# The Determinants Of Florida Tourist Flows: A Gravity Model Approach#

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## I. INTRODUCTION

During recent years, population growth and increasing personal affluence have led to a substantial rise in tourist travel. Tourism in the United States is now a multi-billion dollar industry. For many regions, income, employment, and tax revenues are heavily dependent upon tourist expenditures.

Perhaps no area is more significantly influenced by tourism than the state of Florida. Between 1950 and 1972, the total number of tourists entering Florida increased from about 4.7 million to more than 28 million per year.[1] Tourism-related expenditures in 1972 accounted for more than 12.5 percent of the Florida gross domestic product of 36.2 billion dollars. A substantial proportion of the state tax burden is shifted to tourists because the Florida tax structure is primarily consumption-based.[2] Thus, the need for reliable predictors of Florida tourist levels seems obvious.

This paper presents a model for predicting the number of tourists entering Florida per time period by state of origin. The model developed is essentially a gravity interaction model of tourism flows.[3] Data are cross-sectional by state of tourist origin from four years, 1964, 1965, 1967, and 1968. These particular years were chosen for analysis because they represent time periods for which tourist travel may be separately estimated by all modes, by automobile and by airplane.

Both total and per-capita tourism flows are estimated.[4] Population is an independent variable for the total tourism regressions. Independent variables used in all regression equations include per-capita income in the origin state, travel costs between the origin state and Florida, and a proxy for state climatic conditions.[5]

The parameter estimates for population and income are expected to be positive, while the opposite condition is expected for travel costs. The climate proxy is expected to have a negative coefficient. For a given potential traveler the desire for a Florida vacation should be inversely related to local climate conditions.

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In order to determine the relative importance of independent variables in terms of explanatory power, beta coefficients as well as parameter estimates are presented.[6] Constancy of slope and intercept estimates between years is also tested using a form of the method developed by Chow.[7] Finally, as evidence of the degree of multicollinearity among independent variables, we present two measures. These are the simple order correlation coefficients for the independent variable set and the determinant of the correlation matrix of independent variables.[8]

The study has several purposes. First, we seek to determine whether the simple gravity model, with relatively few variables, can be a useful tool in explaining Florida tourist flows by state of origin. If the approach is successful, then the groundwork is laid for more sophisticated econometric models which may attempt to determine the future effects of tourism on Florida income, tax, and employment levels. Second, results from the model may be useful in analyzing the probable effects of changing national economic conditions on Florida tourism. Finally, the results obtained here are considered to be a single test of a general model of tourist flows. Wherever data are available, the model may be used to analyze the effect of changes in economic conditions on tourism. Thus, other states, regions, nations, or individual tourist facilities may find our results useful and adaptable for their own purposes.

## II. THE MODEL

An expression of the gravity interaction model used to estimate Florida tourists by state of origin is:

$$T_i = \frac{aP_i^{B_1} y_i^{B_2}}{c_i^{B_3} s_i^{B_4}} \qquad (1)$$

where:
- $i$ = subscript representing the origin state
- $a$ = constant of integration
- $B_{1,4}$ = parameters to be estimated by regression analysis
- $T$ = number of tourists per state by mode of travel
- $P$ = state population
- $y$ = state per-capita income
- $c$ = travel cost from state of origin to Florida
- $s$ = proxy for state climatic conditions

The model is stochastic for all estimating equations, and the normal assumptions of least-squares minimization apply. A log-log transformation of (1) yields:

$$\log T_i = \log a + B_1 \log P_i + B_2 \log y_i - B_3 \log c_i - B_4 \log s_i \qquad (2)$$

which is suitable for estimation. Coefficients generated are "elasticity" estimates which relate percentage changes in tourists to given percentage changes in the relevant independent variable.

Regression analysis is also used to estimate per-capita tourist travel. The per-capita stochastic equation is:

$$\frac{T_i}{P_i} = \frac{a\, y_i^{B_1}}{c_i^{B_2}\, s_i^{B_3}} \tag{3}$$

where: $\frac{T_i}{P_i}$ = per-capita tourists per state.

A log-log transformation yields the testable equation:

$$\log \frac{T_i}{P_i} = \log a + B_1 \log y_i - B_2 \log c_i - B_3 \log s_i \tag{4}$$

Utilizing equations (2) and (4) tourist flows by state are estimated for each of the four test years selected. Data from all years are subsequently pooled to generate a second set of elasticity estimates. Travel by three modes is analyzed to include tourists by any mode (all mode), by auto (auto mode), and by air (air mode).

