parks (in dollars),

M = park visitors' income (1,000 dollars), and

Z = demographic and trip-related characteristics.

Although income, M, usually is included in tourism demand equations, it is unclear *a priori* whether it is expected to be significant in this case for two reasons. First, visitors already have incurred very high initial costs by traveling to Costa Rica, and typically are deciding only, at the margin, which park to visit within the country. Second, while *overall* vacation length may in part be a function of income levels, short visits -- usually one or two days -- to the parks in question may not be significantly influenced by income levels. The demographic and trip-related characteristics incorporated in the demand equations include visitors' ages, education, nationality, and whether the visitor was part of a tour.

An additional variable on which data were collected, total trip cost[3], was excluded based on both conceptual and practical grounds. For tourists facing an overall budget constraint, trip cost (expenditures) and trip length are jointly endogenous, necessitating the exclusion of trip cost as an explanatory variable when trip length is the dependent variable of primary interest, as is the case here. Second, as with respect to income, the dominant role of initial travel costs to reach Costa Rica from North America or Europe (the sources of most foreign tourists in Costa Rica) suggests that travel costs from San José and other originating locales are low, in relative terms, and thus would not be expected *a priori* to significantly influence trip length. Finally, as a practical matter, most respondents in the current study were visiting many destinations, including other national parks, other attractions in Costa Rica, and destinations in nearby countries. As mentioned previously, estimating travel cost is problematic for multiple destination trips.

A random sample of foreign tourists was surveyed at the three most frequently visited national parks in Costa Rica: Manuel Antonio, Volcán Poás, and Volcán Irazú. In 1993, these parks accounted for 68 percent of foreign tourist visitation: 30 percent at Manuel Antonio, 25 percent at Volcán Poás, and 13 percent at Volcán Irazú (Bermúdez 1995b). Primary data were collected through in-person interviews conducted in January-March, 1995, during Costa Rica's peak tourist season. The study reported here is based on a total of 311 usable surveys of foreign visitors (a smaller survey of Costa Rican park visitors was also completed but is not reported here). Of these, 105 visitors were surveyed at Manuel Antonio, 105 at Poás, and 101 at Irazú. The refusal rate of randomly-selected visitors was less than five percent. The survey instrument was pre-tested in October of 1994. During pre-testing, it was decided that in-person interviews should be conducted in order to ensure full understanding and completion of the questions. The same

interviewer surveyed all respondents, so it was not possible to test for interviewer bias. Survey instruments were available in Spanish and English.

The interview began with questions about the tourists' experiences in Costa Rica and its national parks. Information on actual park fees paid, opinions regarding "appropriate" fee levels, and willingness to pay for higher fees[4] was collected. In the last case, the respondent was asked, "If the entrance fee were increased only at this park, how high would the daily entrance fee per person have to be so that you would choose not to visit this park?" The respondent was then shown a payment card with values ranging from $0 to more than $1000, and asked to select the appropriate value.

To facilitate collection, data regarding visitors' actual and hypothetical responses to own- and cross-price increases in entrance fees at the three parks were organized in a table. Table 1 is an example for visitors who paid $10 as the entrance fee, and who were asked about a hypothetical fee of $35. The respondent was shown a chart, similar to Table 1, with a blank piece of paper covering all but the first two columns. Beginning with the column marked "Actual", the respondent was asked, "During this trip to Costa Rica, for how many days will you visit Volcán Poás National Park at the current daily entrance fee of $10 per person?" The question was repeated for Volcán Irazú National Park and Manuel Antonio National Park. After filling out the "Actual" column with the appropriate number of days for each park, the interviewer explained that there would be a hypothetical question next, in which the fee would be raised at only one park. The next column was revealed, with a hypothetical fee of $35 at Poás. The interviewer asked, "If the fee were increased to $35 only at Poás, would that affect your plans to visit Poás or any other national parks?" If the respondent replied affirmatively, he or she was asked to state how his or her plans would change. The column was then filled in with the appropriate number

of days in each cell. The process was repeated for the next two columns, for the cases of entrance fee increases at Irazú and Manuel Antonio.

Many respondents had visited or were otherwise familiar with the three parks in question and had little difficulty stating if and how their visitation plans would change. Those that did have problems were able to understand the question after discussing it with the interviewer. While time-consuming, it was possible to elicit responses to these hypothetical questions through a combination of in-person interviews and a chart visible to both the interviewer and respondent. Finally, standard demographic information (household income, nationality, age, education, etc.) was also collected.

B. Random Effects Econometric Estimation

Using the chart in Table 1 to collect information on park demand preferences resulted in a data set consisting of four observations for each of 311 respondents. Estimating a demand equation using the pooled sample of observations would assume that each data point is a completely random draw from the sample population. The panel nature of the data, however, violates this assumption; that is, it is reasonable to believe that there is something common to each individual, but unobserved by the researcher, that creates correlation between the multiple observations per respondent. If this unobserved effect is, in addition, correlated with the included explanatory variables (here, price, income and demographic information), estimation of the pooled model yields biased results. On the other hand, if the unobserved effect is uncorrelated with the included regressors, the results of the pooled model are unbiased but inefficient.

Although some previous work -- for example, Layman *et al.* (1996) -- has nonetheless pooled multiple observations per person, econometric methods are available which can specifically address these problems. Since the actual respondents were randomly selected from a large

population of potential foreign visitors, and we seek to make inferences about the demand preferences of the population given the observed behavior of our sample, a random effects model is appropriate (Hsiao 1986; Greene 1993)[5]. The random effects specification essentially estimates the correlation between the multiple observations for an individual, and then uses this information to generate more efficient coefficient estimates relative to simple pooling (analogous to the use of generalized least squares in a linear model). This model assumes, however, that the unobserved person-specific effect is uncorrelated with the included regressors[6]. An alternative approach is to use one randomly selected observation per person. While ensuring the independence of observations, this approach throws away information by not utilizing all available data. (This approach was nonetheless used in one of the demand equations estimated here, for reasons explained below.)

