Using the TCM to Estimate Fresh-Water Based Recreation in North Central Florida

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Introduction

- The spring systems are unique to North Central Florida and attracts hundred of thousands of visitors worldwide.
- While tourism is an important industry for the economy of Florida, recreational demand are increasing to these natural sites.
- A non-market valuation will determine how individual households perceive the welfare value of the spring sites.
- The four study sites for this study are: Fanning Springs State Park, Ichetucknee Springs State Park, Blue Springs, Madison Blue Springs State Park.

Objective

- Determine if the physical water measures can be estimated in the Travel cost models (TCM)
- Conduct a sensitivity analysis of the fraction of the wage rate to see the changes in consumer surplus.
- Determine if there is a link between perceptions of the sites and individual trip demand.

Data

- The data was collected from four spring study sites from May 2016 to August 2016. Information from the questionnaire consisted of trip frequency, site characteristics, types of activities done on site, and demographics information. Physical water quality data were obtained from the Suwannee River Water Management District (SRWMD).
- The travel cost was estimated using a Google API measuring the site zip code to the respondents home zip code. Other contributing variables were the cost of operating a vehicle from AAA, the standard wage fraction rate of 1/3, and total hours worked per year.
- Several dummy variables were used to determine the effect of site characteristics, income and education.

Methods

- The data collected from an on-site questionnaire is considered to be count data and requires the use of a Poisson model (Parsons, 2003):

$$\Pr(R) = \frac{\exp(-\lambda)\cdot\lambda^{R}}{R!} \quad ,R = 0,1,2,\dots,R$$

where R, is the number of trips made.

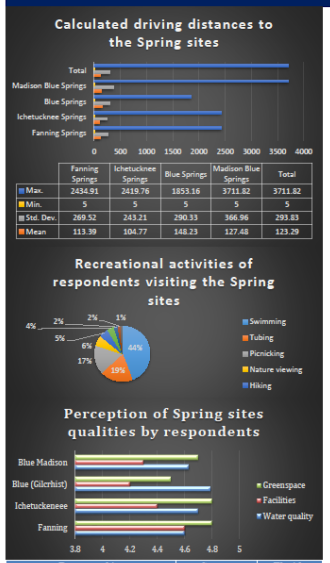
- Due to overdispersion from the questionnaire the negative binomial model can be used :

$$\Pr(R_i) = \frac{\Gamma(R_i+\frac{1}{\alpha})}{\Gamma(R_i+1)\Gamma(\frac{1}{\alpha})}\left(\frac{\frac{1}{\alpha}}{\frac{1}{\alpha}+\lambda}\right)^{\frac{1}{\alpha}}\left(\frac{\lambda}{\frac{1}{\alpha}+\lambda}\right)^{R_i}$$

where α represents overdispersion, if α is greater than zero overdispersion occurs, equal to zero the model will collapse to the Poisson model.

- In addition to an issue of endogenous stratification occurs resulting in a correction method by removing 1 trip from the reported trip (Shaw,1988) .

Results



	Fanning Springs	Ichetucknee Springs	Blue Springs	Madison Blue Springs	Total
Max.	2434.91	2419.76	1853.16	3711.82	3711.82
Min.	5	5	5	5	5
Std. Dev.	269.52	243.21	290.33	366.96	293.83
Mean	113.39	104.77	148.23	127.48	123.29

Demographics	Survey Respondents	Florida Census
Gender		
Female	55%	51.5%
Male	45%	48.5%
Household income (median)	$60,000	$47,212
Education		
High school graduate or higher degree	95%	86.5%
Bachelor's degree or higher	54%	26.8%
Household size	2.2	2.62
Percent in labor force (full-time)	59%	59.2%
Age (mean)	41	40

- The high standard deviation implies respondents are driving longer distances to the visit the spring sites
- Majority of the reported activities involved some form of water contact during each visit
- More than 50% of respondents had a positive view on the site amenities and characteristics of each site visited
- A breakdown of the demographics of respondents compared to the Florida Census

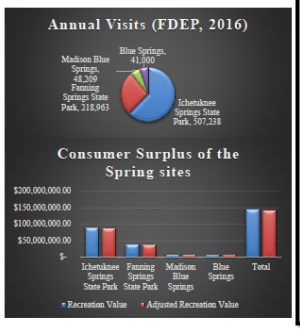
	Model1	Model2	Model3
Lncost	-0.383*** (0.046)	-0.383*** (0.046)	-0.378*** (0.047)
Income Below	0.146 (0.171)	0.155 (0.173)	0.130 (0.174)
Income Average	-0.008 (0.134)	0.009 (0.136)	0.014 (0.137)
Clarity	0.204* (0.113)		
Facilities	-0.085 (0.094)		
Greenspace	0.057 (0.112)		
Clarityd		-0.272* (0.148)	
Facilitiesd		-0.013 (0.137)	
Greenspaced		0.079 (0.171)	
Nitrogen monthly			0.034 (0.038)
Constant	2.844*** (0.323)	3.199*** (0.299)	2.943*** (0.298)
Lnalpha	-0.198*** (0.067)	-0.195*** (0.068)	-0.185*** (0.066)
Observations	468	468	468
AIC	2219	2220	2220
BIC	2252	2253	2245

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Negative binomial estimation of TCM

	Model1	Model2	Model3
Lncost(2/3 wage)	-0.394*** (0.047)		
Income Below	0.138 (0.177)	0.196 (0.173)	0.164 (0.176)
Income Average	0.001 (0.141)	0.035 (0.140)	0.016 (0.141)
Private	-0.032 (0.134)	-0.037 (0.134)	-0.035 (0.134)
Lncost(1/3 wage)		-0.393*** (0.046)	
Lncost(1/2 wage)			-0.393*** (0.046)
Constant	3.117*** (0.281)	3.003*** (0.287)	3.064*** (0.274)
Lnalpha	-0.182*** (0.065)	-0.183*** (0.065)	-0.182*** (0.065)
Observations	468	468	468
AIC	2221	2221	2221
BIC	2246	2246	2246

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Wage fraction analysis

- Wage analysis using different levels of the wage fraction rate
- Estimated output for TCM



- The estimated total CS for the Spring sites with wage analysis with annual visitors

	Model 1	Model 1 OR
Current trips	0.041* (0.021)	1.041** (0.021)
Income Below	0.022 (0.344)	1.022 (0.336)
Income Average	0.007 (0.257)	1.007 (0.265)
College Educated	0.384 (0.249)	1.469 (0.369)
Water	-0.510* (0.272)	0.600* (0.162)
Nitrogen monthly	0.232*** (0.070)	1.261*** (0.084)
Constant cut1	1.798*** (0.357)	6.035*** (2.304)
Constant cut2	3.618*** (0.414)	37.259*** (15.985)
Observations	467	467
AIC	615.6	615.6
BIC	648.8	648.8

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Ordered logistic regression determining perception link

- Determining perception's relationship with visitors

Conclusion

- The TCM analyzing physical water measures are not statistically significant and cannot be explained using this method.
- The wage fraction analysis shows marginal impacts with CS being revised downward with the wage level of 1/3 and 1/2.
- The perception link cannot be determined using the ordered logistic model.

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