Tourism-Generated Earnings in the Coastal Zone: A Regional Analysis

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ABSTRACT

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Over the past thirty years, the coastal counties have shifted from traditional maritime activities such as fishing and boating, to a more service-oriented, and tourism-dependent economy. The key to economic growth in the coastal states has been the strength of the travel and tourist industry. This study links a regional model of tourism-generated earnings to a GIS model to quantify the relationship between the relative size of the travel and tourism sector in each county and the county's proximity to the coast. We find that tourism-related earnings, as a percent of total earnings, are concentrated in counties that lie within forty km (25 miles) of the Atlantic, Gulf and Pacific coasts of the United States. In contrast, the share of earnings attributable to tourism is not sensitive to distance from the coast for counties that are further than forty km (25 miles) inland. The literature on beach quality suggests that coastal tourism is dependent on clean, broad and sandy beaches. Key unanswered questions are: 1, the importance of beach quality to the tourism industry, relative to other amenities such as weather and the presence of cultural attractions; and 2, the degree to which a common set of causes explains migration patterns, tourism, and economic development in the coastal zone.

ADDITIONAL INDEX WORDS: *Location quotient, GIS, regional economics, economic geography, beach quality.*

INTRODUCTION

The economies of coastal counties have become highly dependent on revenues generated from coastal tourism and recreation activities, and by extension on the quality of their beaches. Over the past thirty years, the coastal counties have shifted from traditional maritime activities such as fishing and boating, to a more service-oriented, and tourism-dependent economy (JONES and MANGUN, 2001). The objective of this paper is to show that proximity to the coast plays a major role in promoting tourism, which in turn, promotes higher employment in counties within the coastal zone. Because tourism is closely tied to the quality of beaches, it follows that beach quality is important to a local tourist economy. Therefore, the expense of maintaining the quality of the beach must ultimately be considered to be an investment in the tourism economy.[1]

The term "coastal tourism and recreation" encompasses leisure and recreational activities such as swimming, recreational fishing, snorkeling and diving, recreational boating

and cruises that occur in the coastal zone and in offshore coastal waters. Also included are establishments such as hotels, resorts and restaurants, and the sectors that support coastal development such as retail businesses, marinas, fishing tackle stores, dive shops, fishing piers, recreational boating harbors, beaches and recreational fishing facilities (U.S. DEPARTMENT OF COMMERCE, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, 1998).

Estimates based on data on foreign tourism for such states as Florida and California suggest that as many as one-half of all foreign tourists are drawn to the U.S. because of its attractive coastal shorelines.[2] Foreign tourism contributes to the U.S. balance of payments. The travel and tourism industry[3] is the nation's largest employer and second-largest con-

[1] The primary economic justification for U.S. Army Corps of Engineers beach nourishment projects is hurricane and storm damage protection. The contribution of beach quality to the tourism economy should be viewed as an additional benefit.

[2] In spite of the attractiveness of inland national parks as Yellowstone and Grand Canyon, 85 percent of all U.S. tourist revenues are earned by coastal states and 90 percent of all tourist spending occurs in these states (HOUSTON, 1996 and U.S. DEPARTMENT OF COMMERCE, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, 1998).

[3] KASS and OKUBO (2000) identify the economic industries that contribute to travel and tourism. These include hotels and lodging places, eating and drinking places, transportation sectors, amusement and recreation services, and retail trade. These industries contribute to business tourism demand, non-business tourism demand, and non-tourism demand. Both non-business and business travel to

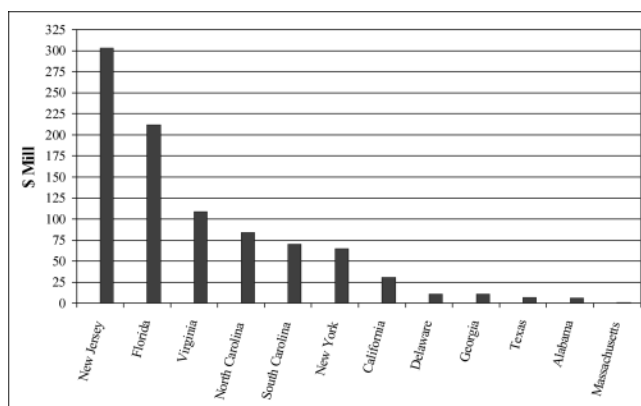Tourism-Generated Earnings in the Coastal Zone

Figure 1.   Beach Nourishment Appropriations: 1995–2001. *Note:* Appropriations are in February 2002 dollars (except for Delaware and California in constant dollars); beach appropriations are at the federal, state, local and private levels (except Delaware and California—federal appropriations only); data for Hawaii was not available. Sources: COBURN (2003) and AMERICAN COASTAL COALITION, undated.