It was found that all visitation responses for the two volcano parks, Poás and Irazú, were of either one day or no days. Because of the binomial nature of visitation at Poás and Irazú, a vector of observations on the response variable Q should display the following properties:

$$\lim_{\beta' X \to +\infty} \Pr[Q_j = 1] = 1 \qquad [2]$$

and

$$\lim_{\beta' X \to -\infty} \Pr[Q_j = 1] = 0 \qquad [3]$$

where j = Poás or Irazú, and X is the vector of independent variables (park entrance fees, income, and demographic and trip-related variables).

The model we estimate (separately) for visitation demand at each of the volcano parks is as follows:

$$
\begin{aligned}
&Y^{*}_{it} = \beta' X_{it} + \mu_i + \upsilon_{it}, \qquad i = 1,\ldots,311;\ t = 1,\ldots,4 \\
&Y_{it} = 1 \ \ if \ \ Y^{*}_{it} > 0, \\
&Y_{it} = 0 \ \ if \ Y^{*}_{it} \le 0, \qquad [4] \\
&\mathrm{var}(\mu_i + \upsilon_{it}) = \mathrm{var}(\varepsilon_{it}) = \sigma^2_{\mu} + \sigma^2_{\upsilon}, \\
&corr(\varepsilon_{it}, \varepsilon_{is}) = \rho = \sigma^2_{\mu} / \left(\sigma^2_{\mu} + \sigma^2_{\upsilon}\right).
\end{aligned}
$$

The (unobserved) residual is composed of two pieces: μ_i, which is randomly distributed *across* respondents, but introduces equal correlation (ρ) between observations *within* a respondent; and υ_{it}, a conventional random error term. For μ and υ distributed normal, each with mean zero and variance given above, this is a probit model with random effects. Under the assumption that μ_i is uncorrelated with the included independent variables, X_{it}, maximum likelihood estimation of this model (following the procedure outlined in Butler and Moffitt (1982)) yields consistent and efficient coefficient estimates (Greene 1993, 1995). The random effects model using the full data set (1244 observations) is preferred to the use of a standard probit on a subset of observations (one per person, or 311 observations) because it uses all of the available information.

In contrast to the binomial nature of demand for visitation at Poás and Irazú, visitors to the beach park (Manuel Antonio) stayed up to eight days, with the majority visiting for zero or one day. Since a large fraction of observations on the dependent visitation variable are zero-valued, classical linear regression methods should not be used due to a number of limitations, including biased coefficients, heteroskedastic error terms and the likelihood of meaningless probabilities and negative variances (Greene 1993). For this reason, the censored regression model, or Tobit model, was used to estimate the demand for visitation at Manuel Antonio National Park. Because of estimation problems with the analogous random effects Tobit model[7], we estimated a standard Tobit model using a subset of our data (i.e., one randomly chosen observation per respondent, or 311 observations):

$$Q_i^* = \alpha' X_i + e_i, \quad e \sim N(0, \sigma_e^2,) \qquad i = 1,\ldots,311$$
$$Q_i = 0 \; if \; Q_i^* \leq 0, \qquad [5]$$
$$Q_i = Q_i^* \; if \; Q_i^* > 0.$$

The general formulation above is referred to as an index function, meaning that the dependent variable may not always be observed directly; however, the outcome reflects an underlying regression (Greene 1993). In this case, the continuous nature of the classical linear regression model is altered when visitation is equal to zero. Variable Q_i is restricted so that it cannot fall below zero, thus ensuring that visitation cannot be negative.

Although not the focus of this paper, conventional regression techniques can also be employed to estimate the determinants of willingness to pay (WTP), adjusting for a bias introduced by the level of the actual entrance fee paid -- similar to "starting point" bias (Thayer 1981) -- that causes observed willingness to pay to diverge from true willingness to pay. This is discussed extensively in other related work (Chase 1996); only summary results are reported below.

V. Empirical Results

A. Econometric Results and Demand Elasticities

Selected summary results from the survey of foreign visitors to the three parks are presented in Table 2. The "actual fee paid" and "actual number of days in park" are based on visitors' behavior at the park where they were surveyed. "Appropriate fee" and "willingness to pay" should also be distinguished. In the first case, visitors were asked: "In your opinion, what daily entrance fee do you think is appropriate for this park?" In the case of "willingness to pay," the relevant survey question was: "If the entrance fee were increased only at this park, how high would the daily entrance fee per person have to be so that you would choose not to visit this

park?" While WTP is a useful concept for estimating demand curves when market data are not available, the "appropriate fee" can be helpful for policymakers when setting fees for quasi-public goods, where the goal is not to strictly maximize revenues but also to afford visitors a positive experience, to encourage them to return, and to promote tourism at other attractions throughout Costa Rica (Aylward *et al.* 1996)[8]. "Number of days if no fee" and "number of days if $35 fee" represent responses to hypothetical questions to see how tourists would change their visitation patterns in response to different prices.

The results show that tourists' responses to alternative fees varied depending on the park in question. The average actual fee paid was lower at Poás than at Irazú because a high percentage of Poás visitors came with tours. The average actual fee paid was lowest at Manuel Antonio National Park, where there was a thriving black market for $5 tickets sold by various local vendors. Neither Poás nor Irazú are close to towns, and there was no black market evident at either park, although a few tourists had bought $5 tickets at travel agencies in San José. As mentioned earlier, actual entrance fees paid may bias WTP estimates (following Thayer 1981). Both the "appropriate fee" and WTP at Manuel Antonio are higher than at Poás and Irazú. These differences are statistically significant according to two-tailed t-tests assuming unequal variances and five percent significance levels. The finding of significant differences in WTP depending on the park in question is confirmed by regression analysis (Chase 1996).

Using a combination of visitation data from the Costa Rican National Parks Service (Bermúdez 1995b) and actual and hypothetical data collected for this study, one can also observe, in rudimentary fashion, the responsiveness of park visitation to changes in entrance fees. Figure 3 displays demand curves for visitation by foreign tourists in the month of January as actual and hypothetical park entrance fees (own-prices) change. The lowest points on the entrance fee axis

are based on National Parks Service visitation data for January of 1994, when the entrance fee was $1.25. The middle points are based on National Parks Service visitation data for January of 1995 and the average "actual fee paid" reported for this study (Table 2). The highest points on the entrance fee axis are based on the average response to "number of days if $35 fee" (Table 2). All three curves are downward-sloping, demonstrating the negative visitation demand relationship between price (entrance fee) and quantity (number of visitor-days). In addition, the curves display different properties regarding slope and functional form.

A more comprehensive understanding of national park visitation demand patterns can be gained from the estimated park demand equations. Using the random effects probit models for estimating visitation at Poás and Irazú, and the standard Tobit model for estimating park visitation at Manuel Antonio yields the regression results given in Table 3. Nearly all of the signs of the estimated coefficients are as expected. Own-price coefficients are all negative and significant; as entrance fees increase, visitation declines[9]. The cross-price estimates are positive and significant for the volcano park equations, confirming the expected substitute demand relationship between the two. This means that if fees were allowed to rise (fall) in one park only, visitation at the other would be expected to increase (decrease). Given the similarity of the attractions offered by these two parks, this is a logical result. Conversely, the coefficients of the volcano price variables are not significant determinants of visitation demand at the beach park, Manuel Antonio. The apparent insensitivity of visitation demand at the beach park to entrance fee changes at the volcano parks located in the interior of the country appears to confirm the relative uniqueness of this park's attractions.

The estimation results for the income variable are mixed, conforming with expectations. Although income has typically been shown to be an important variable in tourism demand, its

importance here was, *a priori*, judged to be uncertain, given that foreign tourists were already in Costa Rica, they had already incurred high travel costs to get there, and at that point, were simply deciding which parks to visit. Under these circumstances, it is by no means apparent that income levels would significantly influence length of stay, particularly in the volcano parks which have relatively limited attractions (recall that none of the survey respondents visited either of these parks for more than one day). The income coefficient was in fact positively signed and significant in the Irazú equation, although not in the Poás equation. In the case of the beach park, Manuel Antonio, the coefficient of the income variable was positively signed and significant, reflecting the importance of income in influencing visitors' lengths of stay, notably the multiple-day visits that were common at this park.

Other demographic and trip-related variables were also included in the estimated park demand equations[10]. Variables representing a visitor's age and whether he/she was on a tour ("Touring") were both unimportant in the Irazú equation, positively signed and significant in the Poás equation, and negatively signed and significant in the Manuel Antonio equation. In the latter two cases, these results conform with expectations: Poás is close to San José, and is the park most easily accessible by formal tours, in which older visitors are disproportionately represented; Manuel Antonio, on the other hand, is more difficult to access, is popular especially among younger travelers, and is less likely to be visited by formal tours (which commonly limit visitors' lengths of stay). Variables representing years of schooling and visitors' nationalities were of mixed importance. Neither of these variables were expected *a priori* to play dominant roles in influencing park visitation. One interesting result stems from the Poás equation. Again, this is the park most easily accessible by formal tours; not only is "Touring" a significant determinant of visitation demand, but the heavy representation of North American, European, and Australian

visitors on these tours (indicated by the importance of the nationality variables) is likewise confirmed.

For any particular park, elasticities of park visitation demand can be calculated from the marginal effects associated with the estimated demand coefficients. The estimated elasticities associated with the own-price, cross-price and income variables are shown in Table 4. As is customary, the elasticities are calculated at the variable means. Own-price elasticities of park demand are located on the main diagonal. These are negative in all cases due to the inverse relationship between entrance fees (price) and visitation demand (quantity). They range from highly elastic (Poás) to nearly unit elastic (Manuel Antonio). Cross-price elasticities are positive and significant for the volcano parks only, indicating their clear (and inelastic) substitute relationship. Entrance fee changes at the volcano parks have no significant influences on visitation at the beach park, Manuel Antonio, and vice versa. Finally, park demand visitation is highly income inelastic in the case of Irazú and Manuel Antonio. It must be noted that these elasticities are estimated over the short-run. Empirical studies have demonstrated that long-run elasticities can be several times higher than short-run elasticities (Walsh 1986).

B. A Policy Experiment: Revenue-Maximizing Fees

There are many instances in which results such as these can be employed by park management officials in designing strategies and policies to achieve desired objectives. One example is the design of entrance fee structures which maximize park revenues. We present this example as an illustration and by no means advocate revenue maximization as the primary goal of park management. The setting of park entrance fees is, in Costa Rica as well as many other countries, a highly politicized matter subject to many factors, not just revenue generation. Nonetheless, it would be interesting to know, for example, whether the levels to which park

entrance fees were increased in 1994 were close to revenue-maximizing levels, and if not, what further changes might increase park revenues.

Given the park visitation demand relationships reported above, we have estimated revenue-maximizing park fees[11] as shown in Table 5. The results show that, compared to average fees paid by respondents to this survey in early 1995[12] (shown in Table 2), revenue-maximizing fees would increase from $9.85 to $10.71 per day at Poás and from $9.56 to $13.51 per day at Manuel Antonio, but would decrease from $12.28 to $8.85 per day at Irazú. Visitation levels would rise or fall in opposite directions from the fee changes (Table 5). Several results are immediately clear. First, revenue-maximizing fee levels are estimated to lie well within the bounds set by the earlier fee structure ($1.25 per day) and the new fee policy (a maximum of $15.00 per day). Only at Volcán Poás, though, did actual entrance fees paid by survey respondents (an average of $9.85 per day) come close to approximating revenue-maximizing levels ($10.71 per day). Changes from actual fee levels to revenue-maximizing levels would be minor in the case of Poás (+8.7 percent), but much larger at Manuel Antonio (+41.3 percent) and Irazú (-27.9 percent).

Second, total park revenues are estimated to increase by more than $316,000, or 20.7 percent, above estimated annualized revenues[13] under the policy existing in 1994-95. Estimated revenues already had increased substantially under the policy change in 1994-95 compared to previous levels, although moving to a revenue-maximizing fee structure would clearly increase revenues even more[14].

Third, adoption of a differential pricing approach to setting entrance fees would indeed result in highly variable fees across parks. The revenue-maximizing levels in Table 5 show that

the highest entrance fee -- $13.51 per day in Manuel Antonio, the park with the most inelastic demand -- is more than 50 percent higher than the lowest of the three, $8.85 at Volcán Irazú.

It is clear that a differential pricing approach to entrance fee structures would enable park officials to take advantage of visitors' varying demand elasticities by charging fees appropriate to specific demands for park attractions and amenities. Park visitation objectives and revenue generation goals can be jointly achieved. Differential pricing using revenue-maximizing fees would, for example, decrease visitation at the most heavily visited volcano park (Poás) and substantially increase visitation at the less commonly visited park (Irazú). Higher entrance fees at Manuel Antonio would not only generate higher park revenues but would also help alleviate the overcrowding and accompanying resource deterioration which have been identified as problems at this park[15]. It must be acknowledged, however, that factors other than revenue generation are important in the design of entrance fee policies at Costa Rica's national parks. These other factors include the perceived unfairness of rapid increases in fees, the negative local economic impacts of high fees which decrease park visitation (and thus the demand for hotels, restaurants, and other associated services), the effects on other attractions such as private nature reserves (Aylward *et al.* 1996), and the lobbying capacity of the powerful tourism industry in Costa Rica.

VI. Conclusions and Implications

Ecotourism has grown in importance over the past decade and is now a major contributor to the economies of numerous developing countries, including Costa Rica, Belize, Ecuador, Kenya, Nepal, Rwanda, and Thailand (Lindberg and Huber 1993). Although local cultures and national attractions differ dramatically, these countries are all grappling with similar issues of ecotourism management. Some of the most pressing issues include increasing tourism revenues, protecting natural attractions from degradation due to overuse, and more effective management of

ecotourism as a vehicle to generate economic growth which is compatible with sustainable natural resource use.

Costa Rica stands out as one of the first developing countries to recognize the economic importance of ecotourism and to actively promote its role in the sustainable development of the national economy. Costa Rica has been a leader in designing and implementing innovative policies aimed at capturing the economic benefits that ecotourism can provide. The entrance fee policy enacted in 1994, and the ensuing controversy, have highlighted the important role of this growing industry and foreign exchange earner. As ecotourism continues to spread throughout the developing world, other countries will look to the Costa Rican experience for guidance.

Examining Costa Rica as a case study, this paper contributes to an understanding of the role that economic analysis can play in the management of protected areas to achieve national policy objectives. The park visitation demand elasticities estimated at the three most popular national parks in Costa Rica are quite different, demonstrating the heterogeneity characterizing both tourist behavior and park attractions and amenities. The estimated cross-price elasticities show that substitutability in visitation demand can exist between parks with similar attractions (e.g., the volcano parks). In cases such as this, charging differential fees (or increasing a preexisting fee differential) can effectively "push" tourists from one park to another, which may be desirable as part of a park management strategy to solve overcrowding at one park or to encourage local economic development at another. Other parks with unique characteristics, however, may not have readily available substitutes. Thus, changing entrance fees at the volcano parks will evidently have little impact on visitation at the beach park, and vice versa.

These results further suggest that solving the problem of overcrowding at Manuel Antonio National Park cannot effectively be addressed through mandating fee changes at the volcano

parks, but must be addressed directly by increasing fees at Manuel Antonio or decreasing fees at alternative substitute attractions (perhaps other beach parks). The results also show that revenue-maximizing entrance fees may differ significantly from those actually charged. In only one of the three Costa Rican parks studied were actual fees close to estimated revenue-maximizing levels. In these and other ways, differential pricing, if used effectively, can be a promising tool for distributing tourism throughout a country in a more beneficial way, increasing park revenues while promoting both sustainable resource use and a higher quality tourism experience.

Related results reported elsewhere (Chase 1996) also suggest that current entrance fees are a factor biasing WTP for national park entrance fees. The entrance fee paid appears to act as a "reference point" or "anchor" from which judgements of WTP are based. Estimates show that a downward bias is created, so that observed WTP is lower than true WTP. This finding suggests that as fees are increased, reference points will shift and WTP will increase. If more countries follow Costa Rica's lead in increasing user fees, visitors to national parks may become accustomed to the idea of paying more substantial user fees, as they currently do to see movies or attend sporting events.

Although revenue generation from entrance fees can be substantial, the evidence on whether or not parks can fund themselves solely through the financial benefits accruing from tourism is mixed. Aylward *et al.* (1996) describe the fee structure at Monteverde, a private reserve in Costa Rica, as variable and dynamic; there, the dual goals of generating funds and maintaining the accessibility of the reserve are achieved. Although private donations and outside funding were instrumental in the establishment of the reserve and still contribute to its maintenance, entrance fees are currently capable of supporting the daily upkeep including administrative costs and

maintenance and protection activities. Other examples of protected areas that fund themselves exclusively through tourism revenues are discussed in Langholz (1996) and Lapage (1994). Whether justified from the standpoint of revenue generation or moving toward a higher true WTP, increasing ecotourism revenues has a further dimension in developing countries -- that of legitimizing ecotourism as an alternative form of land and resource use which may provide public benefits comparable to (or in excess of) the private benefits engendered from competing land uses such as timber and agriculture.

A Policy Footnote

In July, 1995, following the period in which the fieldwork for this study was conducted, the Costa Rican national parks entrance fee policy was revised yet again, partially in response to a preliminary report from this study. The new policy did in fact include differential pricing for national park fees, depending on the level of visitation. Tickets bought in advance for the most popular parks remained at $10; however, tickets bought in advance were $7 at less popular areas, and $5 at the least visited parks. This policy change -- a refinement of the overall increase in park entrance fees introduced in September, 1994 -- proved short-lived, however. Due to strong resistance from the tourism industry to the earlier policy of park fee increases, the government finally capitulated and, in April of 1996, cut park entrance fees from a high of $15 per day to an across-the-board $6 daily fee for foreign visitors at all parks. Notwithstanding its many benefits, the differentiated fee policy had been characterized by accounting and bureaucratic problems in part due to its complexity and difficulties of implementation, but it appears to have suffered equally from its association with the earlier highly controversial policy of overall fee increases. Perhaps the gradual implementation of a differentiated fee policy over time would have been politically more viable than a large one-time increase. Nonetheless, despite the return to lower

across-the-board fees in 1996, Costa Rica's Minister of the Environment, René Castro, concluded that, "In my opinion, price differentiation is the future." (*Tico Times*, March 22, 1996).

Table 1. Sample Chart from Survey Instrument.

Actual

	Price I Days	Price I Days	Price I Days	Price I Days
Volcán IRAZÚ	$10 I	$10 I	**$35** I	$10 I
Volcán POÁS	$10 I	**$35** I	$10 I	$10 I
M. ANTONIO	$10 I	$10 I	$10 I	**$35** I

Table 2. Comparison Between Parks.

	Volcán Irazú (n = 101)	Volcán Poás (n = 105)	Manuel Antonio (n = 105)
Actual fee paid	$12.28	$9.85	$9.56
Appropriate fee	$6.48	$6.77	$7.37
Willingness to pay	$21.75	$21.60	$24.90
Actual number of days in park	1.00	1.00	1.45
Number of days if no fee	1.02	1.12	2.61
Number of days if $35 fee	0.09	0.11	0.19

Table 3. Estimation Results of Random Effects Probit and Tobit Models.

Variable (units)	Volcán Irazú	Volcán Poás	Manuel Antonio
	Coefficient Estimate (s.d.)		
Intercept	4.867*** (1.779)	-3.228 (2.143)	1.543 (1.161)
Price - Irazú ($/day)	-0.346*** (0.037)	0.092*** (0.018)	-0.007 (0.009)
Price - Poás ($/day)	0.092*** (0.020)	-0.281*** (0.030)	0.001 (0.009)
Price - M.A. ($/day)	0.023 (0.016)	0.014 (0.020)	-0.082*** (0.012)
Income (1,000 $)	0.006*** (0.002)	0.001 (0.002)	0.004*** (0.002)
Age (years)	-0.014 (0.009)	0.039*** (0.013)	-0.019*** (0.008)
Education (years)	-0.145** (0.069)	-0.075 (0.085)	0.008 (0.052)
Nationality:			
North American	-0.709 (1.024)	4.843*** (1.411)	0.340 (0.616)
European & Australian (excluded category = Latin American)	0.366 (1.021)	4.612*** (1.379)	0.699 (0.633)
Touring (=1 if part of tour)	-0.445 (0.287)	0.893* (0.508)	-1.786*** (0.285)
N	1244	1244	311
Log likelihood	-389.30	-399.55	-329.95
Chi-square	587.17***	591.89***	118.32***

*** = significant at 1% level.
** = significant at 5% level.
* = significant at 10% level.

Table 4. Estimated Elasticities of Visitation Demand.

Variable	Volcán Irazú	Volcán Poás	Manuel Antonio
Price - Irazú	-1.049*** (0.404)	0.0938*** (0.143)	-0.076 (0.108)
Price - Poás	0.279*** (0.094)	-2.869*** (0.468)	0.009 (0.102)
Price - M.A.	0.070 (0.046)	0.142 (0.200)	-0.963*** (0.127)
Income	0.085** (0.040)	0.029 (0.095)	0.241*** (0.081)

*** = significant at 1% level.
** = significant at 5% level.
* = significant at 10% level.

Table 5. Park Revenues Under Alternative Fee Policies.