The air mode regressions are expected to be somewhat biased because the dependent variable includes some train and bus travelers. This condition is unavoidable because published data include only total tourists and auto tourists by state of origin. The air mode variable is. thus a residual determined by subtracting auto tourists from total tourists. It is expected that the inclusion of train and bus tourists in the air mode regressions will bias the per-capita income coefficients downward and the travel cost coefficients upward.

## III. DATA USED

Observations are from 25 states within the continental United States.[9] Number of tourists from each state are those published by the Florida Department of Commerce [5] for the selected years. State income and population totals are from the Statistical Abstract of the United States [12]. The variable used as a proxy for state climatic conditions is the average hours of sunshine per year as a percentage of the number of possible sunshine hours. Relevant data are published by the U. S. Department of Commerce [13].

The travel cost proxy varied with the travel mode being analyzed. In the all modes regressions, mileage between the largest per state SMSA and Miami, Florida, is used. In estimating air tourist travel, the variable used is air fare, tourist class, between the largest state SMSA and Miami. For auto travel costs we applied the formula: $t = (d)(k) + (\ell)(m)$, where $t$ = travel cost, $d$ = distance, $k$ = average operating cost per mile of auto travel, $\ell$ = estimated cost per day for food and lodging, and $m$ = estimated number of days travel between Miami and the largest SMSA in the origin state.

The distance measure is drawn from the Rand McNally Road Atlas [11]. Automobile operating costs are provided by the American Automobile Association [6]. The air fare data comes from the Official Airline Guide [10]. One day's food and lodging is estimated to be $35.00 per day and each tourist family is assumed to travel, on average, approximately 400 miles per day.[10]

## IV. EMPIRICAL RESULTS

### *Total Tourists: Table One*

For the all modes regressions, the model exhibits very robust explanatory power. Values for $R^2$ range from .75 to .84. F-values indicate a five per cent significance level for all equations. All parameter estimates for independent variables are significant at five per cent except that for the 1964 climate proxy. The matrix determinant is above .2 in all cases. The population parameter estimates are within one standard deviation of unity. Income elasticity ranges from about 1.5 to 2.0 and the travel cost elasticity is approximately -2.0. The climate parameter estimate ranges from -3.0 to -4.8 where significant.

Auto mode equations were also statistically significant. The $R^2$ values range from .70 to .79; F-values are all statistically relevant at five per cent level; t-values denote significance at the five per cent confidence level for all variable estimates except per-capita income, 1965, and sun, 1964. The matrix determinate is again greater than .2. Population parameter estimates for auto mode are within one standard deviation of unity. Income elasticity is lower than for all modes with point estimates from roughly 1.0 to 1.6. Auto travel cost elasticity is about -2.0 except for all years where it is -1.2. The significant climate proxy estimates are between -3.5 and 5.5.

For air mode, the model performs less well, perhaps due to the residual nature of the dependent variable. The $R^2$ is .53 to .62, but equations are significant at five per cent. Estimates for all economic variables except population, 1968, and per-capita income, 1965, are also significant at five percent. The climate proxy is consistently insignificant but has the correct sign in all cases. The determinant is greater than .29 for all regressions. The population elasticity is roughly one where significant. Air travel is a relatively superior good when compared with other forms of travel as indicated by the range of estimates from 1.8 to 3.6. The air fare elasticity estimate ranges from -1.5 to -1.9. Again, the residual nature of the dependent variable would suggest that the income coefficient is probably understated while that for air fare is overstated.

TABLE 1

Total Tourist Determinants: t-Values In Parentheses

| | All Years | 1964 | 1965 | 1967 | 1968 |
|---|---|---|---|---|---|
| All Modes | | | | | |
| Constant | 8.490 | 3.277[a] | 9.135 | 5.190 | 4.804[a] |
| | (9.29) | (1.76) | (3.41) | (2.51) | (1.71) |
| Population | .905 | .884 | .879 | .960 | .854 |
| | (13.41) | (7.12) | (7.06) | (7.60) | (5.07) |
| Income | 1.491 | 1.502 | 1.334 | 1.480 | 2.08 |
| | (6.93) | (3.59) | (2.82) | (3.12) | (3.19) |
| Miles | −1.850 | −2.200 | −1.819 | −1.799 | −1.880 |
| | (12.66) | (7.96) | (5.18) | (6.48) | (5.07) |
| Sun | −3.069 | −1.201[a] | −4.84 | −3.16 | −3.71 |
| | (6.32) | (1.41) | (3.98) | (3.63) | (3.19) |
| F | 92.93 | 27.24 | 25.44 | 28.24 | 17.45 |
| Adjusted $R^2$ | .80 | .82 | .84 | .83 | .75 |
| Multicollinearity | .29 | .22 | .23 | .22 | .22 |
| Auto Mode | | | | | |
| Constant | 10.889 | 6.116 | 11.750 | 7.558 | 7.899 |
| | (9.46) | (3.08) | (3.31) | (3.12) | (2.83) |
| Population | .879 | .847 | .871 | .897 | .868 |
| | (10.65) | (6.33) | (5.38) | (6.00) | (5.11) |
| Income | .977 | 1.273 | 1.033[a] | 1.229 | 1.630 |
| | (3.81) | (2.82) | (1.68) | (2.18) | (2.48) |
| Travel Cost | −1.228 | −2.221 | −1.706 | −1.748 | −1.923 |
| | (9.48) | (7.46) | (3.74) | (5.31) | (5.14) |
| Sun | −4.337 | −1.732[a] | −5.539 | −3.542 | −4.134 |
| | (7.34) | (1.89) | (3.50) | (3.44) | (3.52) |
| F | 53.29 | 22.35 | 14.23 | 17.79 | 16.06 |
| Adjusted $R^2$ | .70 | .79 | .74 | .75 | .72 |
| Multicollinearity | .30 | .22 | .23 | .23 | .22 |
| Air Mode | | | | | |
| Constant | 3.741[a] | −2.402[a] | −1.189[a] | − .768[a] | −1.239[a] |
| | (1.92) | ( .53) | ( .17) | ( .16) | ( .27) |
| Population | .849 | 1.044 | .916 | 1.055 | .514[a] |
| | (6.49) | (3.45) | (2.97) | (3.55) | (1.80) |
| Income | 2.258 | 2.142 | 1.816[a] | 2.080 | 3.637 |
| | (5.56) | (2.30) | (1.81) | (2.00) | (3.43) |
| Air Fare | −1.546 | −1.895 | −1.588 | −1.522 | −1.651 |
| | (5.73) | (2.83) | (2.19) | (2.84) | (2.76) |
| Sun | −1.089[a] | .389[a] | − .023[a] | −1.318[a] | −2.383[a] |
| | (1.08) | ( .18) | ( .01) | ( .63) | (1.19) |
| F | 36.48 | 8.20 | 6.37 | 8.43 | 10.17 |
| Adjusted $R^2$ | .61 | .56 | .53 | .56 | .62 |
| Multicollinearity | .42 | .29 | .36 | .31 | .31 |

[a]: Not significant at five-percent confidence level

*Per-Capita Tourists: Table Two:*

The per-capita all modes regressions generated $R^2$ values between .61 and .80, F-values significant at five per cent and matrix determinants

TABLE 2

Per Capita Tourist Determinants: t-Values In Parentheses

| | All Years | 1964 | 1965 | 1967 | 1968 |
|---|---|---|---|---|---|
| All Modes | | | | | |
| Constant | 8.686 | 3.750 | 9.351 | 5.392 | 5.564 |
| | (8.88) | (2.10) | (3.51) | (2.81) | (2.10) |
| Income | 1.380 | 1.344 | 1.140 | 1.422 | 1.848 |
| | (6.86) | (3.52) | (2.66) | (3.34) | (3.13) |
| Miles | −1.886 | −2.229 | −1.805 | −1.811 | 1.917 |
| | (13.03) | (8.14) | (5.15) | (6.73) | (5.24) |
| Sun | −3.236 | −1.426[a] | −4.934 | −3.239 | −4.020 |
| | (6.83) | (1.76) | (4.07) | (3.99) | (3.65) |
| F | 77.66 | 30.92 | 10.90 | 25.63 | 16.77 |
| Adjusted $R^2$ | .73 | .80 | .61 | .76 | .67 |
| Multicollinearity | .47 | .39 | .32 | .39 | .39 |
| Auto Mode | | | | | |
| Constant | 11.069 | 6.756 | 11.967 | 8.084 | 8.601 |
| | (9.67) | (3.52) | (3.42) | (3.58) | (3.29) |
| Income | .837 | 1.065 | .824[a] | 1.075 | 1.423 |
| | (3.50) | (2.56) | (1.49) | (2.11) | (2.40) |
| Travel Cost | −1.265 | −2.260 | −1.690 | −1.777 | −1.956 |
| | (9.88) | (7.58) | (3.75) | (5.51) | (5.32) |
| Sun | −4.614 | −2.028 | −5.638 | −3.755 | −4.407 |
| | (7.98) | (2.29) | (3.62) | (3.87) | (3.98) |
| F | 54.09 | 31.30 | 6.93 | 20.32 | 19.21 |
| Adjusted $R^2$ | .65 | .80 | .48 | .72 | .70 |
| Multicollinearity | .48 | .39 | .32 | .39 | .39 |
| Air Mode | | | | | |
| Constant | 3.827[a] | −2.599[a] | −1.14[a] | −1.074[a] | −1.661[a] |
| | (1.96) | ( .27) | ( .17) | ( .24) | ( .37) |
| Income | 2.227 | 2.207 | 1.671 | 2.180 | 2.543 |
| | (6.17) | (2.76) | (2.02) | (2.52) | (2.88) |
| Air Fare | −1.638 | −1.887 | −1.557 | −1.521 | −1.463 |
| | (5.96) | (2.89) | (2.24) | (2.91) | (2.37) |
| Sun | −1.172[a] | − .475[a] | − .064[a] | −1.197[a] | −3.586[a] |
| | (1.20) | ( .24) | ( .02) | ( .62) | (1.84) |
| F | 17.32 | 3.30 | 2.04 | 3.71 | 5.36 |
| Adjusted $R^2$ | .35 | .23 | .14[a] | .26 | .36 |
| Multicollinearity | .61 | .57 | .53 | .53 | .55 |

[a]: Not significant at five-percent confidence level

greater than .32. All independent variables have coefficients significant at five per cent except sun, 1964. Per-capita income elasticity ranges from about 1.2 to 1.9, while the travel cost proxy (miles) has an estimate close to -2.0 in all cases. Sun estimates range from -3.2 to -4.9 where significant.

The auto mode equations show values from $R^2$ from .48 to .80, all significant at five per cent or better. Matrix determinants are similar to those for all modes. Coefficient t-values indicate significance at five per cent except for per-capita income, 1965. Ranges for elasticity estimates are: per-capita income, 0.8 to 1.4; auto cost, -1.3 to -2.3; sun, -2.0 to -4.6.

Air mode $R^2$ values are quite low, ranging from .14 to .36, but the equations are significant at five per cent or better except for 1965. The matrix determinant is relatively high. Coefficient estimates are significant at five per cent for the economic variables. Sun has a consistently insignificant estimate, but the sign is correct in all cases. The income elasticity is between 1.7 and 2.5, while air fare ranges from -1.5 to -1.8.

*Beta Coefficients: Table Three:*

Beta coefficients from Table Three indicate that for total tourist all mode and auto mode regressions, population and the travel cost proxy variables share relatively equal importance in terms of explanatory power. Per-capita income is somewhat less powerful, while sun, in most

TABLE 3

Beta Coefficients for Total and Per Capita Tourism Equations

| Total Tourists | All Years | 1964 | 1965 | 1967 | 1968 |
|---|---|---|---|---|---|
| All Modes | | | | | |
| Population | .794 | .835 | .777 | .877 | .714 |
| Income | .507 | .556 | .443 | .472 | .591 |
| Miles | − .864 | −1.124 | − .790 | − .872 | − .852 |
| Sun | − .309 | − .134 | − .423 | − .342 | − .368 |
| Auto Mode | | | | | |
| Population | .783 | .806 | .754 | .836 | .743 |
| Income | .337 | .476 | .336 | .399 | .475 |
| Travel Cost | − .793 | −1.145 | − .726 | − .884 | − .892 |
| Sun | − .448 | − .195 | − .475 | − .392 | − .419 |
| Air Mode | | | | | |
| Population | .530 | .634 | .563 | .643 | .312 |
| Income | .519 | .511 | .419 | .442 | .753 |
| Air Fare | − .459 | − .549 | − .449 | − .527 | − .483 |
| Sun | − .074 | − .028 | − .001 | − .095 | − .171 |
| **Per Capita Tourists** | **All Years** | **1964** | **1965** | **1967** | **1968** |
| All Modes | | | | | |
| Income | .557 | .532 | .586 | .541 | .595 |
| Miles | −1.047 | −1.217 | −1.216 | −1.072 | − .982 |
| Sun | − .388 | − .170 | − .669 | − .419 | − .450 |
| Auto Mode | | | | | |
| Income | .314 | .385 | .379 | .374 | .434 |
| Travel Cost | − .888 | −1.128 | −1.018 | − .961 | − .949 |
| Sun | − .514 | − .221 | − .683 | − .444 | − .467 |
| Air Mode | | | | | |
| Income | .668 | .710 | .536 | .618 | .647 |
| Air Fare | − .634 | − .736 | − .613 | − .703 | − .526 |
| Sun | − .104 | − .046 | − .005 | − .115 | − .317 |