Figure 2.   Annual Value of Coastal Tourism. Note: Data for New York and North Carolina were not available. Source: THE 2001 TRAVEL AND TOURISM MARKET RESEARCH HANDBOOK, 2001; SURFRIDER FOUNDATION, 2002; and MASSACHUSETTS OFFICE OF TRAVEL AND TOURISM, 2002.

tributor to the U.S. gross domestic product, generating over $700 billion annually (KASS and OKUBO, 2000). Coastal tourism and recreation comprise the largest and fastest-growing sector of the U.S. service industry, accounting for 85% of all tourism-related revenues (U.S. DEPARTMENT OF COMMERCE, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, 1999).

Beaches are unstable landforms. Ocean waves and winds constantly alter the shoreline by redistributing beach sand. Given the importance of tourism to the economic well being of many coastal communities, preserving the quality of beaches for recreational purposes has become a primary consideration. Beach nourishment, which entails the placing of sand on an eroding or limited-width beach for the purpose of extending the beach seaward, is the only engineered shore protection system that directly addresses the problem of sand deficit caused by erosion.[4] The addition of sand on the beach enhances the recreational and aesthetic quality of the beach, strengthening its economic value as well as providing storm protection (DOUGLASS, 2002). As a secondary benefit, a wider beach is more attractive and accommodates more beachgoers, thus generating more business for tourism-dependent communities (JONES and MANGUN, 2001).

Figure 1 shows the total (federal, state, local and private) expenditures for beach nourishment projects in selected coastal states from 1995 to 2001. New Jersey beach nourishment projects totaled $303 million, followed by Florida ($212 million) and Virginia ($109 million). California received ap-

proximately $31 million in federal appropriations. In contrast, Figure 2 shows California generating about $38 billion of revenues annually from coastal tourism—a ratio of 1,226:1. By contrast, Florida has a ratio of about 102 to 1, New Jersey has a ratio of 40 to 1, and Virginia about 6 to 1.[5]

The majority of larger beach nourishment projects in the United States are carried out by the U.S. Army Corps of Engineers (USACE), in response to direct congressional mandate. Current policy requires that beach nourishment projects satisfy a cost-benefit test, giving greatest weight to the protection of coastal property from damage caused by storms and hurricanes. "Any increase or enhancement of recreational opportunities is considered incidental" (ROBINSON, ZEPP, and SHOUDY, 2001). The Office of Management and Budget (OMB) acknowledges the importance of tourism to local economies, but argues, in response, that the benefits of increased tourism are essentially local rather than national in scope, and should thus be locally financed. OMB emphasizes the impact of beach renourishment on property values and the local tax base, as well as on the ability of increased tourism to generate additional user fees and sales tax revenues (OFFICE OF MANAGEMENT AND BUDGET, 2002).

This paper is motivated by the fundamental differences in approach and points of contention between the USACE and OMB. Although both USACE and OMB acknowledge the economic importance of beaches in promoting tourism and tourism-related employment, they have a fundamental disagreement on the nature and scope of the federal role in financing beach restoration and regional sediment management pro-

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coastal commercial centers are influenced by presence of economic as well as cultural and other recreational activities.

[4] In contrast, engineering techniques such as the construction of seawalls, groins, jetties and other hardened structures are designed to protect structures from hurricane and storm damage. They do not protect the beach itself. Beach nourishment, by adding sand to the beach and widening it seaward, also creates a larger barrier to storm surge and wave action.
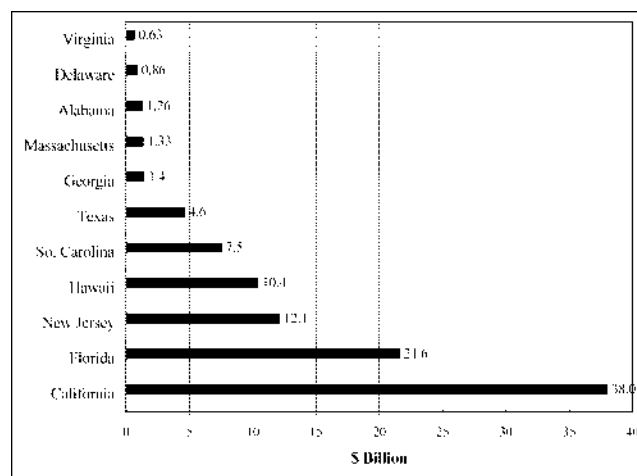
[5] This ratio is broadly indicative of the positive impact of beach nourishment projects on the tourism sector. Beach nourishment expenditures are driven by such factors as erosion rates, and travel and tourism expenditures are attracted to the coastal zone by a wide range of natural and cultural amenities.

jects. The position of the USACE, as well as interest groups such as the Coastal Coalition, is that, in evaluating the merits of federal funding of beach nourishment projects, recreational benefits, as well storm and hurricane protection, should be taken into account. In contrast, OMB holds that economic benefits from beach nourishment projects should be able to generate the tax revenues necessary to fund all, or at least a larger share, of project costs.[6] In the remainder of this paper, we address the economic value of tourism and the importance of tourism to the coastal economy. We present a statistical analysis of the relationship between tourism and proximity to the coast.

