Three Essays on Non-Market Valuation Applications

by

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A dissertation submitted to the Graduate Faculty of
Auburn University
in partial fulfillment of the
requirements for the Degree of
Doctor of Philosophy

Auburn, Alabama
December, 12, 2015

Hedonic Prices, Recreational Demand, