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Tropical Tourism as Economic Activity: OTS in Costa Rica

By

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TROPICAL SCIENCE AS ECONOMIC ACTIVITY:

OTS IN COSTA RICA

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ABSTRACT

Expenditures in support of tropical science may have measurable impacts on certain small economies. The study tests this hypothesis through estimation of spending attributable to the Organization for Tropical Studies, Inc. (OTS), with field stations in Costa Rica. The expenditures model contains the following components: the OTS budget, personal spending by OTS participants, expenditures by former participants making return visits, expenditures by other persons induced to visit Costa Rica through OTS contacts, and international airfares with the Costa Rican national airlines.

Although simplified and containing wide margins of uncertainty, the model suggests that annual transactions in Costa Rica attributable to OTS are between US$2.9 to $10.2 million. A maximum of $3.4 million is direct injection, and the remainder is secondary spending through an economic multiplier. OTS accounts for perhaps two to three percent of Costa Rica's national tourist receipts.

Spending by students and junior scientists apparently exceeds that of senior scientists and other categories of OTS visitors and users. Low daily spending is more than outweighed by long stays. However, the socioeconomic determinants of spending, return visitation, and induced travel require additional study.

The economic contribution of OTS is perhaps greatest in its qualitative dimensions. Favorable attributes include rapid growth, sustainable activity, and the likelihood of relatively small economic leakages. OTS plays a major catalytic role in environmental education and in laying a base for management and visitation of Costa Rica's wildlands. Hence the direct economic contribution may be less than the indirect.

INTRODUCTION

The social contribution of science and scientists is inherently difficult to describe and evaluate. Perversely for scientists, some political authorities judge them less by the number and quality of scholarly papers they produce than by the quantities of goods and services they buy. Nowhere is this more evident than in the tropics, where material living standards continue to be depressed over widespread segments of the human population. Visiting biologists are free to pursue unusual beetles and butterflies, but how many dollars will they spend? From the perspective of local governments, this question is legitimate and central.

By almost any yardstick, tropical biology is a very small economic sector in which there is considerable underinvestment (Lewin 1986). Yet spending in support of tropical biology may have measurable impacts on certain small economies. A case to be examined is the Organization for Tropical Studies, Inc. (OTS), with field stations in Costa Rica.

The OTS, along with the Smithsonian's Tropical Research Institute in Panama, is among the most important institutions for biological research in the neotropics. Starting with seven universities, the OTS consortium now comprises 44 members (Table 1). Since the founding of OTS in 1963, some 1,600 university graduate students and hundreds of faculty have traveled from the U.S.A. to Costa Rica under OTS auspices (Stone 1987, p. 37). Hence it is no coincidence that Costa Rica provides the field

TABLE 1. OTS Member Institutions, 1987-1988

U.S.A. and Puerto Rico	
Univ. Arizona	Univ. Michigan
Auburn Univ.	Michigan State Univ.
Univ. California (Berkeley)	Univ. Minnesota
Univ. California (Davis)	Univ. Missouri (Columbia)
Univ. California (Irvine)	North Carolina State Univ.
Univ. California (Los Angeles)	Univ. North Carolina (Chapel Hill)
Univ. Chicago	Pennsylvania State Univ.
City Univ. New York	Univ. Puerto Rico
Univ. Connecticut	Rutgers Univ.
Cornell Univ.	Smithsonian Institution
Duke Univ.	Stanford Univ.
Univ. Florida	State Univ. New York (Stony Brook)
Univ. Georgia	Texas A&M Univ.
Harvard Univ.	Tulane Univ.
Univ. Hawaii	Univ. Utah
Indiana Univ.	Univ. Washington
Univ. Iowa	Washington Univ.
Univ. Kansas	Univ. Wisconsin (Madison)
Louisiana State Univ.	Yale Univ.
Univ. Maryland	
Univ. Miami	
Costa Rica	
Univ. Costa Rica	National Autonomous Univ.
National Museum Costa Rica	Technological Inst. Costa Rica

Source: Stone 1987.

sites for almost 40 percent of all research in terrestrial tropical ecology (Clark 1985). Examined here through two surveys and auxiliary data are the economic impacts of OTS in the Costa Rican context.

ANALYTICAL FRAMEWORK AND METHODS

The OTS provides flows of foreign exchange (U.S. dollars) to Costa Rica through multiple channels. A first channel is the OTS budget for ongoing operations and capital improvements. A second is personal spending by individual students, researchers, instructors, etc., while in Costa Rica. A third is spending by former OTS participants making return visits to Costa Rica. A fourth is spending by additional persons visiting Costa Rica because of the personal or professional influence of someone in OTS. A fifth is spending for international airfares by the persons in these various categories. Still other spending links can be conceptualized, but only these five are considered in the present framework.

The five components together comprise primary (i.e., basic) spending. In Costa Rican national accounts, the spending by OTS is for "invisible exports." Primary expenditures by OTS lead to subsequent rounds of economic activity in Costa Rica through a sectoral multiplier. Although OTS administrators and participants may not ordinarily regard themselves as tourists, the transactions multiplier for tourism is conceptually the most relevant among alternative choices for the sectoral multiplier.

The expenditures model can be summarized as follows:

$$TEX = (BUD + PER + RET + OTH + LAC) \times MUL, \text{ where}$$

TEX = total expenditures in Costa Rica attributable to the OTS presence;

BUD = OTS budget for purchases of goods and services in Costa Rica;

PER = personal expenditures by the OTS population while in Costa Rica;

RET = expenditures by former OTS participants making return visits to Costa Rica;

OTH = expenditures by other persons induced to visit Costa Rica through contacts with individuals in OTS;

LAC = expenditures with LACSA airlines for travel by OTS participants, returnees, and induced travelers; and

MUL = transactions multiplier for tourism in Costa Rica.

To estimate total expenditures (TEX), this study combines OTS budget figures (BUD) with data from two surveys. The first survey (SURVEY I) quantifies personal spending (PER) for OTS students, researchers, instructors, and other OTS participants. The second survey (SURVEY II) examines expenditures accruing through return visits (RET) and by other persons (OTH) visiting Costa Rica because of OTS influence. Both surveys consider the frequency with which OTS travelers use LACSA, the Costa Rican airlines (LAC).

SURVEY I was conducted in Costa Rica during February-August, 1987. The OTS population was divided into two broad strata, viz., students and researchers vs. all other users and visitors. Each stratum was sampled in proportion to its size. Questionnaires were administered directly, as well as through OTS field administrators serving as intermediaries. The sample

accounted for approximately one-fourth of all person-days at OTS facilities.

SURVEY II was mailed to a simple random sample of approximately 10 percent of the OTS mailing list during January-June, 1987. This list contains the names of approximately 95 percent of all students, researchers, instructors, and administrative board members who have ever participated in OTS programs. It also contains the names of financial contributors, individuals on natural history tours who have stayed at OTS facilities, and a miscellany of other friends of the organization. Of the 312 individuals randomly selected for the survey, usable responses were received from 269. Adjusting for ineligible and non-reachable individuals, the effective response rate was 93 percent. This is high, even for a specialized population (Dillman 1978, pp. 21-27).

EMPIRICAL RESULTS

Table 2 provides empirical estimates for the expenditures model described in the previous section. High and low estimates are given because some components contain considerable margins of uncertainty. Key details are briefly discussed below.

OTS Budget

Since 1980 the OTS budget has almost quadrupled. The current budget is $2.2 million, of which $1.2 million is directed through the Costa Rican Office (Table 3). For years 1982-87, the share of funds transferred from North America to Costa Rica has been 52 percent. Of the remaining 48 percent, OTS informally

TABLE 2. Estimates for Expenditures Model, OTS in Costa Rica (1986-87).

Component [1]	Thousand US$ per Year	
	Low	High
BUD	1,200	1,375
PER	111	111
RET	210	261
OTH	120	951
LAC	268	688
MUL (dimensionless)	1.5	3.0
TEX	2,900	10,200

[1] Cf. text for definitions and relationships.

TABLE 3. Budget Totals for All OTS and for Amounts Disbursed through Costa Rica.

Fiscal Years	Activity Levels [1]	Budgets		
		Total OTS Expenses	Transferred to Costa Rica	Proportion Transferred
	person-days	US$ thous.	US$ thous.	%
1980	NA	579	NA	NA
1981	NA	643	NA	NA
1982	11,700	1,044	398	38
1983	12,700	944	535	57
1984	14,300	995	513	52
1985	13,800	1,394	701	50
1986	17,900	1,787	1,044	58
1987	18,800	2,200	1,200	55

[1] At OTS field stations and other sites in Costa Rica.

estimates that one-third finds its way to Costa Rica in the form of airline tickets, travel expenses, and expenditures under contracts and subcontracts. The model partially accounts for these expenditures in other ways, e.g., through RET and LAC. However, the high estimate of BUD assumes an additional net outflow from the North American Office.

In descending order, the principal functional elements in the OTS budget are salaries and fringe benefits; supplies, food, and lodging; travel and meetings; and maintenance and repairs. In 1987 OTS supported 61 full-time equivalent employees in Costa Rica, tripling the number from seven years earlier. At La Selva, the largest of the OTS biological stations, OTS has gradually shifted increasing amounts of purchasing to local agents in Sarapiqui, especially for food. Reasons given include cost savings, less administration, and good public relations.

Personal Spending

Students, researchers, and others on OTS-related assignments in Costa Rica incur personal expenses not reimbursed through the organization. Personal items include lodging (e.g., before and after official OTS activities); food and beverages; gifts, souvenirs, books, and stationery; camera film and development; clothing and related articles; sports and research equipment; transportation; entertainment; and medical expenses.

As shown in Table 4, these personal expenses were $5.81 per person-day for a weighted sample of more than 5,000 person-days. As might be anticipated, students and researchers spend

TABLE 4. Personal Spending in Costa Rica by OTS Participants and Visitors, 1987.

Category	Activity Level	Expenditures Survey: Sample Size	Person-Days	Expenditures, US$: Per Person	Per Person-Day
Students and Researchers	16,400	65	4,566	377	5.37
All Other [1/]	2,400	31	531	165	9.63
Total	18,800	96	5,097	309	5.81

[1/] Natural history visitors, special events and expeditions, etc.

considerably less per person-day than other categories of visitors and users. Yet students and researchers average 70 days in Costa Rica, compared with 17 days for the aggregate of other categories. This has the interesting consequence that, per person, students and researchers incur personal expenditures of almost $400 each.

Return Visits

No fewer than 61 percent of individuals who have been to Costa Rica with OTS have returned at least once. This refers to a random sample whose first experiences in Costa Rica with OTS vary from as early as 1963 to as recently as 1986. As the OTS population base has grown, the number of return visits has increased correspondingly (Figure 1).

Selected characteristics of these return visits are presented in Table 5. Return visits are motivated primarily by professional assignments. Many return visits are lengthy, with 28% lasting for one month or more.

Mean trip expenditure in Costa Rica is $760, not including airfare. To avoid double counting with BUD, these in-country expenditures are adjusted downward by the proportion of person-nights spent at OTS facilities (34 percent of all person-nights).

Tables 6 and 7 examine the variables associated with mean daily spending and total trip expenditures, respectively. Survey respondents were asked to estimate average daily spending according to six expenditures classes. Table 6 indicates that

FIGURE 1. Time Profile of Return Travel to Costa Rica by Former OTS Participants.

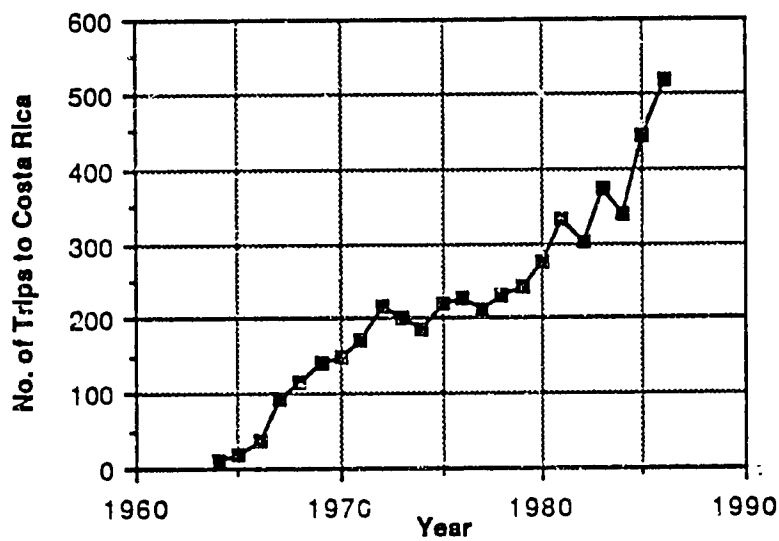

TABLE 5. Selected Characteristics of Most Recent Visits to Costa Rica by OTS Returnees.

Characteristic	All Returnees (n=98)
Primary motivation for return travel to Costa Rica:	
Professional assignment	90%
Vacation, recreation	5%
Visit friends, family	2%
Other	3%
No. nights in Costa Rica:	
1-7	34%
8-14	20%
15-21	16%
22-29	2%
30+	28%
Average daily expenditures in Costa Rica:	
< $11	14%
$11-$25	26%
$26-$50	28%
$51-$75	15%
$76-$100	11%
> $100	6%
Total expenditures in Costa Rica:	
< $500	43%
$501-$1000	32%
$1001-$1500	12%
$1501-$2000	4%
> $2000	9%
Proportion of travel expenses reimbursed:	
All or nearly all	48%
Most	26%
Some	9%
None or very few	17%

daily spending is higher for the minority of return visits not motivated by professional assignments. That is, daily spending is higher for visits considered vacations, visits to friends and family, and visits made for other reasons. This might also explain the positive association between higher spending and non-reimbursement of expenses.

In Table 6 the roles of age, income, and length of visit are the inverse of their roles in Table 7. Positive correlations in Table 6 are negative correlations in Table 7. Although daily spending is higher among the more senior returnees (as defined by age and income), the relatively more junior returnees incur greater expenditures as the result of their longer stays. Largely consistent with this observation is that individuals who are married and who have full-time employment show lower total expenditures than all others (Table 7).

Travel by Others

Costa Rica captures spending by travelers induced to visit that country through the word-of-mouth influence of the OTS population. Presumably this influence is large, given that 70 percent of the OTS population hold Ph.D.s; 48 percent are university professors. Professors and other Ph.D.s may be regarded as opinion leaders by graduate students and selected other segments in the broader population (Mill and Morrison 1985, pp. 20-21).

Among individuals having gone to Costa Rica with OTS, 69% claim to have definitely influenced other persons to travel

TABLE 6. Variables Associated with Daily Spending on Return Visits to Costa Rica.

Variable	Spending Level	Statistical Test
Trip motive:		
Professional (n=80)	Class mean = 2.82	F = 3.57
Other (n=9)	Class mean = 3.67	p < .10
Expenses reimbursed:		
All or most (n=66)	Class mean = 2.79	F = 3.16
Some or few (n=25)	Class mean = 3.32	p < .10
Age:		Pearson r = .35
(21-77)		n = 90
		p < .001
Income:		Pearson r = .36
(11 classes)		n = 91
		p < .001
Nights in Costa Rica:		Pearson r = -.41
(2-200)		n = 89
		p < .001

TABLE 7. Variables Associated with Total Expenditures on Return Visits to Costa Rica.

Variable	Mean Expenditures [1]		Statistical Test
Marital status:			
Married (n=54)	$ 514	A	F = 4.76
Never married (n=18)	$ 747	A B	p < .05
Divorced (n=15)	$ 1,216	B	
Employment:			
Full-time (n=72)	$ 567	A	F = 6.18
Other (n=17)	$ 1,099	B	p < .05
Age: (21-77)			Pearson r = -.27, n = 89, p < .05
Income: (11 classes)			Pearson r = -.29, n = 89, p < .01
Nights in Costa Rica: (2-200)			Pearson r = .46, n = 89, p < .001

[1] Means with the same letter are not statistically different.

there. These other persons are mainly professional colleagues, students, and friends. Survey II suggests that each OTS experience in Costa Rica leads to visits there by 3.9 other persons.

Three problems are presented for the estimate of OTH in the expenditures model. The respondents were asked for their perceptions of influence, a very subjective and difficult assessment. Secondly, some individuals would have gone to Costa Rica even without the OTS contacts. Here it is important to distinguish between OTS contacts as passive sources of information vs. OTS contacts as active persuaders in the travel decision. Thirdly, the number of trips per person influenced, and the time distribution and expenditure per trip, are not a part of the survey data.

The low estimate of OTH assumes that half of the reported number of other travelers induced to visit Costa Rica would have gone even without the OTS contacts. Also conservative is the assumption of one trip per traveler. The high estimate assumes that none of OTH would have occurred without the OTS contacts, and that OTH is similar to RET in terms of number of trips, expenditure per trip, and time distribution of trips.

Use of LACSA Airlines

Airfare is a large component of an individual's travel expenses for educational and scientific study (Wood 1984). The frequency of using the Costa Rican national airlines (either one-way or round trip) was 38 percent in SURVEY I and 55 percent in

SURVEY II. The selection of airlines is sometimes restricted, since various contracts and grants funded by the U.S. government specify that the recipient must travel by U.S. carrier.

A U.S. airline generates a demand for ground services in Costa Rica, just as LACSA generates a demand for ground services in the U.S. Hence the division of expenditures between Costa Rica and the U.S. is a complex exercise, with large leakages occurring in both directions.

This analysis simplifies and assumes that all airfares with LACSA, and no airfares with other carriers, accrue to Costa Rica. In 1987 the number of international airfares not paid under BUD was 1,600 to 3,700. The spread in estimates is explained by varying assumptions about OTH, and by alternative definitions of the OTS population. Adjusted for frequency of use, and applying coach-class fares from Miami, the estimates of LAC are as given in Table 2. Some travelers undoubtedly obtained airfares at discount prices, but discounts are offset by the conservative assumption that all airfares are priced from Miami. About 20 percent of flights originate from other cities, all but one of which has higher airfares to Costa Rica.

Tourism Multiplier

Much confusion surrounds the definition and estimation of economic multipliers; multipliers for the tourism sector are no exception (Archer 1976). The appropriate concept in the present context is the sales or transactions multiplier, measuring the increase in Costa Rican business turnover for each dollar OTS

injects into the national economy. This is contrasted with income multipliers, which are defined for value-added after production costs are subtracted.

The Costa Rican tourist authorities (ICT) presently assume a multiplier of 3.0, adopted from a study for Colombia. This appears unusually high in light of documented multipliers below 2.0 for economically more advanced countries like Ireland and the United Kingdom (Mathieson and Wall 1982, p. 68). Multipliers for small and import-dependent Caribbean economies are even lower (McElroy and Tinsley 1982).

It seems reasonable to infer that the multiplier for Costa Rica is above most multipliers for tourism in the Caribbean islands, but considerably below the 3.0 applied by ICT. Here ICT's estimate of 3.0 is made an upper bounds on MUL, with 1.5 selected as a reasonable lower bounds. Leakages outside of the Costa Rican economy probably are not substantial, given that most budget items are for local salaries, local food and supplies, local transportation services, and local repair and maintenance services.

CONCLUSIONS AND DISCUSSION

Empirical Issues

As an early venture into the economics of tropical science, the expenditures model formulated here is necessarily simplified. Yet the framework is sufficient to establish an order of magnitude. The framework suggests that current annual transactions in Costa Rica attributable to OTS are about $2.9 to

$10.2 million, of which $1.9 to $3.4 million is direct injection and the remainder is secondary spending through the multiplier. Net income, or formation of gross domestic product (GDP), is by accounting definition a lesser amount, perhaps on the order of 50 to 60 percent of gross expenditures. Thus OTS presently contributes about two to three percent of Costa Rica's total tourist receipts (currently about $130 million), and only a fraction (less than 0.3 percent) of the country's GDP.

Many in the scientific and environmental communities will find these proportions disappointingly small. Although Costa Rica is not considered a large producer and exporter of timber products, Costa Rica's wood exports average $20-25 million annually (FAO 1987). This greatly overshadows the magnitude estimated here for OTS as one of the two largest tropical science programs in the neotropics. However, the comparison is highly misleading because an enterprise is being scaled against an industry. The economic flows from Costa Rica's other natural science enterprises (e.g., its national parks, biological reserves, privately-owned field sites, etc.) have to be incorporated in the loose definition of a wildlands industry before the scaling is appropriate.

The economic impact of OTS is perhaps greatest in its qualitative dimensions. The previous comparison with timber exports ignores issues such as environmental consequences and long-term sustainability. Unlike earnings from alternative forms of tourism and commodity exports, Costa Rica's earnings from OTS are not particularly sensitive to price shifts and competing

destinations. Stability is complemented by rapid growth, evidenced by the expanding OTS budget and the upward-sloping timepath of return visits. Moreover, a considerable proportion of OTS expenditures are realized outside of San Jose, a circumstance fostered through deliberate OTS purchasing procedures.

Moreover, it can be argued that even the model's high estimate is too conservative. The word-of-mouth effect, a phenomenon exceptionally difficult to define and quantify, is vulnerable to understatement in a static framework of the kind presented here. Another aspect is that many persons first introduced to Costa Rica through OTS now reside in that country permanently. The structure of the surveys omitted those residents, even though they should be credited with an influx of additional expenditures. One individual, for example, owns and manages a private nature reserve, attracting a clientele primarily from outside of Costa Rica. Others are salaried or are in alternative ways adding to the country's national output.

Additionally, OTS has served as operational nerve center and active partner in environmental education and in multi-million dollar projects to incorporate more wildlands into the Costa Rican national parks system (Stone 1987, pp. 36-37). The parks, in turn, will become a base for increased non-commodity income, especially since Costa Rica appears to have some measure of international comparative advantage for nature-based tourism (Mendoza 1986). Whether efforts for park expansion would have

gone forward with as much success without OTS cannot be answered. Yet the philosophical viewpoint that OTS should be regarded primarily as catalytic agent, and only secondarily as an enterprise in its own right, has considerable merit.

Analytical Issues

This study of the OTS case raises a number of questions for future research. It suggests that personal expenditures are not a large component of economic activity, and therefore that improved estimates will have only minor consequences for total expenditures. The opposite applies for international airfares and for travel by persons influenced through OTS contacts. A wide margin of uncertainty characterizes both of these latter components, and they carry relatively heavy empirical weights.

The question of airfares is primarily one of careful accounting and detailed investigation of money flows. Induced travel is more complex because it adds problems of conceptualization to those of estimation. Finally, the transactions multiplier, not yet estimated in Costa Rica, warrants major research attention.

The present study suggests that the economic contribution of students and junior scientists may exceed that of senior scientists and other categories of visitors and users, person for person. Low daily spending is more than outweighed by long stays. This finding, if it withstands further testing, has important implications for tourism policy in Costa Rica and other

countries of importance for tropical science. Hence the issue deserves rigorous analytical treatment in future investigations.

A remaining set of issues concerns socioeconomic determinants of return visitation and induced travel. The statistical tests presented here examined one variable at a time, even though many variables are known to be correlated. Ideally, a multivariate analytical treatment would help separate and more accurately identify the respective roles of different explanatory factors.

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