LITERATURE REVIEW

Beach quality has a major impact on the value of the coastal zone to both residents and visitors. This can be seen in high property values, commercial and residential development, tourism, employment and tax revenues. A number of case studies have established a relationship between beach quality and one or more measures of the demography or economy of the coastal zone. FINKL (1996) examines the economic effect of abandoning shore preservation. He concludes that "[a] federal management policy of "no new beach replenishment" will in the first decade: 1, cause accelerated loss of beaches; 2, place a larger proportion of the coastal population at risk from flooding; 3, increase vulnerability of coastal infrastructure to floods and inundation; 4, decrease revenue from tourism; and 5, result in higher costs for future shore protection.

HOUSTON (1996) establishes the importance of shoreline preservation to the U.S. economy. He traces the linkages from beach preservation to beach quality and from the quality of beaches to their attractiveness as tourist destinations. Houston then documents the importance of tourism, and particularly visits from abroad, to the economies of coastal states and to the nation as a whole. STRONGE (2001) takes the approach of HOUSTON (1996) one step further, by establishing in detail the economic benefits that accrue from shoreline preservation. The author has developed a broad methodology to estimate the impacts of beach quality on property values, revenues to the tourism industry, employment and tax revenues. Extrapolating from a detailed study of several coastal communities, Stronge estimates that "[t]he beaches contribute to the Florida economy through their impact on property values as follows: $8.1 billion in direct spending, $15.4 billion in total spending (including "ripple effects"), 389,717 in full-time equivalent jobs created and $8.1 billion in payrolls." This suggests that, in the aggregate even if not in every instance, shoreline preservation has a strongly positive impact on the Florida economy.

KING (2002) documents the benefits of beaches and beach nourishment to the State of California. Based on surveys of visitors to California beaches, the author estimates that in 2001, California beaches were responsible for $61 billion in

spending and $15 billion in total tax receipts. In a case study of north San Diego County, King estimates the sensitivity of beach tourism to beach crowding and coastal erosion. He concludes, "the loss of tax revenue from diminished tourism substantially exceeds the cost of maintaining these beaches." POMPE and RINEHART (1995) using a hedonic pricing model, estimate the effect of beach quality on property values in two South Carolina coastal towns. The authors find a strong positive relationship between beach width and the value of both developed and undeveloped lots. The authors conclude that "the willingness to pay for wider beaches is an indication of the size of the storm protection and recreational values produced by wider beaches." SILBERMAN and KLOCK (1988) use a contingent valuation model (CVM) to estimate the willingness to pay (WTP) for beach nourishment projects on the northern New Jersey shore. The beaches that comprise the Northern New Jersey coast are close substitutes. Although the average WTP for a beach nourishment project along a single beach is small (less than $1.00), the shift in beach attendance to the re-nourished beach from adjacent, lower-quality beaches is large. The authors estimate benefits at both the intensive and the extensive margins. Benefits at the intensive margin are those that accrue to current users. Benefits at the extensive margin affect users who shift from alternative beaches to a renourished beach. Silberman and Klock estimate the net benefits of beach nourishment at about $11 per beachgoer per year, or roughly equivalent to the cost of two day's parking.

DUNN, FRIEDMAN, and BAISH (2000) discuss in detail the economic impacts of coastal erosion and federal, state and local policies designed to mitigate damage to public and private property. They cite a Heinz Center report on beach reclamation (KRIESEL, LANDRY, and KEELER, 2000):

> "If beach conditions deteriorate—by armoring the shoreline or otherwise—inland property values decrease by as much as 20 percent. And, although the protective armoring increases the value of waterfront property by about 25 percent, the net increase is much lower (6 percent) because of poorer beach conditions."

Dunn, Friedman, and Baish find that the economic justification for beach nourishment projects requires that the fixed project costs be offset by benefits to a large number of residents and visitors. They conclude that shoreline protection, especially beach nourishment, passes a cost-benefit test only in densely developed coastal areas such as Ocean City, Maryland and Miami Beach, Florida. In less densely developed areas the authors conclude that beach nourishment can be justified only as a supplement to, but not as a substitute for, other erosion management policies such as relocation of structures away from the floodplain and protection of open land.

IMPORTANCE OF TOURISM IN THE UNITED STATES

Travel and tourism represents one of the largest service export industries as well as the third largest retail sales industry in the U.S. (TRAVEL INDUSTRY ASSOCIATION OF

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[6] Sufficient tax revenues would come from the increase in property values and the local tax base, as well as the ability of increased tourism to generate additional user fees and sales tax revenues.
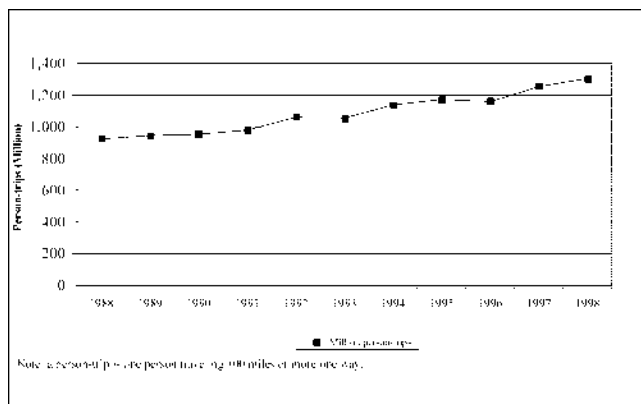
Tourism-Generated Earnings in the Coastal Zone

Figure 3.   U.S. Travel Volume. Source: THE 2001 TRAVEL AND TOURISM MARKET RESEARCH HANDBOOK, 2001. Source: AMERICAN COASTAL CO-ALITION, undated.

Figure 4.   International Travel to the U.S. Source: THE 2001 TRAVEL AND TOURISM MARKET RESEARCH HANDBOOK, 2001.

AMERICA, 2000). It is also one of the country's largest employers, ranking as the first, second or third largest employer in 29 states and generating 7.8 million jobs with $171.5 billion in payroll income. In 2000, the U.S. travel industry generated $582.5 billion in direct revenues from both domestic and international travelers.

The key to recent economic growth in the coastal states has been the strength of the travel and tourism industry. In this section we examine trends in both domestic and foreign travel to the U.S. The popularity of coastal states as travel destinations for both domestic and international travelers is then reviewed. Our findings show that the popularity of coastal states with both domestic and international travelers has led to a dependence of coastal counties on the travel and tourism industry.

Travel Trends in the United States

During the 1990s, the United States experienced a steady growth of domestic travel and an increased number of foreign visitors. Figure 3 shows that the volume of travel in the United States has increased steadily from 925 million person trips in 1988 to 1.3 billion person trips in 1998, an annualized rate of growth of 3.5 percent. Figure 4 shows that the number of foreign tourists visiting the U.S. has increased from about 40 million in 1990 to roughly 51 million in 2000, an annualized growth rate of 2.5 percent.

From 1991 to 2000, travel expenditures increased from $360 billion to $582 billion.[7] Figure 5 shows the level of U.S. travel expenditures from 1991 to 2000 (TRAVEL INDUSTRY ASSOCIATION OF AMERICA, 2001).[8] U.S. residents account for

roughly 80 percent of total travel expenditures, with foreign visitors accounting for the remaining 20 percent.

Table 1 lists the top 10 states visited by domestic travelers during 1998 (THE 2001 TRAVEL AND TOURISM MARKET RESEARCH HANDBOOK). Seven of the ten states have extensive shorelines where some of the country's most popular beaches can be found (LEATHERMAN, 1998).

Figure 6 shows the range of activities in which U.S. travelers participate. This figure demonstrates that natural amenities such as beaches play an important role in attracting tourists. Coastal states are also popular among international travelers. Figure 7 shows the top 9 states visited by foreign tourists in 1999, of which seven are coastal states. California and Florida, the top two destinations for foreign tourists have extensive shorelines and an attractive year-round climate.

Economic Value of Tourism

Projects to maintain the natural shoreline and to ensure quality beaches promote a healthy coastal economy. Coastal tourism has become a highly competitive industry as other countries seek to increase the number of visitors to their beaches.[9] Table 2 shows the number of jobs created by the travel and tourism industry for selected coastal states in 2000.

Despite the economic benefits of tourism, the executive branch of the U.S. Federal Government has tended to underestimate the importance of tourism for the economy. In 1995, the U.S. terminated its membership in the World Tourism Organization, an intergovernmental organization that pro-

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[7] Travel expenditures are in nominal terms.

[8] Travel expenditures are broken down between U.S. residents and foreign visitors. These expenditures include international passenger fares on U.S. flag carriers. Between 1992 and 2000, the average annual growth rate for total travel expenditures has been 5.20 percent with U.S. resident travel expenditures growing at 5.15 percent annually and international travel expenditures growing at 5.38 percent annually.
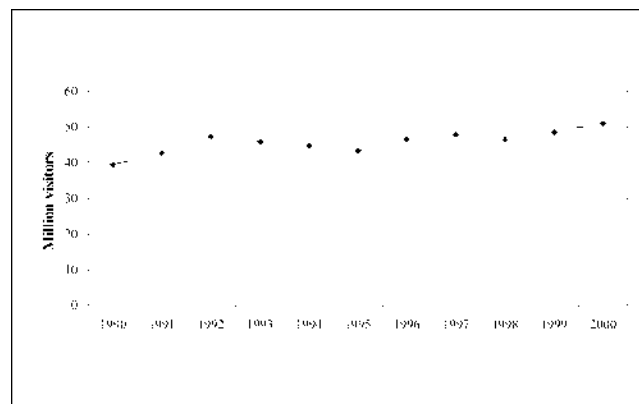
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[9] For example, tourists from Northern Europe can travel to Mediterranean or Caribbean beaches just as easily as they can to U.S. destinations. Japanese tour groups have choices that include beaches in Fiji, Hawaii or the Australian Gold Coast. Moreover, given today's rapid pace of communications, the existence of poor water quality or degraded or eroding beaches is quickly communicated among networks of travel agents and others in the tourism marketing business (see HOUSTON, 1996 and U.S. DEPARTMENT OF COMMERCE, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, 1998).
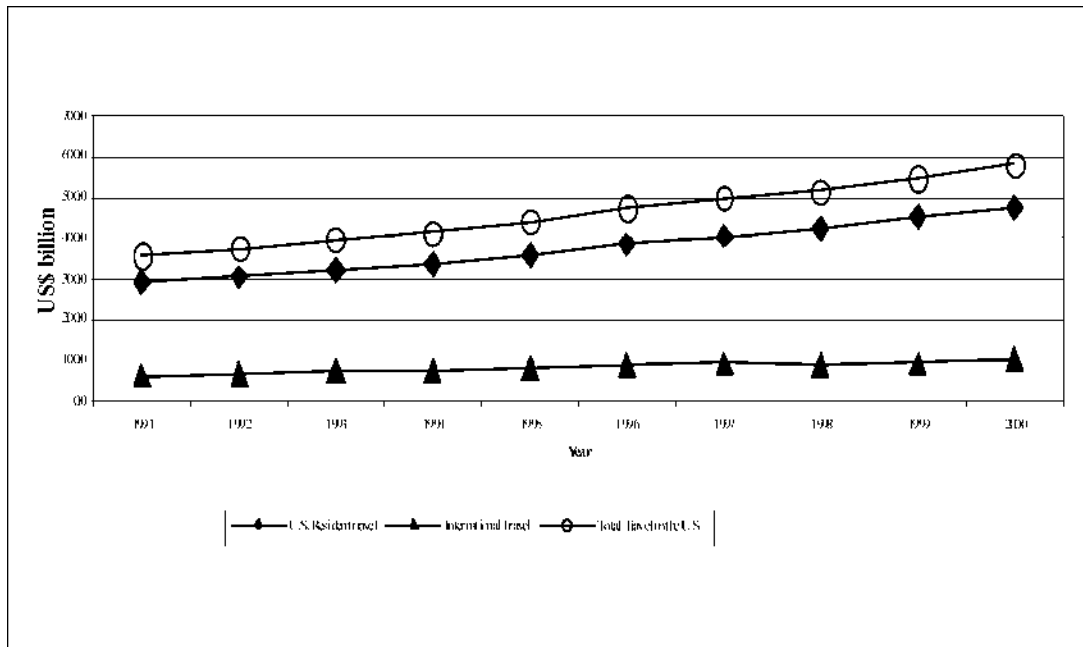
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Figure 5.   U.S. Travel Expenditures. Source: THE 2001 TRAVEL AND TOURISM MARKET RESEARCH HANDBOOK, 2001.

motes economic growth and job creation through tourism (ERDMANN, 2001). This attitude on the part of the Federal government reflects the policy that the promotion of tourism is a state responsibility. Individual states have recognized the economic value of tourism and have taken an active role in its promotion. For the fiscal year 2000–2001, state governments planned to spend $685.8 million for travel and tourism development and promotion, up 5.6% from fiscal year 1999–2000 (TRAVEL INDUSTRY ASSOCIATION OF AMERICA, 2000). Table 3 shows the budgets and expenditures for tourism promotion for selected coastal states for the fiscal year 1998–1999.

METHODOLOGY

Linkages between tourism and the economy of the coastal zone, and between beaches and coastal economic development are well established in the literature. The causal relationship between beaches and tourism, on the other hand, relies primarily on anecdotal evidence, drawn from a limited number of case studies. What is needed is an analytic framework within which to assess the impact of beaches on tourism in the coastal zone.

Table 1.   *Top ten states among U.S. domestic travelers (1988).*

● California	● Georgia
● Florida	● Ohio
● Texas	● North Carolina
● Pennsylvania	● Illinois
● New York	● New Jersey

Source: THE 2001 TRAVEL AND TOURISM MARKET RESEARCH HANDBOOK.

Regional Model of Tourism-Generated Earnings

The fundamental question addressed by this paper is: Do beaches promote tourism and higher employment? In this section, we model the relationship between tourism-generated earnings and proximity to the coast. The concentration of travel and tourism-generated earnings is used as an indicator of the importance of tourism to a given county.

Using a location quotient as a dependent variable is an established process for quantifying issues and structuring
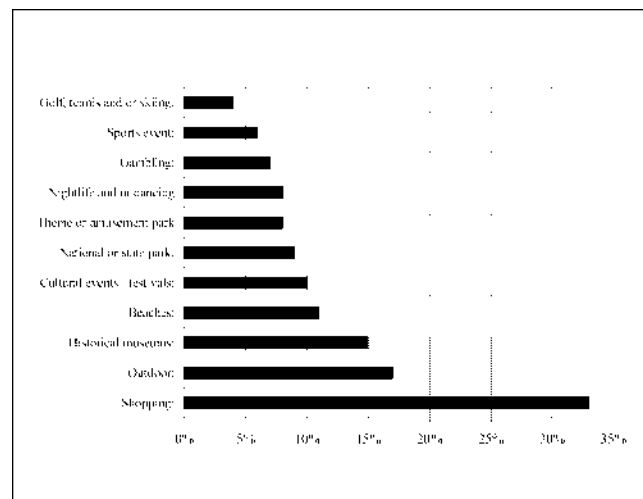

Figure 6.   U.S. Traveler Activities. Source: THE 2001 TRAVEL AND TOURISM MARKET RESEARCH HANDBOOK, 2001.
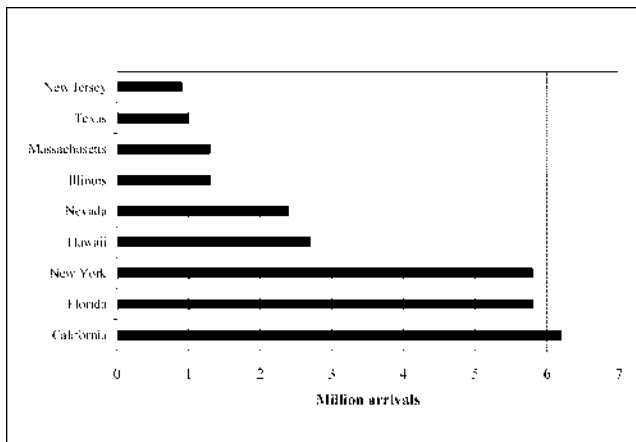
Tourism-Generated Earnings in the Coastal Zone

Figure 7.   Top Nine States for Overseas Travelers (1999). Source: THE 2001 TRAVEL AND TOURISM MARKET RESEARCH HANDBOOK, 2001.

Table 2.   *Travel-generated employment (2000).*

	Travel Employment (000)	Percentage of Work Force (%)
California	904.42	5.25
Florida	775.40	10.25
Texas	544.40	5.26
New York	429.40	4.82
Georgia	243.77	5.85
New Jersey	213.70	5.12
Virginia	210.10	5.78
North Carolina	197.90	4.97
Hawaii	169.10	28.17
Massachusetts	143.40	4.42
South Carolina	116.10	5.89
Alabama	76.40	3.55
Delaware	15.27	3.66

Source: Travel employment data taken from TRAVEL INDUSTRY AS-SOCIATION OF AMERICA (TIA), 2001, and monthly civilian labor force statistics taken from U.S. DEPARTMENT OF LABOR, BUREAU OF LA-BOR STATISTICS, 2000.

models on a regional level (ISARD *et al.,* 1998). The location quotient is a measure of the share of tourism-related employment in the local economy relative to its share in the nation as a whole. The location quotient lq(i) for the travel and tourism sector in county i is defined as follows:

$$lq(i) = \frac{\dfrac{\text{travel and tourism earnings in county i}}{\text{total earnings in county i}}}{\dfrac{\text{travel and tourism earnings in the U.S.}}{\text{total earnings in the U.S.}}} \quad (1)$$

For the purposes of this analysis, we use, as a proxy for the travel and tourism industry, earnings in the following three sectors: hotels and lodging places; eating and drinking places; and miscellaneous amusement and recreation services (KASS and OKUBO, 2000).[10] These sectors comprise about half of travel and tourism value added and nearly two-thirds of employment. This group of establishments excludes, in particular, the transportation sectors, among which air transportation, local and suburban transit, and automobile rental and leasing are the most important. Air transportation is excluded because county-level data are not available. Local and suburban transit is also excluded because tourism is a relatively small share of their output and earnings.[11]

For a county in which travel and tourism is relatively unimportant, the location quotient will have a value less than 1; for major travel destinations the location quotient will be greater than one. For example, the location quotient for Sioux City, IA-SD is 0.43; for Peoria, IL, approximately 1.00, and for Honolulu, HI, 2.58. The results for each county are shown in Figure 8.

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[10] These data are available on CD-ROM from the U.S. Department of Commerce, Bureau of Economic Analysis. See SWENSON (2002), Table CA05.2, Personal Income and 2-Digit Earnings.
[11] A more complete accounting for county level earnings in the travel and tourism sector would require access to non-published data from the U.S. Census Bureau or the U.S. Department of Labor.

Using GIS to Determine County Distance from the Coast

Lacking access to data on beach quality, we used proximity to the coast as an indicator of the existence of beaches. We grouped the 3,085 counties in the continental U.S. by distance from the Atlantic, Gulf or Pacific coasts. Table 4 shows the five county groupings used in this study. A geographic information system (GIS) was utilized to determine the distance between the county centroid and closest coastline.[12] Figure 9 shows the counties in each category.

RESULTS

An analysis of variance was performed to determine if tourism employment (as measured by the location quotient) is related to distance from the coast. We tested the null hypothesis that the underlying population means are equal

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[12] A GIS is a computer system, hardware and software, that is used to capture, display, query and analyze spatial information (OS-LEEB and KAHN, 1999; CHANG, 2002).

Table 3.   *Tourism promotion expenditures and budgets (FY 1998–1999).*

	($) Million	% Change
Hawaii	37.91	23%
Texas	29.47	16%
Florida	27.28	18%
Massachusetts	21.35	23%
New York	18.74	4%
Virginia	17.34	1%
South Carolina	13.20	(9%)
California	12.30	68%
North Carolina	9.65	7%
Alabama	8.75	2%
Georgia	7.31	(13%)
New Jersey	7.00	1%
Delaware	n/a	n/a

Source: THE 2001 TRAVEL AND TOURISM MARKET RESEARCH HANDBOOK.
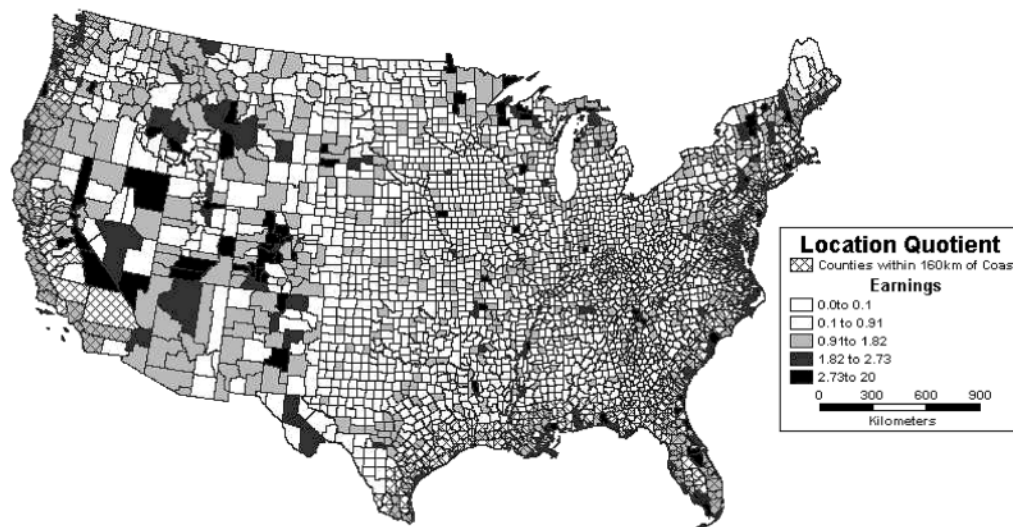
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Figure 8.   Location Quotients by County.

against the alternative hypothesis that at least one pair of means are unequal:

$$H_0: \quad \mu_0 = \mu_1 = \mu_2 = \mu_3 = \mu_4$$

$$H_A: \quad \mu_i \neq \mu_j, \quad \text{for at least one } i \neq j.$$

The ANOVA results are given in Table 5.

The critical value for the F statistic (4, 3080 degrees of freedom at a 0.05 confidence level) = 2.37. We reject the hypothesis that the means are equal at the .05 confidence level.

In addition we undertook a further test of the null hypotheses that the mean location quotient for each pair of groups is equal, against the alternative hypotheses that, in each instance, the mean for the group of counties closer to the coast is greater than that for the group at a greater distance from the coast (RICE, 1995).

The test statistic for the difference between the means for groups i and j is:

$$t = \frac{\bar{x}_i - \bar{x}_j}{s_P\sqrt{1/n_i + 1/n_j}} \qquad (2)$$

where s_P = the square root of mean squared errors (the denominator in the F-test) and n_i is the sample size for the ith group. The degrees of freedom for the t-test are the same as for the denominator of the ANOVA F test, *i.e.,* $\Sigma n - k = 3080$. The critical value for the Bonferroni t-statistic is 2.576, for the (one-tailed) test for difference in means, at the .05

Table 4.   *Groupings of counties by proximity to the coast.*

County Group (distance from coast)	Number of Counties
Distance ≥ 160 km	2,529
120 km ≤ Distance < 160 km	117
80 km ≤ Distance < 120 km	123
40 km ≤ Distance < 80 km	70
Distance < 40 km	246

significance level.[13] The t-statistics for the ten pair-wise comparisons are given in Table 6.

Note that for the coastal zone (within forty km, (25 miles) of the coast) and each inland group of counties, we reject the null hypothesis that the mean location quotients are equal. For each of the other pair-wise comparisons, we fail to reject the null hypothesis of equal means. This finding suggests that tourism-dependent industries are concentrated within forty km (25 miles) of the coast; there is no measurable difference in the economic importance of tourism for counties beyond 80 km (50 miles) from the coast vs. those that are 160 km (100 miles) or 800 km (500 miles) inland. This is strong evidence for the unique quality of the coastal zone as a magnet for tourism.

CONCLUSIONS

Tourism-generated earnings are an important source of revenues and employment for counties in the coastal zone. Economic growth in coastal states over the past decade can be attributed to the strength of the travel and tourism industry. Over the past 30 years, coastal states have restructured their economies from traditional maritime activities to a more service-oriented economy, thus making them more dependent on tourism for their continued economic viability.