cases, is least important. For air mode, most equations show that population, per-capita income, and air fare have nearly equal explanatory power. Sun has very little influence.

For per-capita tourists, all modes and auto mode equations show that travel costs, per-capita income and sun are of declining importance in explanatory power. For per-capita air mode, air fare and per-capita income are again equally important with sun relatively unimportant.

Some independent variables show simple order correlations of greater than .5, as indicated in Table Four. However, the relationships between independent and dependent variables appear strong enough to overcome interdependence in most cases. This is evidenced by consistently strong statistical test measures throughout the study. We assume, therefore, that results are not seriously undermined by problems of multicollinearity.

Statistical tests for slope and intercept constancy indicate that there are no statistically significant differences between years. In no case was the relevant F-value greater than 1.9, which is well below a significance level of five per cent.[11] This indicates that pooling data for all years is a legitimate exercise since no dramatic change in variables not included in the study, such as tastes and preferences, appears to have occurred.

## V. CONCLUSIONS

Empirical results generated in this study validate the model reasonably well as indicated by the tests of explanatory power and statistical significance. Income and travel costs are the primary economic determinants of tourist travel to Florida. The effect of home-state climatic conditions also influences the demand for Florida vacations.

When population is used as an independent variable, the results indicate that a hypothesis of unitary elasticity cannot be rejected. Population consistently had an elasticity estimate within one standard deviation of unity. Thus, when estimating Florida tourism, it appears that elasticity estimates for income and travel cost will be relatively unaffected whether total or per-capita tourists is the dependent variable.

TABLE 4

Simple Order Correlation Coefficients with Data Combined for All Years

| | Income | Miles | Travel Cost | Air Fare | Sun |
|---|---|---|---|---|---|
| Population | .56 | .51 | .49 | .37 | .11 |
| Income | – | .69 | .71 | .57 | −.16 |
| Miles | – | – | .93 | .94 | −.08 |
| Travel Cost | – | – | – | .87 | −.17 |
| Air Fare | – | – | – | – | −.02 |

Income elasticity estimates were consistently greater than one, suggesting that Florida tourism will grow or decline proportionately faster than per-capita income. Income elasticity estimates for air travelers are somewhat higher than those for auto travelers; air travelers will therefore be relatively more responsive to income changes. Travel cost elasticities are relatively high for all travel categories investigated. The mean value of travel cost elasticity consistently ranged between -1.5 and -2.0, implying a substantial consumer reaction to a rise or fall in the cost of travel.

The empirical results suggest that Florida tourism will be quite strongly affected by changing economic conditions. This conclusion is reinforced by the fact that Florida income and tax revenues have suffered substantially during the recent economic recession coupled with a significant rise in travel costs.

Multicollinearity is not considered to be a serious problem in the regressions. Chow tests indicate that slopes and intercepts have remained relatively constant over the time period from which data were drawn. Although air travel equations may be biased due to the residual nature of the dependent variable, we believe that useful information has been generated.

The authors regard this study as an initial, but important step in analyzing the demand for Florida Tourist travel. The simple gravity model with relatively few variables has been effectively used to explain variation in tourism flows by travel mode. The major determinants of tourism have been observations which are relatively small in number so that an extensive independent variable set could not be tested. Other variables which might be important but we have neglected include the cost of alternative vacations, degree of urbanization in the local area, family size, and so on. When more disaggregated data becomes available, a less truncated model will be tested. Hopefully, the study will be useful to other researchers as they seek to analyze tourist impacted areas.

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FOOTNOTES

[1]See *Florida Tourist Study* (Tallahassee, Florida: Florida Development Commission), selected issues. The *Study* defines a tourist as "an out of state resident who stays at least one night in the state for reasons other than necessary layover for transportation connections or for strictly business purposes. Visitors on one day shopping trips, those only in transit to points outside the United States, and those visiting Florida for business reasons only are not classified as tourists nor are out of state military personnel stationed in Florida or out of state students.