	Parks		
	Volcán Irazú	Volcán Poás	Manuel Antonio
1993[1]			
Entrance Fees	$1.25	$1.25	$1.25
Visitation	54,370	100,821	119,418
Park Revenues	$67,963	$126,026	$149,273
Total 3 parks: $ 343,262			
1994-95 Policy (Estimated)[2]			
Entrance Fees	$12.28	$9.85	$9.56
Visitation	34,797	68,014	45,123
Park Revenues (est.)	$427,307	$669,940	$431,371
Total 3 parks: $1,528,618			
Revenue-Maximizing Fee Policy[3]			
Entrance Fees	$8.85	$10.71	$13.51
Visitation	73,370	63,479	38,198
Park Revenues	$649,328	$679,868	$516,058
Total 3 parks: $1,845,254			

[1] Actual visitation numbers from Costa Rican National Parks Service. Revenues estimated based on across-the-board $1.25 daily fee.

[2] Visitation is estimated based on actual visitation from January-April 1995, annualized based on monthly visitation patterns from 1993. Entrance fees are actual average fees paid by survey respondents (Table 2).

[3] Revenue-maximizing fees based on demand elasticities estimated from actual and hypothetical survey data. Visitation and revenue estimates based on optimal fee levels.

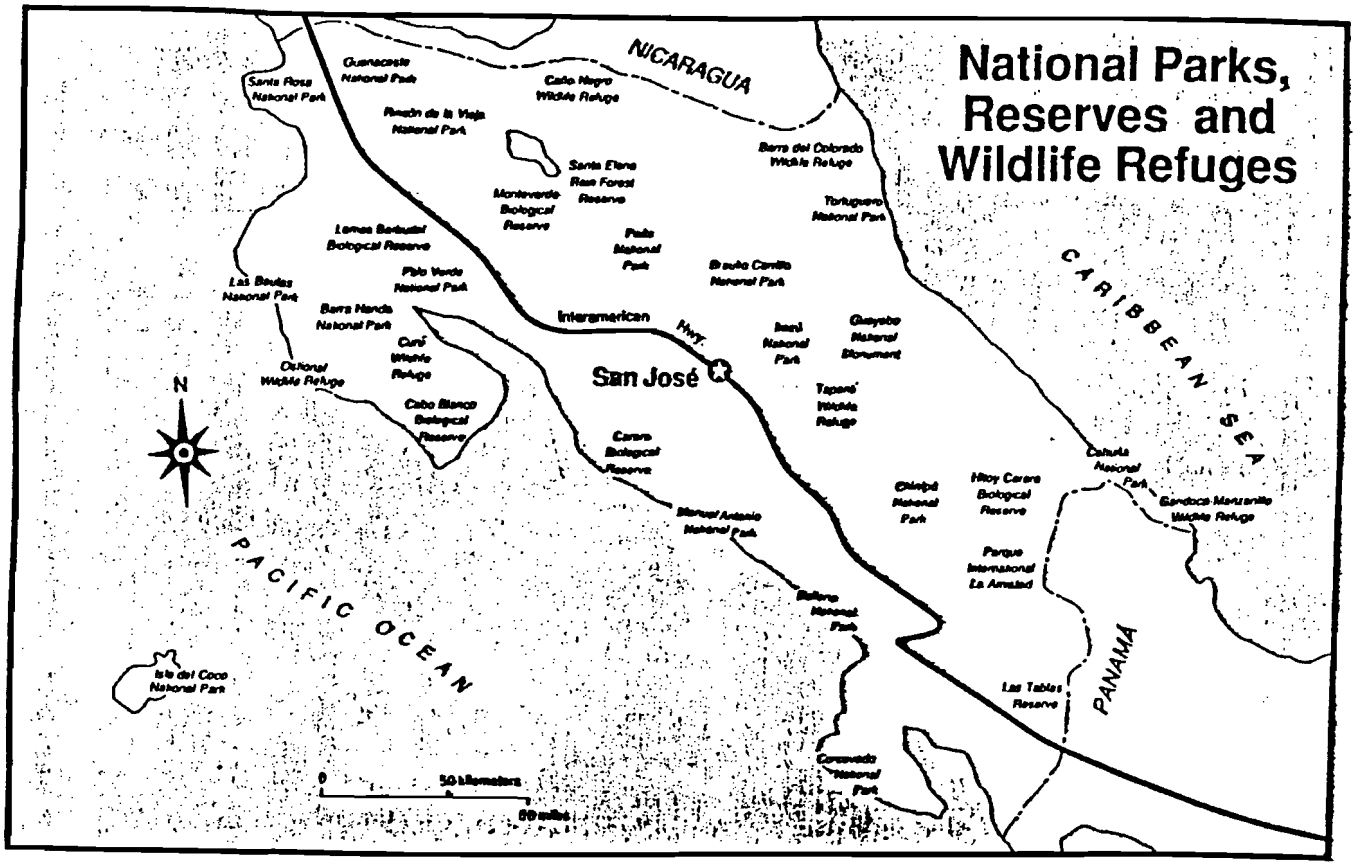

Figure 1 **National parks of Costa Rica**

Source: Blake B. and A. Becher (1993), *The New Key to Costa Rica*, California: Ulysses Press.