Travel and tourism data examined in this paper show that the steady growth of domestic travel in the U.S., along with the increased number of foreign visitors, has led to a 38 percent increase in travel expenditures between 1991 and 2000. Moreover, coastal states are a popular travel destination for both domestic and international travelers. Tourists are drawn to beaches for their recreational activities. In order to

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[13] The Bonferroni method is used to compensate for the effect of conducting multiple comparisons on the same set of data; this assures that the risk of rejecting one of the ten null hypotheses when it is correct is at most 5%.

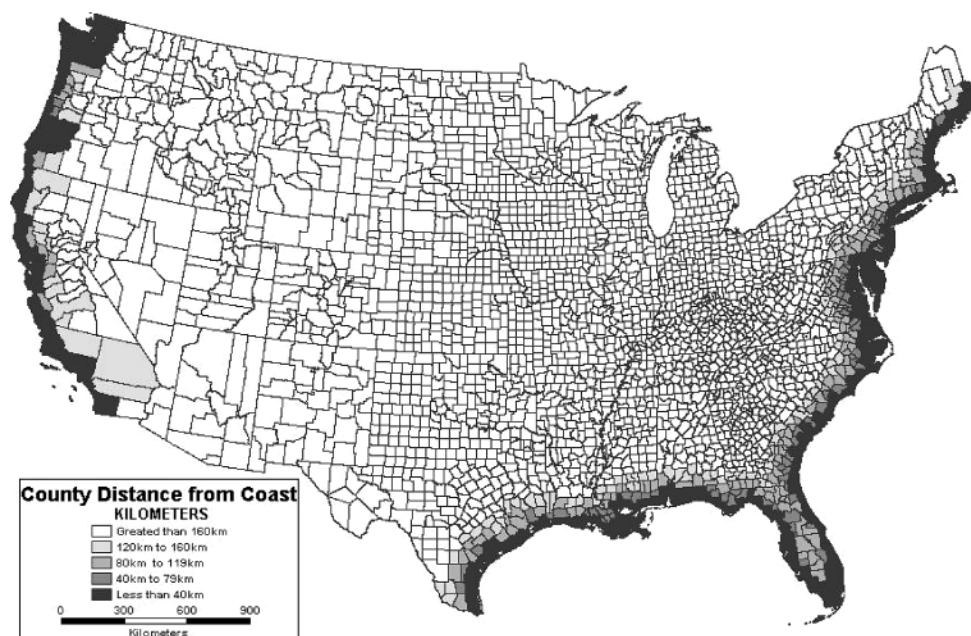Tourism-Generated Earnings in the Coastal Zone

Figure 9.   County Distances from a Coast.

remain competitive in the global market for tourism, coastal counties must consider the cost of maintaining their beaches as an investment in their local economies.

We quantify the degree to which the coastal economy is dependent upon tourism. Tourism-related earnings, as a percent of total earnings, are concentrated in counties that lie within forty km (25 miles) of the Atlantic, Gulf and Pacific coasts of the United States. In contrast, the share of earnings attributable to tourism is not sensitive to distance from the coast for counties that are further than forty km (25 miles) inland.

This study raises a number of questions. The literature on beach quality suggests that the coastal tourism is dependent on clean, broad and sandy beaches (FINKL, 1996; HOUSTON, 1996; STRONGE, 2001). Recreational activities and beach quality are complementary goods. In other words, the value to the visitor of recreational activities, *i.e.,* the user's "willingness to pay" (WTP) for them, is an increasing function of beach quality. Thus, when a beach is restored, the WTP for jointly-consumed recreational activities will increase. If a non-market good such as beach quality is jointly consumed with a market good such as beach access, it is possible to calculate the demand (WTP) for the non-market good by observing the demand for the market good (MÄLER, 1971).

A major barrier to the practical implementation of mea-

sures of the benefits of beach quality derived from weak complementarity is the paucity of data on beach quality itself. Individual case studies have developed measures of beach quality, including: 1, beach width; 2, size and color of sand granules; and 3, water quality. However, such data are available for only limited parts of the coastal zone. The authors contend that developing a more comprehensive set of beach quality data will further enhance efforts of determining the benefits from tourism of beach renourishment projects.

The GIS model developed in this paper, augmented with data on beach and water quality, can provide the basis for a more comprehensive analysis of the importance of beaches to the tourism sector. An econometric model can be used to explain both regional differences and trends over time in the coastal economy. Building on the results of the current study, our future work will concentrate on the following issues: 1, the importance of beach quality to the tourism industry; 2, the importance of other amenities such as weather and the presence of cultural attractions; and 3, the degree to which a common set of causes explains migration patterns, tourism, and economic development in the coastal zone.

Table 5.   *Analysis of variance.*

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Sum of Squares	F Statistic
Between Groups	41.909	4	10.47725	12.90013
Within Groups	2501.519	3080	0.812181	

Table 6.   *Pairwise t-statistics for difference between population means.*

Group	0	1	2	3
0 (>160 km)				
1 (<160 km)	1.58			
2 (<120 km)	0.12	1.07		
3 (<80 km)	1.14	0.07	0.85	
4 (<40 km)	6.73*	5.34*	4.18*	4.35*

* Significant, p < 0.05.

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