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Analyzing the Effects of Amenities, Quality of Life Attributes and Tourism on Regional Economic Performance using Regression Quantiles

Ronald J. Gunderson and Pin T. Ng [1]
Northern Arizona University, USA

Abstract. Conventional wisdom argues that tourist expenditures and recreation activities generate demands for traded goods and services, and create jobs and income for local residents in counties endowed with rich natural amenities. However, more recent studies have suggested that regions with high levels of amenities can experience lower wages and higher unemployment because amenities are capitalized into wages and rents in a manner that can hinder economic growth. Attempting to estimate the impact of tourism and retirement activities on the local economy, a few studies have performed multiple least squares regression analysis to discount activities generated by both local residents and nonresidents who travel for purposes other than tourism. However, the least square regression provides nothing more than an estimate of the average of the response (dependent) variable conditioned on the covariates (independent variables). In almost all regression settings with the exception of the rather naive constant-error-variance setup, the upper and lower quantiles (percentiles) often depend on the covariates quite differently from the mean or the median response. Investigating quantiles other than the mean or median using quantile regression analysis, we have found interesting dependency effects that cannot be discovered otherwise. The results of this analysis provide crucial information to policy makers while discussing public policy effectiveness in natural resource management and community development. If policy is to rely on the structural shift that is taking place in rural America, we need a better understanding on how amenities, quality of life attributes, and tourism affect regional economic performance.

1. Introduction

Economic structure in many parts of rural America has undergone significant changes over the past three decades. Many rural communities endowed with rich natural amenity resources like mild climate, clean air, varied topography, mountains and abundance of water have moved from market-based extractive and manufacturing activities to non-market-based activities such as recreation and retirement.

Prior research has found that nonmetropolitan counties with higher levels of amenity attributes have experienced widespread population growth through net in-migration on top of natural increases while rural areas with lower levels of amenities, on the other hand, have a tendency to lose economic activities to the nearby growing urban center (see e.g., Kusmin (1994), Fulton, Fuguitt and Gibson (1997), Beale and Johnson (1998), and English, Marcouiller and Cordell (2000)). Conventional wisdom argues that tourist expenditures and recreation activities generate demands

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for traded goods and services, and create jobs and income for local residents in counties endowed with rich natural amenities. Tourists seeking tranquility and adventure in environments rich in natural resources inject new dollars into local businesses, support local tax bases and generate increased demands for local land, labor and capital (Johnson and Moore (1993), English and Bergstrom (1994)).

However, more recent theoretical and empirical studies have suggested that regions with high levels of amenities can experience lower wages and higher unemployment because workers who reside in low amenity regions must be compensated via higher wages while people living in high amenity areas might be willing to accept periods of unemployment (see e.g., Roback (1982, 1988), Blanchflower and Oswald (1996), and Deller and Tsai (1999)). Hence, questions like "How does tourism affect the level and distribution of residents' income?", "Are recreation and tourism jobs necessarily lower with respect to aggregate local income generation?", "What are the effects of age and income distributions on growth?" and "Has the change in increased dependence on recreation and tourism been beneficial to long-time residents and newcomers?" are crucial to policy makers while discussing public policy effectiveness in natural resource management and community development. If policy is to rely on the structural shift that is taking place in rural America, we need a better understanding on how amenities, quality of life attributes, and tourism affect regional economic performance. In this research, we propose to answer these questions using quantile regression analysis.

2. Methods

2.1 Quantile Regression.

One major difficulty in determining the impact of tourism on local economic growth is caused by the fact that many of the businesses that cater to tourists also serve local residents and visitors on trips for purposes other than resource-based tourism, e.g., for business or for family matters. In an attempt to separate recreation-based tourist travel from resident spending and spending by travelers for purposes other than resource-based tourism, English, Marcouiller and Cordell (2000) use a two-step approach. First, the minimum requirements technique is applied to separate total economic activities (E) into the local demand (E_L) and export demand (E_X) components. Multiple least squares regressions are used next to partial out (discount) activities generated by nonresidents who travel for a purpose other than tourism (E_N) from the export demand (E_X) to extract the tourism demand (E_T).

With the least squares estimated tourism related employment and income, counties are identified as tourism dependent when both their percentage of estimated income and employment due to nonresident recreation visitation are more than double the estimated national percentages. This tourism dependence indicator variable along with an adjacency to a metropolitan area indicator variable and two region indicator variables are used as independent variables in a series of least squares multiple linear regression analysis using several measures of income, economic structure, housing and population characteristics as dependent variables. Among other results, they found that counties dependent on tourism have significantly higher per capita income than do nondependent counties, the economic structure in tourism dependent counties is less diverse than in nondependent rural counties, housing is more expensive in tourism-dependent areas than in other rural areas, and population growth is higher in tourism-dependent counties than other rural counties. These findings have important policy implications.

However, one major drawback of the multiple regression analysis via least squares estimation, besides its sensitivity to outliers, is succinctly expounded by Mosteller and Tukey (1977):

> *"What the regression curve does is give a grand summary for the averages of the distributions corresponding to the set of x's. We could go further and compute several different regression curves corresponding to the various percentage points of the distributions and thus get a more complete picture of the set. Ordinarily this is not done, and so regression often gives a rather incomplete picture. Just as the mean gives an incomplete picture of a single distribution, so the regression curve gives a correspondingly incomplete picture for a set of distributions."*

The least square regression provides nothing more than an estimate of the mean of the response (dependent) variable conditioned on the covariates (independent variables). In a pioneering work more than two decades ago, Koenker and Bassett (1978) introduced quantile regression as an alternative to classical least squares regression. This approach offers a comprehensive strategy for completing the regression picture. Classical least squares methods of estimating conditional mean functions are just not well suited to this task. In almost all regression settings with the exception of the rather naive homoscedastic (constant-error-variance) setup, the upper and lower quantiles (percentiles) of the response often depend on the covariates quite differently from the mean or the median response. This is usually caused by heterogeneity across the sample in both the variance (traditional heteroscedasticity) and the structural model (conditional function). Investigating the quantiles other than the mean or median via quantile regression will reveal interesting dependency effects that cannot be discovered by looking at only the measure of central tendency estimations through least squares regression.

Given *n* observations on the vector of *k* covariates, x_i, which usually include the intercept term and the scalar response, y_i, the τ-th regression quantile, b_τ, is the solution to

$$\min_{b_\tau \in R^k} \sum_{i \in \{i \mid y_i - x_i' b_\tau \geq 0\}} \tau\left(y_i - x_i' b_\tau\right) + \sum_{i \in \{i \mid y_i - x_i' b_\tau < 0\}} (\tau - 1)\left(y_i - x_i' b_\tau\right)$$

where R^k is the *k*-dimensional Euclidean space, and $\tau \in (0,1)$ refers to the τ-th quantile or *100* τ -th percentile of interest. The objective function assigns a weight of τ to the nonnegative residuals and $(\tau\text{-}1)$ to the negative ones. The special case of τ =0.5 yields the median regression quantile $b_{0.5}$ so that the fitted median regression plane, $\hat{y}_{0.5} = x' b_{0.5}$, is the conditional median estimate which divides the response into two equal portions with half above and half below the median regression plane.

2.2 Data

The National Outdoor Recreation Supply Information System (NORSIS) data set developed and maintained by the USDA Forest Services' Wilderness Assessment Unit, Southern Research Station, Athens, Georgia contains over 300 separate variables ranging from population density, the proportion of county acres by type of land use, employment and income levels in recreational industries, to the number of public libraries. Many of these variables capture the amenities that contribute to the overall quality of life of the regions. There are altogether 2,260 non-metropolitan counties in the contiguous United States. Following English, Marcouiller and Cordell (2000), we divide the counties into three regions: South, North and West, with 955, 686 and 619 rural counties, respectively. Three tourism-related sectors are used in this study: (1) hotels and other lodging, (2) eating and drinking places and (3) recreation and amusement services.

2.3 Estimating Export Activities and Tourism

We follow English, Marcouiller and Cordell's (2000) minimum requirements approach to separate E_L from E_X. Counties are grouped into clusters of similar attributes with respect to population density, distance to metropolitan areas, cropland acreage, forest acreage, pasture/range acreage, and mountain acreage using the Partitioning Around Medoids (PAM) algorithm of Kaufman and Rousseeuw (1990). The number of clusters chosen for the South, North and West are 5, 4 and 2, respectively. Export activities for county *i* and sector *j* are computed by

$$E_{Xij} = \left[\frac{E_{ij}}{E_{iJ}} - \min\left(\frac{E_{ij}}{E_{iJ}}\right)\right] E_{iJ}$$

where E_{Xij} is the tourism export activity (employment or income) for county *i* and sector *j*, E_{ij}, is the economic activity for county *i* and sector *j*, E_{iJ} is the economic activity for county *i* summed over all sectors, and *min(.)* is the minimum function which identifies the minimum activity among all counties in the cluster of county *i*.

English, Marcouiller and Cordell (2000) provide justification for treating the non-tourism related activity, E_N, as a function of county population, *POP*, and the tourism related activity, E_T, as a function of a vector of recreational resource attributes, *REC*. There are altogether 45 recreational attributes from urban facilities, land resources, water resources and winter resources used in their paper, and principle component analysis is used to retain 16 principle components with eigenvalues greater than 1.0 in each of the three regions. We have also used the same number of principle components as a surrogate for the recreational resource attributes. The regression model we use to extract the tourism related activity is:

$$\log(E_X / POP) = a + b_{REC} REC$$

where *a* and b_{REC} are the generic estimated scalar intercept and vector slope coefficients. When the least squares regression is used in the estimation, the coefficients have the usual conditional mean interpretation; however, they are the regression quantile estimates when quantile regression is used. We used a logarithmic transformation of export activity per capita as the response because of the log-linear relationship between export activity and population and the heteroscedastic nature of the response distribution as apparent in Figure 1.

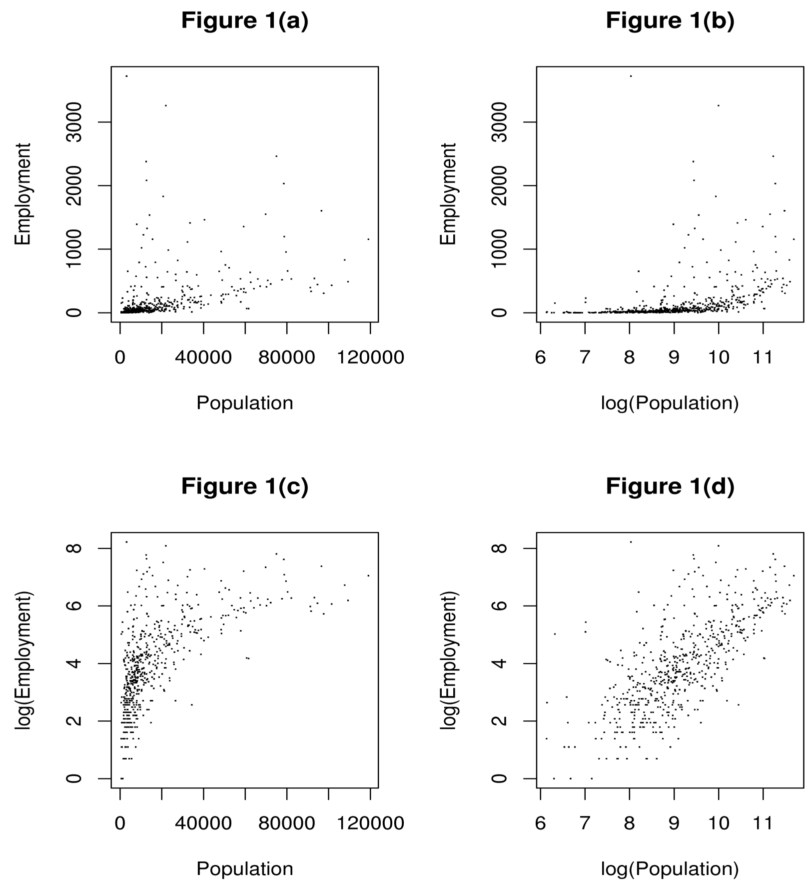

Figure 1. Scatter plots of various transformations of employment and population for the West region

The estimated export activity is $\hat{E}_X = \exp\left(a + b_{REC} REC\right)\left(POP\right)$, non-tourism related activity is given by $\hat{E}_N = \exp(a)\left(POP\right)$ and the estimated tourism related activity is then obtained as.

$$\hat{E}_T = \hat{E}_X - \hat{E}_N$$

3. Empirical Results

3.1 Local Jobs and Income

The least squares along with the quantile regression estimates of local employment and income attributable to resource-based tourism are presented in Table 1. The least squares estimated total average income across all the three sectors and three regions is $9.811 billion and the total average number of jobs is 544,000. Thus, the aggregate average income per job that depends on resource-based tourism is $18,035. If we assume that a county which achieves a specific quantile of income also attains the same quantile in employment, we can perform similar analysis on aggregate income per job. Suppose all the counties are operating at the median income and employment level capacity in the production function given their respective resource attributes, the estimated total median income is $9.832 billion and total median number of jobs is 541,000. Hence, the aggregate median income per job is $18,174. If all the counties have reached the 85-th percentile in income and employment potential in the production function, the estimated 85-th percentile aggregate income per job is $18,292; however, the aggregate income per job is $19,602 if all counties have reached only 15% of the potential.

Table 1. Jobs and income attributable to resource-based tourism by region and sector. In each cell, the numbers are, from top to bottom, the estimates from the .15th, .50th, and .85th quantile regressions with the least squares regression estimates inside the parentheses.

Sector	North	South	West	U.S. total	% total	Income($) Per Job
Eating/drinking						
Jobs (1000s)	61	21	46	128	13%	20570
	99	75	33	207	16%	18101
	(115)	(81)	(68)	(264)	(21%)	(15879)
	111	109	97	317	25%	14350
Income (million $)	1014	896	723	2633	17%	
	1328	1571	848	3747	25%	
	(1505)	(1522)	(1165)	(4192)	(28%)	
	1531	1712	1305	4548	31%	
Accommodations						
Jobs (1000s)	30	14	28	72	20%	18639
	90	41	67	198	58%	19121
	(77)	(36)	(50)	(163)	(48%)	(20693)
	158	104	121	383	116%	18864
Income (million $)	549	285	508	1342	18%	
	1709	830	1247	3786	57%	
	(1495)	(644)	(1270)	(3373)	(50%)	
	3321	1695	2209	7225	110%	
Recreation Services						
Jobs (1000s)	29	9	16	54	17%	18593
	57	38	41	136	43%	16904
	(57)	(29)	(31)	(117)	(37%)	(19197)
	116	66	70	252	83%	22385
Income (million $)	466	269	269	1004	16%	
	800	715	785	2299	39%	
	(988)	(526)	(732)	(2246)	(38%)	
	2064	1322	2255	5641	97%	
Total						
Jobs (1000s)	120	44	90	254		19602
	246	154	141	541		18174
	(249)	(146)	(149)	(544)		(18035)
	385	279	288	952		18292
Income (million $)	2029	1450	1500	4979		
	3837	3116	2880	9832		
	(3952)	(2692)	(3167)	(9811)		
	6916	4729	5769	17414		
Jobs (in percent)	1.2%	0.5%	1.9%	1.1%		
	2.6%	1.7%	2.9%	2.3%		
	(2.6%)	(1.6%)	(3.1%)	(2.3%)		
	4.0%	3.1%	6.0%	4.0%		
Income (in percent)	0.7%	0.5%	1.0%	0.7%		
	1.3%	1.1%	2.0%	1.3%		
	(1.3%)	(1.0%)	(2.2%)	(1.3%)		
	2.3%	1.7%	4.0%	2.3%		

Some interesting characteristics in job compensation are revealed when we investigate the aggregate income per job at the different quantiles across the three sectors. For the eating/drinking sector, the aggregate income per job declines from $20,570 to $14,350 if all the counties move from the lower 0.15^{th} quantile of the distributions in both income and employment towards the higher 0.85^{th} quantile. This likely reflects the fact that as the counties move toward the production frontier in income and jobs, the additional new jobs in this sector are likely to be part-time jobs that pay relatively low wages. As counties move from the lower to the higher quantiles in both income and employment in the accommodation sector, the aggregate income per job is quite stable possibly reflecting the rather stable production technology in this sector so that the additional jobs are paying similar wages as the existing ones. In the recreation sector, we observe a trend that is opposite to that in the eating/drinking sector in that the additional jobs and income created are higher when the counties move towards the production frontier. This may reflect the fact that the additional jobs are of the more specialized types that pay higher wages.

Casual observation of the estimated average and median employment and income in Table 1 also reveals that tourism exports account for about one-fifth of the total employment and around one-fourth of the total income in the eating/drinking sector across all the three regions. Resource-based tourism is more important in the recreation services sector since estimated employment and income amount to about 40 percent of both the total employment and income in that sector while tourism exports are even more important in the accommodation sector in that they account for almost half or more of the total employment and income.

3.2 Identifying Recreation Dependent Counties.

There are a variety of approaches in defining recreation dependent non-metropolitan counties in the literature. Bender, Green, Hady, Kuehn, Nelson, Perkinson and Ross (1985), Ross and Green (1985), and Hady and Ross (1990) define recreation dependence as a county having at least 10% of total employment or labor/proprietor income in eating/drinking places, hotels and other lodging, and amusement establishments. Beale and Johnson (1998) use a multistep process that utilizes two empirical measures along with contextual indicators to identify potential recreational counties. Using the total estimated tourism related average income and employment in eating/drinking places, accommodation, retail trade and recreation services, English, Marcouiller and Cordell (2000) computed total tourism related jobs and income as a percentage of the national total jobs and income respectively, and define counties as tourism dependent when a county has more than double the national percentage in both area. With this criterion, they identify 338 counties as most dependent on tourism.

The estimated total average as well as total median jobs and income from Table 1 make up about 2.3% and 1.3% of the national total respectively. Using twice these national percentages in both jobs and income as the threshold, however, identifies only 155 and 144 counties as recreation dependent using, respectively, the estimated average and median income and jobs for individual counties. Hence, we defined a county as recreation dependent if both the percentages of its jobs and income that can be attributable to recreation-based tourism are higher than their respective national percentages. Using the estimated average jobs and income for each county, we identify 371 counties as recreation dependent while 359 counties are identified when the estimated medians are used. There are 324 counties that are commonly identified as recreation dependent by both the estimated averages and medians while 47 counties are identified by the estimated averages but not the medians and 35 are identified by the estimated medians but not the means. These counties are identified in Figure 2 through Figure 10.[2]

Recreation dependent counties identified by both approaches encompass approximately 14 percent of the 2,260 nonmetropolitan counties in the contiguous U.S. The distribution of these counties varies significantly across regions, and six states had no counties in the recreation dependent category which were common to both approaches (Alabama, Connecticut, Illinois, Massachusetts, New Jersey, Rhode Island).

The disparity across geographic regions is clearly evident from Figure 11. Recreation dependent counties are largely found in the northern New England states and eastern New York, northern Minnesota and Wisconsin and the Upper Peninsula in Michigan, several counties within states containing the Rocky and Appalachian mountains, significant parts of California and Washington, and pockets of counties along the coasts of Oregon and Florida as well as in west Texas and other regions.

[2] For Figures 2 through 11, the crosshatched counties are those identified as recreation dependent using both the mean and median estimated job and employment thresholds, the southeast slashed counties are the ones identified by the mean but not the median, the northeast slashed counties are the ones identified by the median but not the mean, the dotted counties are the metropolitan counties and the blanks are the non-metropolitan counties not picked up not picked by either approach

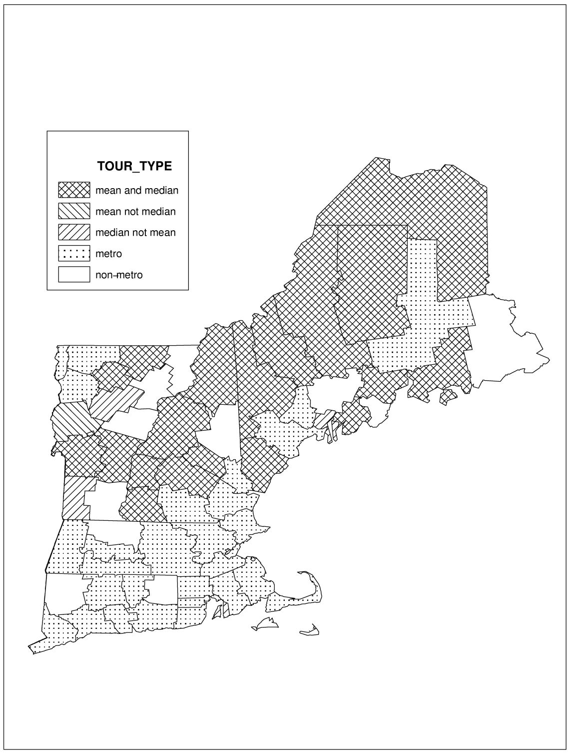

Figure 2. Recreation dependent counties in the New England division.

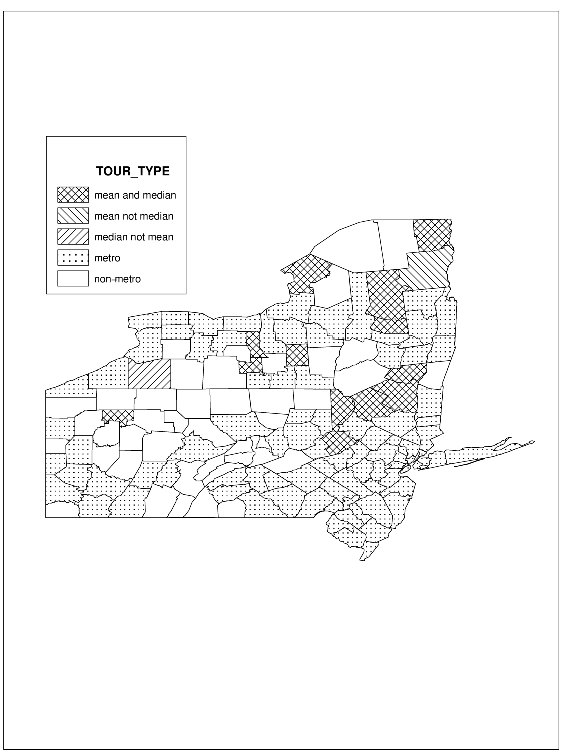

Figure 3. Recreation dependent counties in the Middle Atlantic division.

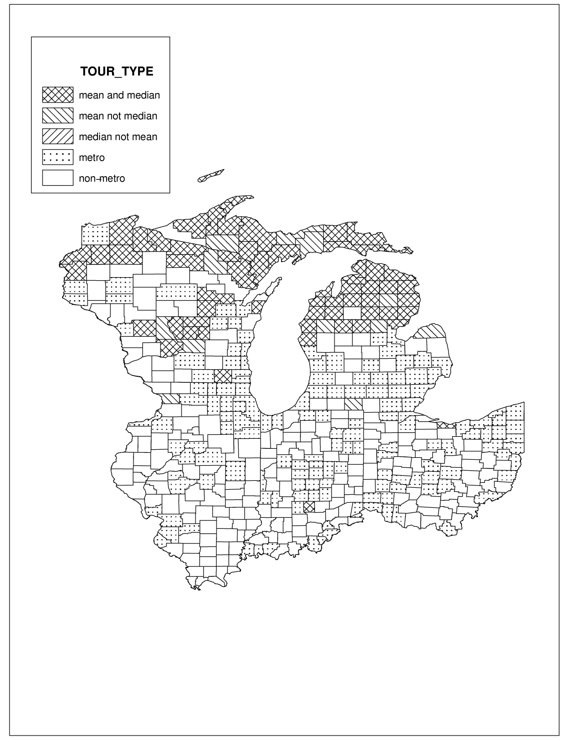

Figure 4. Recreation dependent counties in the East North Central division.

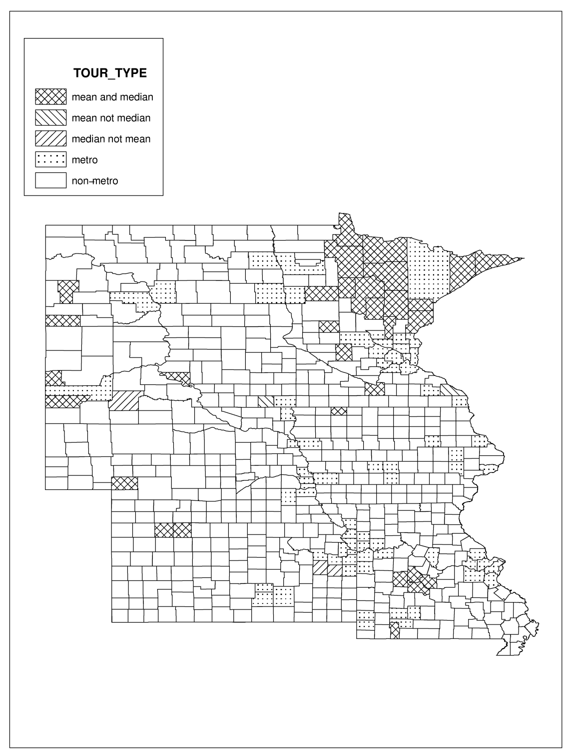

Figure 5. Recreation dependent counties in the West North Central division.

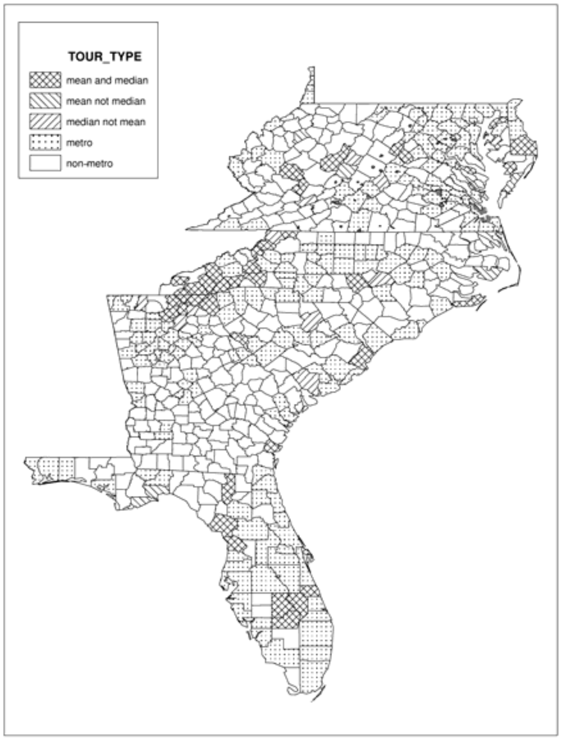

Figure 6. Recreation dependent counties in the South Atlantic division.

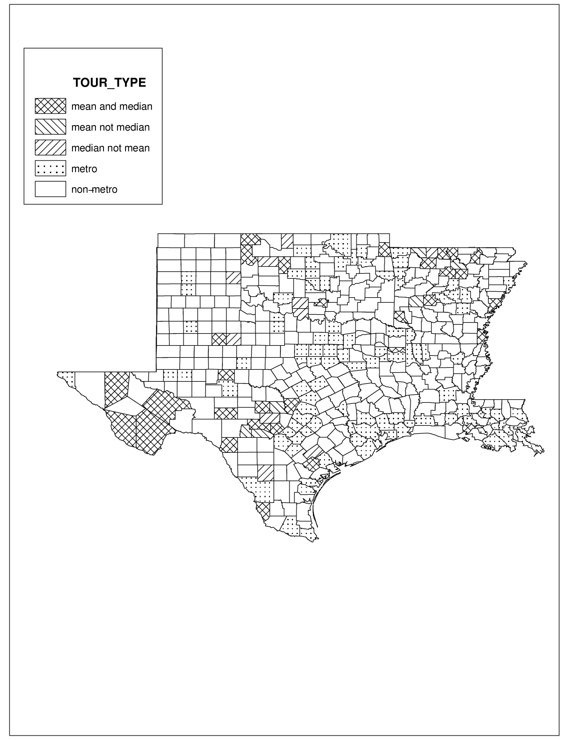

Figure 8. Recreation dependent counties in the West South Central division.

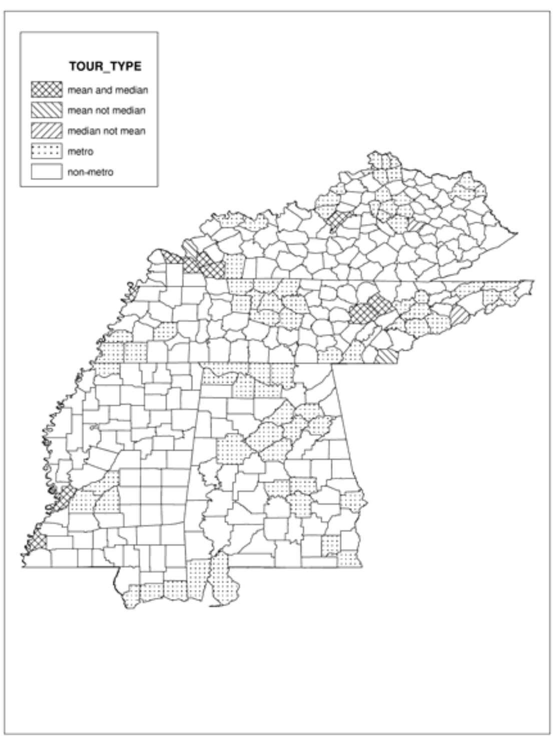

Figure 7. Recreation dependent counties in the East South Central division.

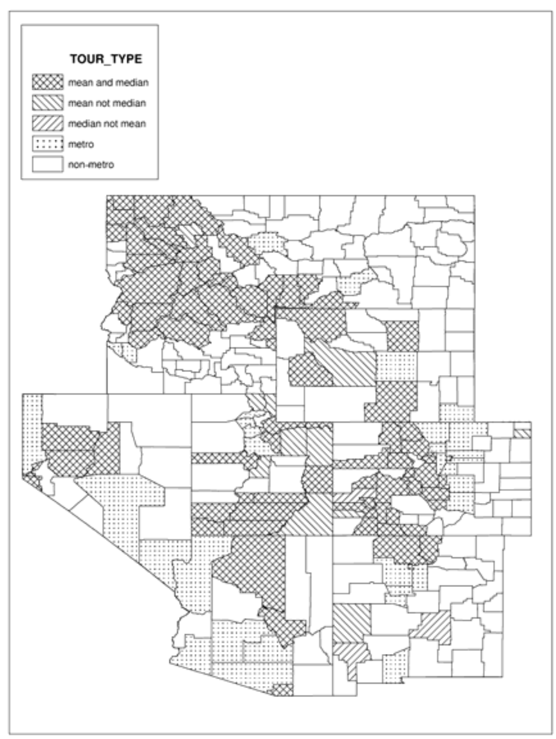

Figure 9. Recreation dependent counties in the Mountain division.

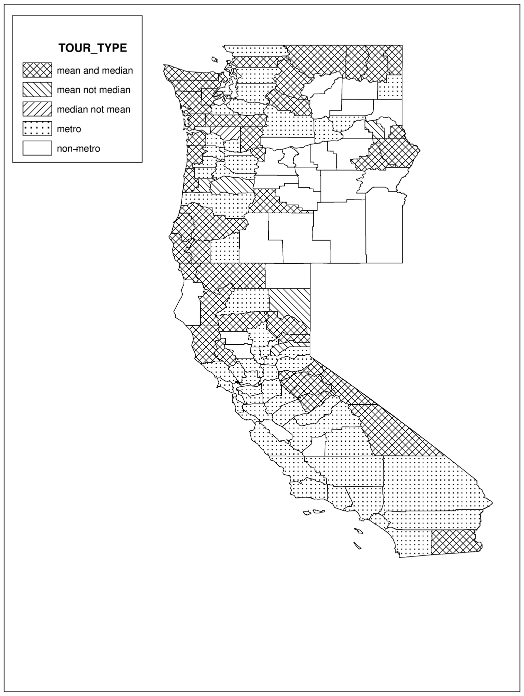

Figure 10. Recreation dependent counties in the Pacific division.

For the most part, these are the counties that have traditional reputations for lake or water-oriented recreation, mountain sports and hiking, national parks, ski resorts, or various manmade amusement parks or other significant recreation attractions.

An interesting picture emerges when we focus on the set of counties that were identified as recreation dependent by only one approach and not the other. Although no obvious pattern emerges to explain the differences, when we examine the 47 counties identified under the mean approach but not under the median, several of these counties are located in Michigan and in Utah. Alternatively of the 35 counties identified only by the median approach, we find additional counties from Georgia and Oklahoma in this group. In both cases additional counties from Texas are identified which were not common to both approaches.

When we compare the overall results of this study with the findings of Beale and Johnson (1998) the selection of the recreation dependent counties at first appears to be somewhat similar although they identified only 285 recreational counties in contrast to the 324 counties that were common to both the mean and median approaches utilized in our study. However,

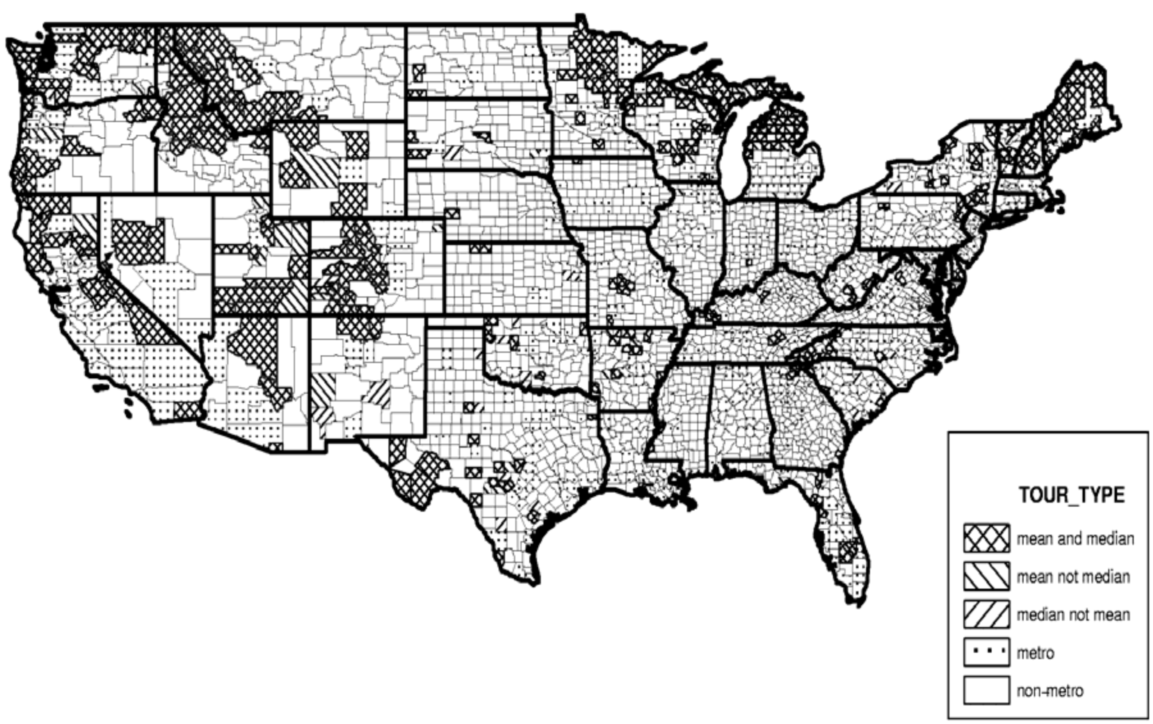

Figure 11. Recreation dependent counties in the United States.

upon closer examination, only 173 counties are identified in both studies. Part of this difference can be attributed to the timeframe involved (Beale and Johnson use 1980 data while we use 1990 data). The major rationale for the differences, however, is more properly attributed to the differing methodologies and criteria used to identify recreation dependency. Nevertheless, the differences in the counties that were selected under each process are a testament to the difficulties associated with defining and identifying recreation based counties without a commonly accepted definition for what constitutes recreation.

3.3 Characteristics - Recreation Dependent Counties.

Overall, we employed 15 variables to determine how recreation dependent counties differ from those which were classified as non-recreation dependent. Several of the variables are identical to those used by English, Marcouiller and Cordell (2000) thus permitting a comparison of results between the two studies.

The dependent variables for this study include four income-related variables, five housing-related variables and six demographic and social indicators. These variables are listed in Table 2. The independent variables in these regressions are the recreation dependent indicator variable, regional dummies and whether a county is adjacent to a metropolitan county.

Table 2. Dependent Variables Used to Study the Effects of Recreation Dependent Counties

Income Characteristics	Per Capita Income in 1990
	Average Household Income in 1990
	Percent Median Household Income Increase 1980-1990
	Percent Below Poverty Level in 1989
Housing Characteristics	Median Housing Value in 1990
	Percent of Homes Seasonally Vacant in 1990
	Percent Change in Housing Values 1980-1990
	Percent of Homes Rented in 1990
	Change in Number of Housing Units 1980-1990
Demographic and Social Characteristics	Percent Increase in Total Population 1980-1990
	Percent Increase in Total Population 1990-1995
	Percent Increase in Total Population 1989-1999
	Percent of County Residents College Educated in 1990
	Percent Female-Headed Households in 1990
	Percent Living on Farms in 1990

The following sections and figures provide a summary of the results for each of the variables.

3.4 Income Characteristics.

A visual summary of the quantile regression results based upon 1990 Per Capita Income levels in each county are presented in Figure 12. In the first panel, the intercept may be interpreted as the estimated conditional quantile function of 1990 per capita income for a non-recreation dependent county in the North that is not adjacent to a metro region. Per capita income at the τ =.05 quantile is $10,762 and increases to $18,696 at the τ = .95 quantile. The average per capita income is $14,830 while the median is $14,812.

In the second panel we show how per capita income differs between recreation dependent and non-recreation dependent counties for any chosen quantile. Average per capita income in recreation dependent counties is $167 less than what exists in non-recreation

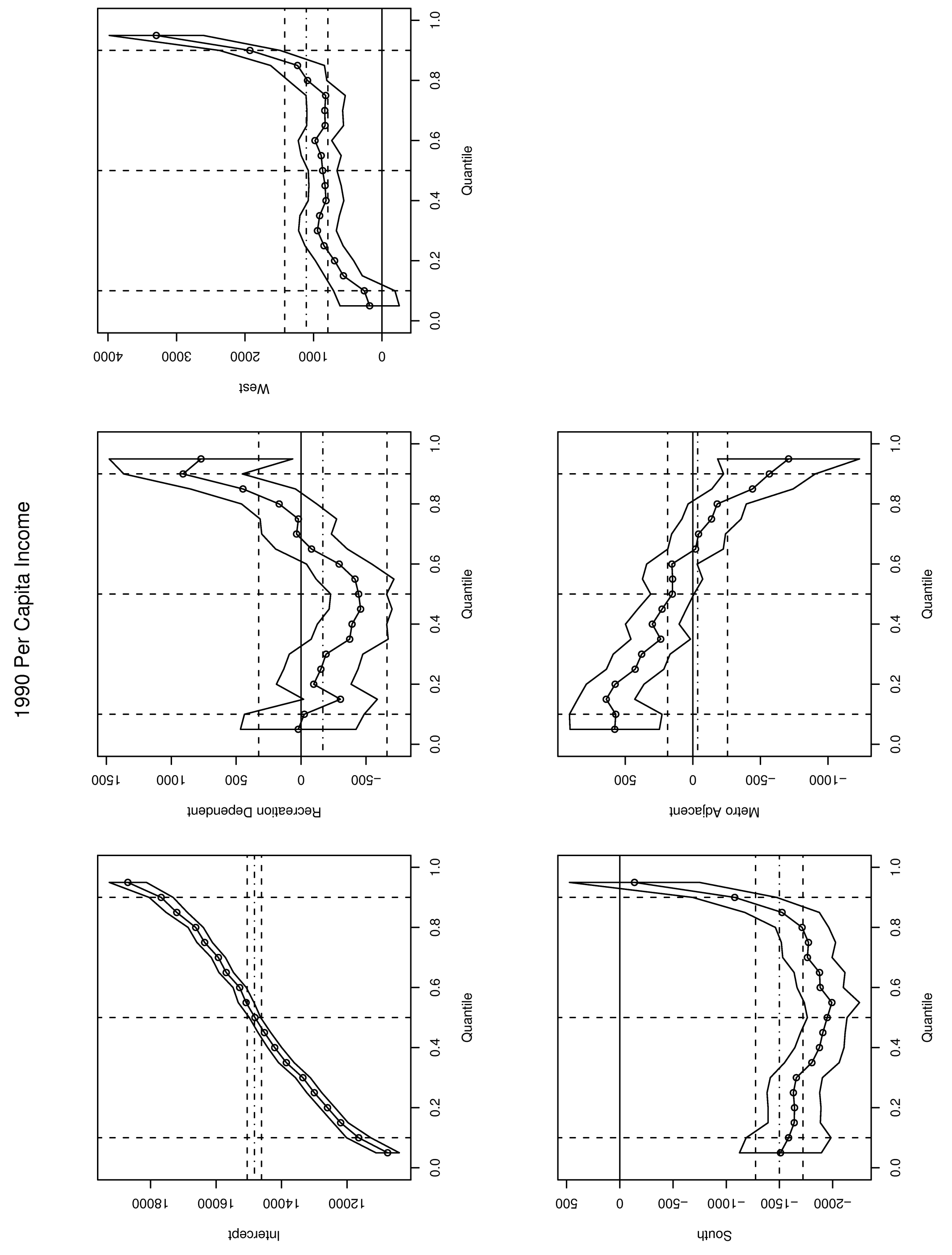

Figure 12. Regression quantile estimates with 1990 Per Capita Income as the dependent variable.

dependent counties using OLS estimates of the mean effect but is statistically insignificant. This figure contrasts with the findings of English, et al. who reported higher mean levels of per capita income in recreation dependent counties. Furthermore, the quantile regression results indicate that median per capita income is lower in recreation dependent counties by $443 at the $\tau = .5$ quantile; however, the disparity is insignificant at a 10 percent level of significance in the lower tail of the distribution and per capita income becomes higher in recreation dependent compared with non-recreation dependent counties in the upper tail when τ is greater than 0.85.

Upon examination of the regional dummy variables, residents in counties in the West region typically experience an average per capita income that is approximately $1,100 above those in the North; however, counties in the West at the median quantile are only $866 above those in the North, but this income disparity rises to $3,295 at τ = .95; i.e. persons living in the "richer" counties in the West are at least three-thousand dollars wealthier than their Northern counterparts.

A similar situation exists when comparing per capita income between counties in the South and the North. According to the OLS estimates of the mean, average per capita income in the southern counties is $1,499 less than counties in the North. In fact, the per capita income at the median quantile in the South is $1,949 below that of the North, but at the 95th percentile, per capita southern incomes are only $138 below those in the North. This implies that the "richer" counties in both the North and South possess nearly comparable per capita income levels.

Finally, the average per capita income using the OLS estimate for metro adjacent counties is $35 below what exists in rural counties. However, this OLS estimate is insignificant at a 10 percent level of significance. In the lower half of the distribution, residents in the metro adjacent counties have relatively higher per capita incomes; however, near the upper end of the distribution when τ is greater than 0.9, incomes in the metro adjacent regions are substantially below those of their rural counterparts. The relatively higher levels of per capita income in the nonadjacent counties in the upper quantiles might be explained by the presence of more very wealthy households who have chosen to move beyond the suburban centers to even more remote areas further away from the employment sub-centers in the region and, hence, taking their higher income with them.

The mean Average Household Income in 1990 for recreation dependent counties was $2,219 below that in non-recreation counties. This finding is also contrary to the findings of English, et al. who reported higher mean levels of average household incomes in the recreation dependent counties. However as is evident from the graphs in Figure 13, using the quantile regression results, median Average Household Income was only $1,350 below that in the non-recreation dependent counties, and the variation in average household incomes is minimal across the quantiles; however, the disparity becomes insignificant at τ =.8 and above. Mean average household incomes in counties in the West were $4,534 above those in the North although counties at the median quantile in the West were only $2,196 above the North. The disparity widens considerably in the upper tail when τ is .90 and higher. When we compare average household incomes in the South to those in the North, southern counties experienced an estimated average of $1,426 below their northern counterparts. The quantile regression results were considerably below that of the mean for all quantiles except for τ = .05, and when τ is .80 and above; however, the results are insignificant at these higher levels. In addition, the numbers pertaining to the metro adjacent counties are also insignificant for all quantiles and the mean.

We use a similar approach to analyze each of the remaining 13 dependent variables included in this study but we limit our focus to the effect of recreation dependence on the various dependent variables. Tables 3 through 5 provide the OLS mean and regression quantile coefficients, and p-values for the 15 dependent variables at five different $\tau = .10, .25, .50, .75, .90$ while Figure 14 through Figure 16 provide the visual summary for the whole range of $\tau \in (0,1)$.

Recreation dependent counties also had lower poverty rates, and experienced a higher percentage increase in median household incomes in the years between 1980 and 1990 than did the non-recreation dependent counties. However, the comparisons of poverty levels vary significantly when we examine the results for the various quantiles. From Table 3 for example, when measuring the percentage of persons below the poverty level, recreation dependent counties in the lower tail of the distribution typically experienced rates that were one or two percent below non-dependent counties; however when $\tau = .90$ the poverty rate was four percent below the nondependent counties, and when $\tau = .95$ the rate was six percent below the rate in the other counties. Therefore, the incidence of poverty diminishes in the upper quantiles for the recreation dependent counties compared to other counties.

Significant variation is also apparent when investigating the percentage increase in median household incomes at the various quantiles. The "faster growing" counties at the higher end of τ experienced higher rates of increase by 10 percent in median household income from 1980-1990 than the non-recreation dependent counties, but this number diminishes to a less than 10 percent differential in the rate of increase in the "slower growing" counties.

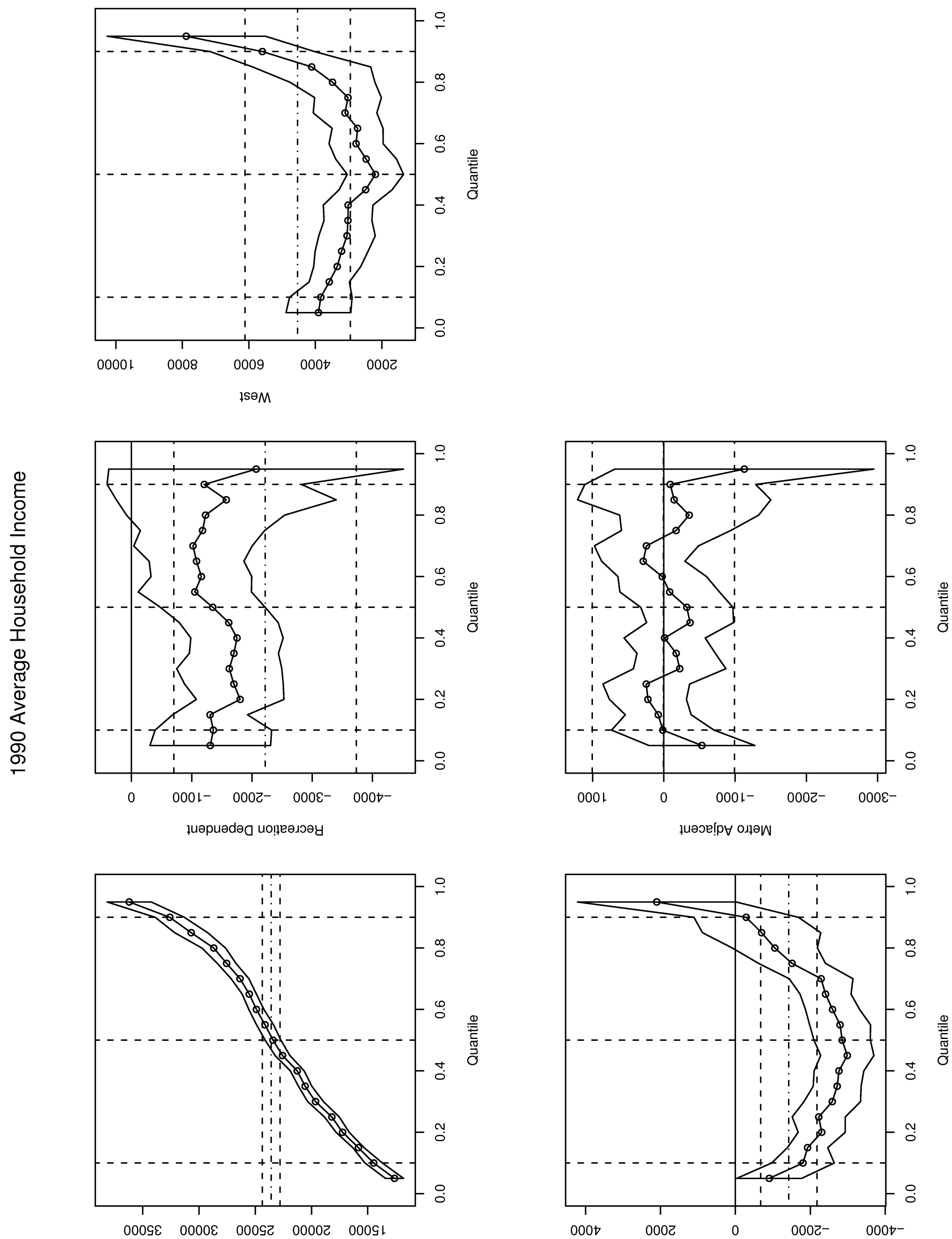

Figure 13. Regression quantile estimates with 1990 Average Household Income as the dependent variable.

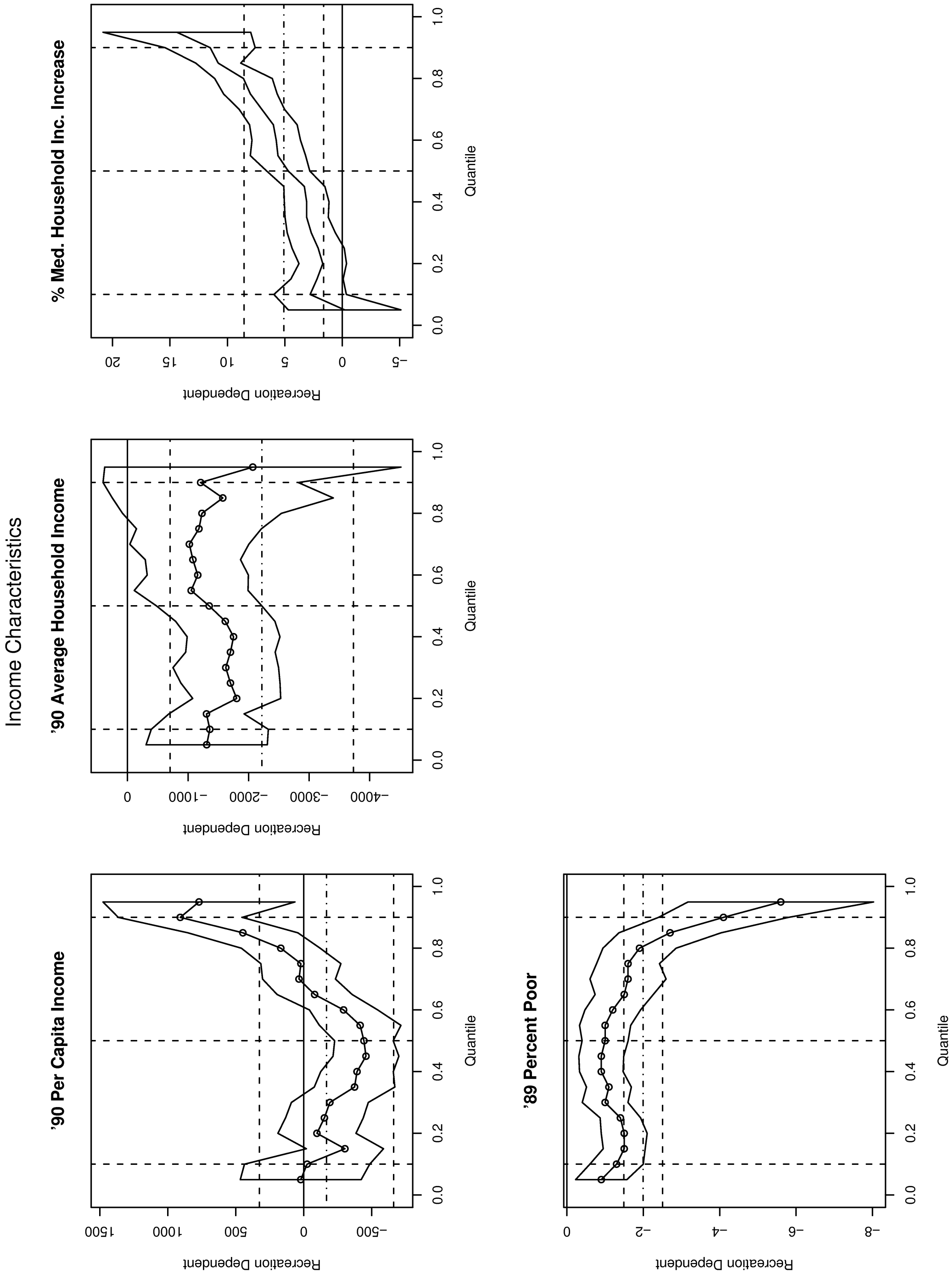

Figure 14. Regression quantile estimates for the slope of the Recreation Dependent indicator variable with the various dependent variables associated with income characteristics.

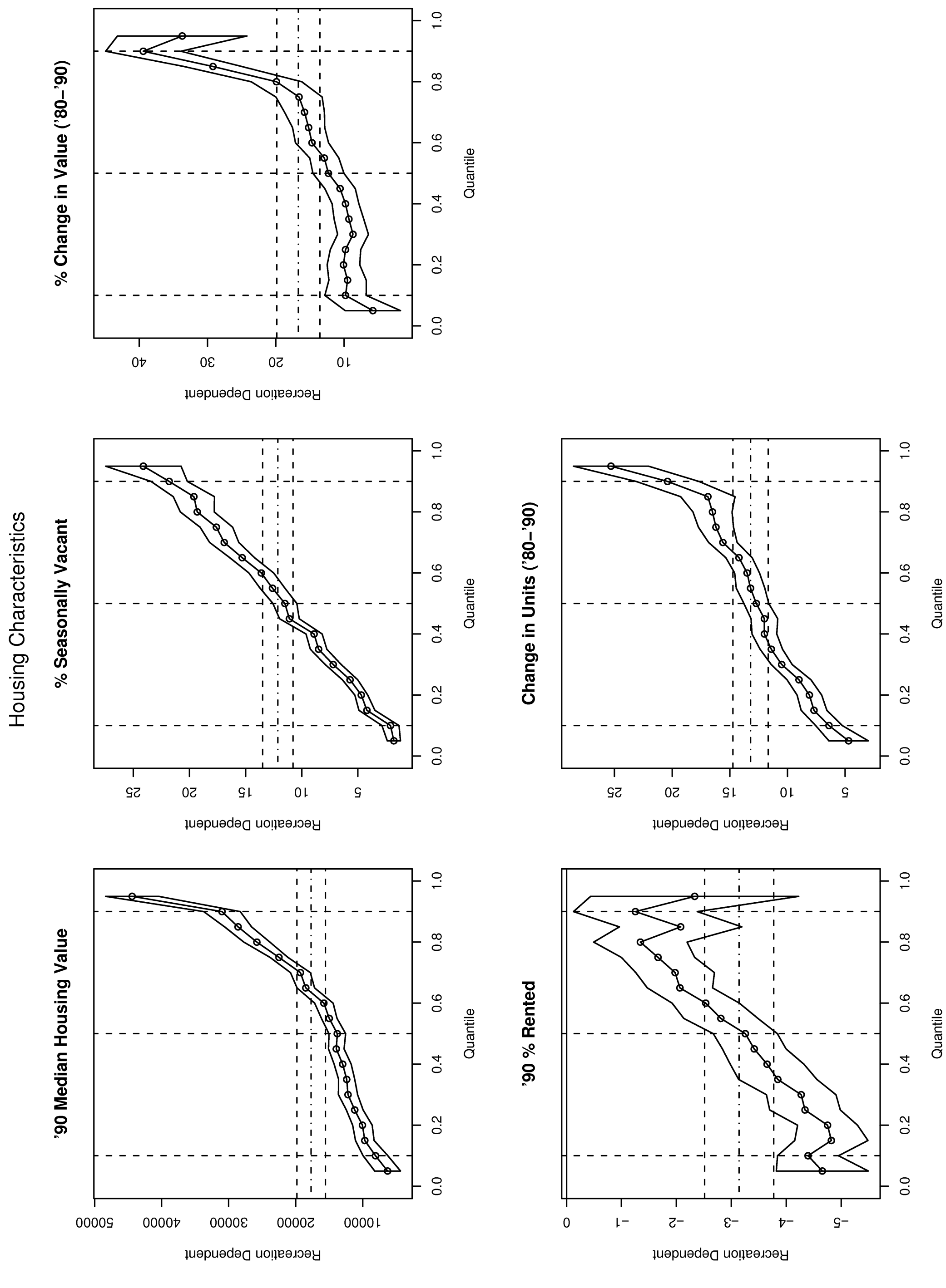

Figure 15. Regression quantile estimates for the slope of the Recreation Dependent indicator variable with the various dependent variables associated with housing characteristics.

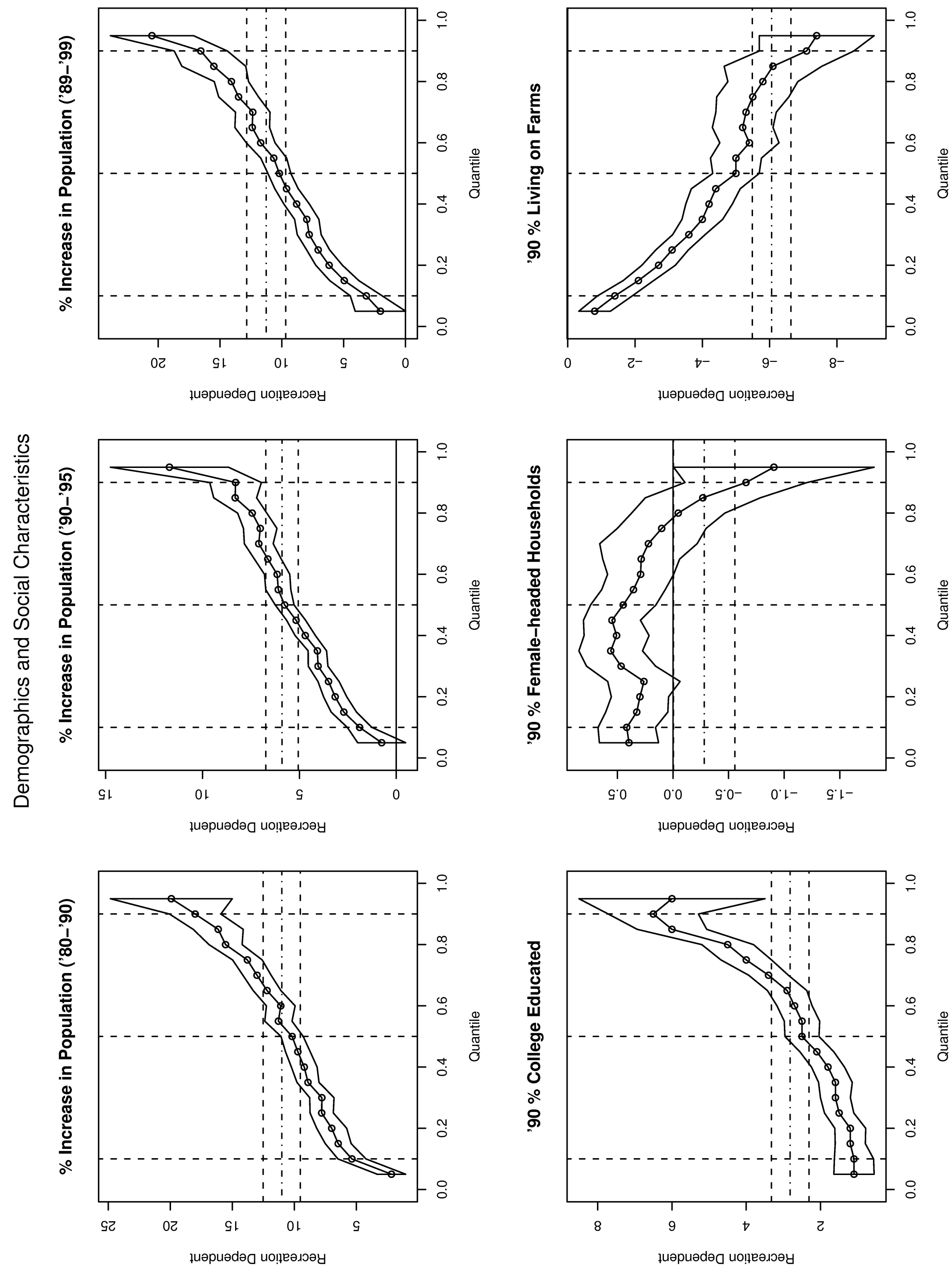

Figure 16. Regression quantile estimates for the slope of the Recreation Dependent indicator variable with the various dependent variables associated with demographic and social characteristics.

3.5 Housing Characteristics.

Similar patterns exist in Table 4 for the housing variables used in this study. As an example, the OLS mean estimate for the 1990 Median Housing Value was $17,701 higher in the recreation type counties, and $13,800 higher at the $\tau = .5$ quantile. However, at $\tau = .1$ median housing values were just $8,100 higher in the recreation dependent counties; but when $\tau = .9$, median housing

Table 3. OLS Mean and Quantile Regression Results for Income-Related Dependent Variables (Regression coefficients with p-values in parenthesis)

	OLS Estimates	Regression Quantile Estimates $\tau = .10$	$\tau = .25$	$\tau = .50$	$\tau = .75$	$\tau = .90$
1990 Per Capita Income						
Constant	14,830	11,644	13,001	14,812	16,349	17,677
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
Recreation Dependent	-167	-24.5	-152	-443	21	909
	(.313)	(.930)	(.382)	(.000)	(.907)	(.001)
West	1,105	259	846	866	822	1,928
	(.000)	(.034)	(.000)	(.000)	(.000)	(.000)
South	-1,499	-1,586	-1,631	-1,949	1,773	-1,080
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
Metro Adjacent	-35.0	571	427	152	-138	-566
	(.776)	(.006)	(.000)	(119)	(.300)	(.006)
1990 Average Household Income						
Constant	23,583	14,474	18,189	23,415	27,538	32,587
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
Recreation Dependent	-2219	-1,360	-1,701	-1,350	-1,180	-1,209
	(001)	(.021)	(.000)	(.011)	(.060)	(.218)
West	4,534	3,836	3,211	2,196	3,019	5,593
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
South	-1,426	-1,804	-2,226	-2,851	1,513	-288
	(.015)	(.000)	(.000)	(.000)	(.005)	(.734)
Metro Adjacent	6.30	13.9	246	-323	-173	-90.7
	(.990)	(975)	(.506)	(.411)	(.711)	(.901)
Percent Median Household Income Increase						
Constant	62.58	45.6	53.4	60.7	69.8	80.5
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
Recreation Dependent	5.10	2.8	2.1	4.7	8.0	11.5
	(.000)	(.144)	(.129)	(.000)	(.000	(.000)
West	-2.44	-7.0	-4.9	-1.8	0.4	3.0
	(017)	(.000)	(.000)	(.104)	(.772)	(.196)
South	2.11	-3.8	-0.5	3.4	6.0	6.5
	(.021)	(.022)	(676)	(000)	(.000)	(.002)
Metro Adjacent	1.69	0.5	1.9	3.0	2.4	0.1
	(.030)	(.726)	(.064)	(.000)	(.023)	(.955)
1989 Percent Poor in County						
Constant	12.52	7.4	8.9	11.3	14.5	19.5
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
Recreation Dependent	-2.0	-1.3	-1.4	-1.0	-1.6	-4.1
	(.000)	(.002)	(.000)	(.006)	(.001)	(.000)
West	1.01	0.3	0.5	0.5	0.7	2.0
	(.004)	(.468)	(.111)	(.161)	(.151)	(.047)
South	7.05	4.4	5.4	6.4	8.8	9.8
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
Metro Adjacent	-1.89	-1.3	-1.3	-1.6	-2.1	-3.1
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)

values were $44,400 higher compared to those elsewhere. Similar patterns emerge for the remaining housing-related variables as evidenced in the trends portrayed in the accompanying figures. This effect is expected and is in part attributed to the impacts of increased tourist-related activities in recreation dependent counties that directly exert upward pressure on local real estate markets.

Table 4. OLS and Quantile Regression Results - Housing-Related Dependent Variables (p-values)

		Regression Quantile Estimates				
	OLS Estimates	$\tau = .10$	$\tau = .25$	$\tau = .50$	$\tau = .75$	$\tau = .90$
1990 Median Housing Value						
Constant	38,477	26,000	30,400	35,700	42,000	50,100
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
Recreation Dependent	17,701	8,100	11,200	13,800	22,500	31,000
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
West	1,068	-5,300	-2,400	1,200	2,400	4,100
	(.318)	(.000)	(.000)	(.103)	(.002)	(.011)
South	-2,626	-200	500	0	-1,600	-4,600
	(.006)	(.837)	(.447)	(1.000)	(.023)	(.001)
Metro Adjacent	7,342	6,300	6,400	6,900	7,600	9,800
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
1990 Percent of Homes Seasonally Vacant						
Constant	16.11	6.5	8.2	11.4	19.0	28.6
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
Recreation Dependent	12.1	2.1	5.7	11.5	17.6	21.8
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
West	1.68	1.9	3.4	4.7	3.2	0.7
	(.003)	(.000)	(.000)	(.000)	(.000)	(.464)
South	-0.79	1.6	1.5	1.3	-0.4	-2.7
	(.109)	(.000)	(.000)	(.020)	(.000)	(.002)
Metro Adjacent	-2.42	-0.9	-0.8	-1.2	-2.6	-4.7
	(.000)	(.009)	(.010)	(.013)	(.000)	(.000)
Percent Change in Housing Values 1980-1990						
Constant	30.07	2.2	12.7	24.7	36.3	60.0
	(.000)	(.136)	(.000)	(.000)	(.000)	(.000)
Recreation Dependent	16.7	9.8	9.8	12.3	16.6	39.4
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
West	-11.65	-5.2	-6.3	-8.3	-9.0	-21.0
	(.000)	(.004)	(.000)	(.000)	(.000)	(.000)
South	20.75	25.5	25.5	25.0	25.6	15.9
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
Metro Adjacent	8.15	8.0	7.6	6.9	7.9	9.0
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
1990 Percent of Homes Rented						
Constant	20.93	14.11	17.39	20.85	24.02	27.39
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
Recreation Dependent	-3.14	-4.40	-4.34	-3.26	-1.67	-1.25
	(.000)	(.000)	(.000)	(.000)	(.000)	(.067)
West	2.71	1.66	1.41	2.33	2.61	4.88
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
South	0.41	0.54	-0.07	-0.42	0.19	1.75
	(.170)	(.064)	(.826)	(.173)	(.595)	(.003)
Metro Adjacent	0.69	1.13	0.91	0.79	0.47	-0.22
	(.008)	(.000)	(.002)	(.003)	(.115)	(.664)
Change in Number of Housing Units 1980-1990						
Constant	0.69	-7.5	-4.0	0.1	5.0	11.3
	(.233)	(.000)	(.000)	(.849)	(.000)	(.000)
Recreation Dependent	13.2	6.4	9.0	12.7	16.2	20.4
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
West	2.79	0.1	-0.2	-0.2	2.3	5.8
	(.000)	(.884)	(.744)	(.754)	(.011)	(.000)
South	7.07	3.7	6.1	6.9	7.5	9.1
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
Metro Adjacent	4.11	3.7	3.1	3.6	3.7	3.9
	(.000)	(.000)	(.000)	(.000)	(.000)	(.002)

3.6 Demographic and Social Characteristics.

Recreation dependent counties also experienced more rapid rates of population growth in both the decades of the 1980's and the 1990's when compared to their counterparts. From Table 5, OLS mean estimates for total population growth in recreation type counties were 11 percent higher than in non-recreation counties in the 1980-1990 period and the rate was slightly higher at an 11.2 percent increase from 1989 to 1999. The comparable figures at the median quantile were each 10.2 percent above those for non-recreation type counties. The accompanying figures show the same pattern of increase here as occurred with the housing variables. The disparity in population growth is less in the lower quantiles where the differences are 3 to 5 percent when $\tau = .10$. However the differences increase to around 20 percent when $\tau = .95$. This tells us that population change in the most rapidly growing recreation dependent counties is occurring at a rate that is 20 percent higher than what is occurring in the most rapidly growing non-recreation counties.

Recreation dependent counties also possess a higher percentage of college educated residents and the disparity with non-recreation counties increases in the higher quantiles as shown in the accompanying figures. This disparity is not surprising based on our earlier findings that similar disparities in per capita incomes also appear in the upper quantiles. The strong relationship that exists between education and income levels suggests that counties with a greater percentage of college educated residents will be the same counties with a greater proportion of residents with higher income levels who have chosen to live in amenity-rich regions. It is only when we examine the percent female-headed families and percent of residents living on farms where these demographic and social patterns no longer hold.

At $\tau = .5$, recreation-dependent counties had 0.44 percent more female-headed households in 1990 than their non-recreation counterparts. However, the percent female-headed households changes very slowly when we move from the lower quantiles to the median, and although this percentage decreases in the upper end of the tail, the numbers are insignificant at $\tau = .6$ and above.

The OLS mean estimate for the percent of residents living on farms is 6.1 percent lower in the recreation counties when compared to others. The comparable figure for the regression quantile when $\tau = .5$ is five percent lower. However, when $\tau = .1$ recreation dependent counties had only an 0.8 percent lower level of residents on farms, but this number falls to 7.1 percent when $\tau = .9$. This implies that the percentage of persons living on farms becomes less and less in the recreation dependent counties as we move from the lower to upper quantiles.

4. Economic Implications and Conclusion

Studies designed to identify recreational counties in nonmetropolitan areas of the U.S. often conclude that tourist expenditures and recreation activities generate demands for local goods and services, and create jobs and income for local residents in counties endowed with rich natural amenities. However, in this study, we have used quantile regression techniques to demonstrate that counties located in the upper and lower quantiles often depend on the covariates in ways that differ from the mean or the median response. Our findings address policy issues for public and private entities which are concerned with population growth, natural resource management and community development in these areas.

Hence, the answer to the questions "How does tourism affect the level and distribution of residents' income and what are the affects on economic growth?" lies with differing values that appear for each quantile.

In general, recreation dependent counties had lower average household incomes in 1990, experienced a higher percentage increase in median household incomes in the years between 1980 and 1990 and had lower poverty rates compared to the non-recreation dependent counties.

The conventional wisdom that suggests an inverse relationship between income and tourism dependency appears to be true for the middle 50 percent of counties in the nation; however, for the wealthiest counties, income levels increase along with tourism dependency. An example would be the presence of high income properties in counties containing world-class ski resorts in the Western states. The rise in income levels can be attributed to the recreational presence within these regions, although the distribution of income among the residents within these counties may be highly uneven, thus generating a new set of issues facing local policy makers.

The "faster growing" recreation-dependent counties experienced higher rates of increases in median household income from 1980-1990 than the "slower growing" recreation-dependent counties. Furthermore, the recreation-dependent counties also experienced lower poverty rates than the non-recreation-dependent counties, and the difference between poverty rates increases as we move towards counties with higher poverty rates.

Table 5. OLS Mean and Quantile Regression Results for Social & Demographic-Related Dependent Variables (Regression coefficients with p-values in parenthesis)

	OLS Estimates	Regression Quantile Estimates $\tau = .10$	$\tau = .25$	$\tau = .50$	$\tau = .75$	$\tau = .90$
Percent Increase in Total Population 1980-1990						
Constant	-6.59	-14.83	-11.47	-6.66	-1.41	2.11
	(.000)	(.000)	(.000)	(.000)	(.015)	(.037)
Recreation Dependent	11.0	5.36	7.79	10.18	13.78	17.99
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
West	1.82	-2.20	-1.02	-0.86	1.7	7.68
	(.008)	(.001)	(.007)	(.105)	(.016)	(.000)
South	4.40	1.89	3.08	4.18	3.98	7.25
	(.000)	(.001)	(.000)	(.000)	(.000)	(.000)
Metro Adjacent	5.50	4.52	4.78	4.12	4.31	6.73
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
Percent Increase in Total Population 1990-1995						
Constant	0.60	-3.31	-1.61	0.60	3.37	5.70
	(.055)	(.000)	(.000)	(.012)	(.000)	(.000)
Recreation Dependent	5.89	1.89	3.50	5.76	7.02	8.29
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
West	2.07	-2.46	-0.94	0.55	3.42	7.18
	(.000)	(.000)	(.003)	(.056)	(.000)	(.000)
South	2.08	-0.39	1.06	1.71	2.72	4.08
	(.000)	(.242)	(.000)	(.000)	(.000)	(.000)
Metro Adjacent	2.36	2.50	2.14	1.73	1.62	2.40
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
Percent Increase in Total Population 1989-1999						
Constant	-0.64	-7.76	-4.38	-0.33	4.03	8.88
	(.270)	(.000)	(.000)	(.462)	(.000)	(.000)
Recreation Dependent	11.26	3.16	7.05	10.20	13.50	16.55
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
West	2.64	-5.10	-2.83	-0.61	4.45	9.69
	(.000)	(.000)	(.000)	(.265)	(.000)	(.000)
South	3.74	-1.14	1.36	3.15	5.05	7.30
	(.000)	(.095)	(.006)	(.000)	(.000)	(.000)
Metro Adjacent	5.32	4.95	4.33	3.54	4.69	6.35
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
1990 Percent College Educated						
Constant	11.00	7.1	8.3	10.1	12.5	15.6
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
Recreation Dependent	2.82	1.1	1.5	2.5	4.0	6.5
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
West	2.81	2.6	2.7	2.8	2.4	2.5
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
South	-1.18	-0.9	-0.9	-1.0	-1.3	-1.7
	(.000)	(.001)	(.000)	(.000)	(.000)	(.007)
Metro Adjacent	0.035	0.2	0.3	0.1	0	-0.5
	(.852)	(.401)	(.092)	(.629)	(1.000)	(.361)
1990 Percent Female-Headed Households						
Constant	7.48	4.89	5.92	7.13	8.65	10.13
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
Recreation Dependent	-0.28	0.42	0.26	0.44	0.10	-0.66
	(.173)	(.008)	(.186)	(.012)	(676)	(.049)
West	-0.81	-1.59	-1.46	-1.19	0.074	-0.13
	(.000)	(.000)	(.000)	(.000)	(.002)	(.683)
South	3.78	1.25	2.01	3.15	5.11	7.04
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
Metro Adjacent	0.40	0.75	0.53	0.56	0.17	0.15
	(009)	(.000)	(.000)	(.000)	(.338)	(.544)

Table 5 (con't). OLS Mean and Quantile Regression Results for Social & Demographic-Related Dependent Variables (Regression coefficients with p-values in parenthesis)

	OLS Estimates	Regression Quantile Estimates $\tau = .10$	$\tau = .25$	$\tau = .50$	$\tau = .75$	$\tau = .90$
1990 Percent Living on Farms						
Constant	11.00	2.0	4.3	8.7	15.3	21.5
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
Recreation Dependent	-6.06	-1.4	-3.1	-5.0	-5.5	-7.1
	(000)	(.000)	(.000)	(.000)	(.000)	(.000)
West	3.01	0.2	1.0	2.1	3.4	5.8
	(000)	(.513)	(.000)	(.000)	(.000)	(.000)
South	-4.14	-0.5	-1.4	-3.3	-6.4	-7.7
	(000)	(.066)	(.000)	(.000)	(.000)	(.000)
Metro Adjacent	-1.81	0	-0.4	-1.1	-2.1	-3.0
	(000)	(1.000)	(.067)	(.000)	(.000)	(.000)

We also considered the economic implications that relate to the question of whether or not recreation and tourism jobs are predictably lower with respect to aggregate local income generation. The results differ for each of the three sectors analyzed in this paper. In the eating/drinking sector, as the counties move toward the production frontier in income and jobs, the additional new jobs in this sector are likely to be part-time jobs that pay relatively low wages. In the accommodation sector, as counties move from the lower to the higher quantiles, the aggregate income per job is generally constant possibly reflecting the rather stable production technology in this sector. However, in the recreation services sector, aggregate income per job increases as counties move from the lower to the upper quantiles perhaps indicating that the additional jobs are of the more specialized types that pay higher wages.

The third question we address is "Has the change in increased dependence on recreation and tourism been beneficial to long-time residents and to newcomers?" For each of the housing variables used in this study, the differences that exist between recreation and non-recreation dependent counties in the lower quantiles are quite small. However, when moving towards the higher quantiles, changes in home values along with rental prices and the number of seasonal units each become more pronounced, and can raise the affordable housing gap in these areas. Therefore, the benefits associated with the increases in property values are partially offset by the increased living costs that appear in the higher quantile regions.

The final question asks how changes in demographic and social characteristics impact growth. For the most part, recreation dependent counties experienced more rapid rates of population growth in both the decades of the 1980's and the 1990's when compared to their counterparts and disparity increased when moving towards the higher quantiles of the distribution. Recreation dependent counties in the upper quantiles of the percent of persons living on farms also experience the greatest declines in farming activity when recreation based activities replace farming activity in those counties that once relied on farming for their primary source of income become more recreation dependent.

We conclude that policy concerns will vary across counties, and tourist amenities, quality of life attributes, and recreation activities will affect regional economic performance in significantly different ways depending upon where each county falls within the distribution on each economic measurement variable.

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