[2]For a discussion of the impact of tourists on Florida revenue collections, see Garey C. Durden, *A theoretical and Empirical Analysis of the Relationship Between Tourists and Florida Revenues with Forecasts of Tourists and Taxes for Selected Categories*, (Florida State University, Tallahassee, Florida, 1973). Unpublished doctoral dissertation.

[3]For an example of multivariate regression analysis used with a gravity model in travel demand studies see, Bernard Malamud, "Gravity Model Calibration of Tourist Travel to Las Vegas," *Journal of Leisure Research*, Vol. 5, No. 4, (Fall, 1973) pp. 23-33. For a further elaboration on gravity models, see "An Economic Derivation of the Gravity Law of Spatial Interaction," *Journal of Regional Science*, (1969), pp. 273-82.

[4]Previous studies have generally not included estimates of total tourists, preferring to estimate per-capita tourism only. Such an approach is based on the assumption that population changes and changes in tourists are unitarily proportional. Under strictly ceterisparibus conditions this would be the case. These assumptions, however, may not be entirely appropriate. If population characteristics should vary systematically with population size, then Florida tourism could conceivably be affected. In our highly aggregated data, this seems possible. Larger populations, for example, may be related to higher urban density which could lead to an increased relative demand for Florida vacations as cramped city dwellers seek to escape the urban rat race. Additionally, there is no specific need to delete population as a predictor if multicollinearity is not a problem.

[5]An attempt to capture the effect of cyclical economic conditions was also made in preliminary regressions but coefficients were generally insignificant. Various proxies were used including state unemployment rate, lagged state unemployment rate and ratio of previous to current year's unemployment rate. Our findings support those of Malamud [8] in his study of Las Vegas tourism. A relative travel cost variable, ratio of air fare to auto travel costs, was also used in preliminary regressions, but this too proved unsatisfactory. Our conclusion is that automobiles and airplanes are not particularly good travel substitutes. However, results may possibly be different where data are less aggregated, and more degrees of freedom are possible.

[6]Beta coefficients are computed in terms of standard deviations. This leads to a comparison of relative explanatory power between members of the independent variable set. The methodology for converting partial coefficients into units of standard deviations may be found in: Yamane, Taro, *Statistics, An Introductory Analysis*, (Harper & Row, New York), 1969, pp. 761-63.

[7]See Gregory C. Chow, "Tests of Equality Between Sets of Coefficients in Two Linear Regressions." *Econometrica*, Vol. 28 (July, 1960) pp. 382-93, and Domar Gugarati, "Use of Dummy Variables in Testing for Equality Between Sets of Coefficients in Linear Regression: A Generalization," *American Statistician*, Vol. 24, No. 5 (December, 1970), pp. 18-22.

The statistical test used is F=

$$\frac{[RSS(HN) - RSS(HA)] / n}{RSS(HA) / (T - k)}$$

where: RSS = residual sum of squares
HN = null hypothesis, parameters equivalent
HA = alternative hypothesis, parameters not equivalent
(T - k) = number of degrees of freedom under HA
n = number of restrictions required

[8]The regression package used (Q.S.A.S.E.) automatically computes the determinant of the correlation matrix of independent variables. The determinant will have a value between zero (perfect multicollinearity) and one (perfect orthagonality). For all regressions the determinant value was greater than .2, which appears to indicate a relatively strong degree of orthagonality, since t-values were also high.

[9]Tourist totals were available for only North Carolina, Kentucky, New York, Georgia, Ohio, Pennsylvania, Alabama, New Jersey, Illinois, Michigan, Indiana, Virginia, Tennessee, Louisiana, Massachusetts, Maryland, Texas, California, South Carolina, Missouri, Connecticut, Mississippi, Wisconsin, and Minnesota.

[10]In the pooled regressions, the lodging cost variable was multiplied by the consumer price

index for the relevant year. The per-capita income variable was divided by the appropriate consumer price index.

[11]Individual as well as groups of variables and constants taken together were tested for statistically significant differences between years. For example, intercept estimates were tested by including a dummy variable for three years, holding the fourth year as the excluded base. Subsequently, a single dummy for each year was tested, holding the other three years in the base. Slope estimates were tested similarly. Slope estimates for each year were separated by multiplying observations of the relevant variable by one for that year and by zero for the other three years.