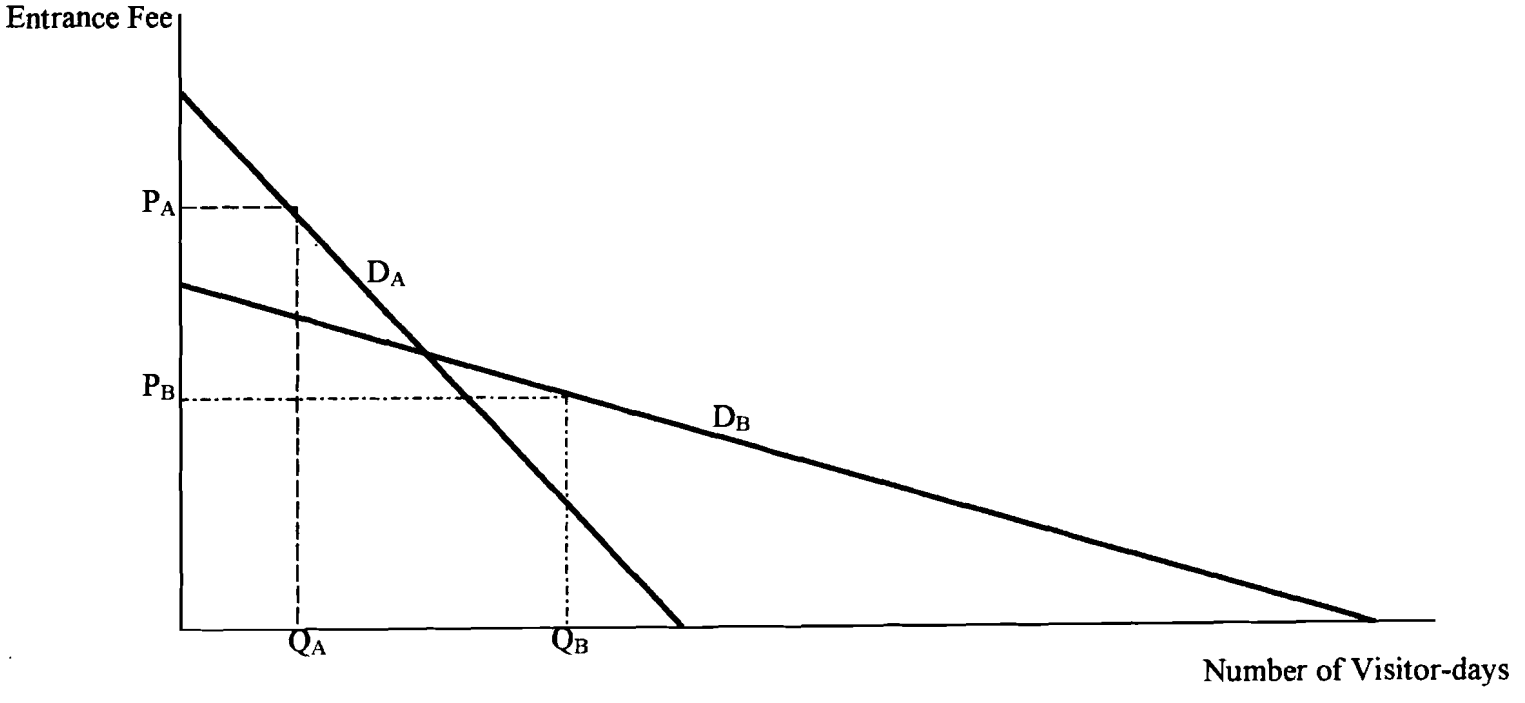

Figure 2 **Price differentiation in Parks A and B due to variations in elasticity of demand and desired levels of visitation and revenue generation**

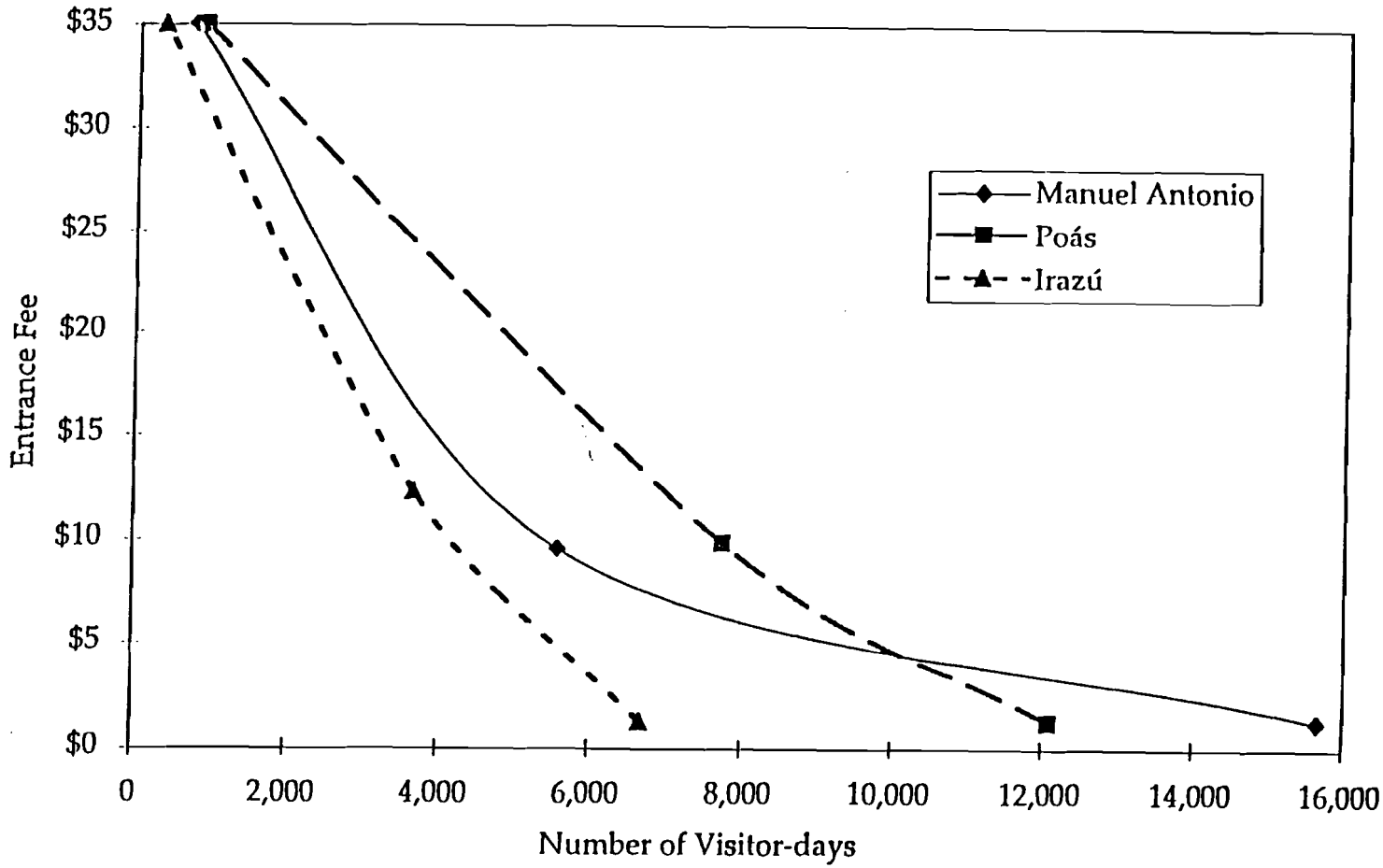

Figure 3 **Actual and hypothetical demand of foreign visitors at three Costa Rican national parks, January 1994-1995**

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ENDNOTES

[1] See, for example, Anas (1988), Leuschner *et al.* (1987), Lindberg and Huber (1993), and Rosenthal, Loomis and Peterson (1984).

[2]For a detailed discussion of ecotourism in Costa Rica, see Aylward *et al.* (1996).

[3] While data on total trip costs were collected in this study, data on travel costs to specific parks from nearby originating locations were not. For reasons outlined in the text, we do not believe this to be a significant omission.

[4] WTP estimates are discussed further elsewhere (Chase 1996); only summary results are reported here (Table 2).

[5] If, on the other hand, our sample was not randomly drawn or exhausted the population, it would be more appropriate to draw conclusions *conditional* upon our sample by estimating a fixed effects model (Hsiao 1986; Greene 1993). In the linear case, this is equivalent to including a dummy variable for each respondent while suppressing the overall intercept.

[6] The linear fixed effects model does not require that the unobserved person-specific effect be uncorrelated with the included explanatory variables. Unfortunately, there is no analogous fixed effects estimator for the probit and Tobit models (Hsiao 1986; Greene 1993), thus we are unable to test whether the random or fixed effects model better fits our data.

[7] Preliminary estimation of a random effects Tobit model (using LIMDEP version 7.0) on the full data set for Manuel Antonio yielded erratic results. Reasons for these results could include: violation of the orthogonality assumption; problems with LIMDEP's estimation procedure to evaluate the model's complex, highly nonlinear likelihood function (Greene, 1996); or the presence of non-well behaved data (although this seems unlikely given success with standard Tobit estimation). For these reasons, standard Tobit estimation was employed on a random subset of the data.

[8] As a practical matter, the "appropriateness" of national park entrance fees has proved to be an important economic and political issue in Costa Rica over the past three years.

[9]The question has been raised as to whether the existence of black markets for discounted tickets potentially biases the estimation results. This seems unlikely to be the case. While the existence of a black market does affect the *actual fee* paid (see mean values in Table 2), this influence is already incorporated in our analysis in the same way that other variations in the actual fee paid are accounted for. As long as there are not systematic measurement errors in the observed actual prices paid, our results are not biased. We have no reason to believe that respondents' stated prices paid were different from actual prices paid, or that their demand responses were otherwise biased. At an administrative or political level, however, a failure to recognize the difference between *announced* and *actual* entrance fees paid by park visitors may indeed lead to misguided park management decisions, including those regarding pricing policy.

[10]The park where the interview took place may potentially bias the respondent's stated willingness to visit that and other parks. For example, people may be less able to predict their demand under hypothetical scenarios for the alternative parks (which they may or may not have visited) than for the park at which they are interviewed. Unfortunately, to satisfactorily correct for such possible bias is beyond the scope of

this study. First, we do not have detailed information on which parks the respondents visited prior to their interview. More importantly, the heteroscedasticity corrections in random effects probit and Tobit models necessary to address this potential bias are prohibitively difficult to implement. Future research should explore this issue in greater detail.

[11] Revenue-maximizing fees are estimated based on demand elasticities derived from the actual *and* hypothetical data used in the preceding analysis, not simply from the reduced data set comprising actual fees (summarized in Table 2).

[12] Recall that average entrance fees in early 1995 represented a combination of the full $15 daily charge for fees paid at park entrances and much lower fees if purchased as part of a tour or in the black market. Resulting average estimated fee levels are thus unique to each park and are considerably lower than those derived from the set of actual and hypothetical data, for which the mean fee across all three parks was $16.86.

[13] The policy existing at the time of the study period (early 1995) was in existence for less than a year, thus "annualized" visitation levels are calculated by extrapolating actual visitation from January to April 1995, to an annual basis using monthly visitation weights from 1993, the last full year prior to the introduction of policy changes in fee structures. Revenue estimates are calculated as the product of estimated fees and estimated visitation levels.

[14] Actual visitation (and revenues) under a revenue-maximizing fee policy which results in the lowering of entrance fees in one or more parks can be expected to be higher than the levels estimated here. This is due to the fact that lower park fees will induce additional visitation demand from visitors who chose not to visit during a period of higher park fees and were not included in this study.

[15] In a complete system of tourist demand relationships, incorporation of other beach parks and non-park substitutes for beach-type tourist amenities found at Manuel Antonio Park could well result in lower revenue-maximizing fees; thus, the conclusions here are illustrative only and strictly apply only to the sample at hand.

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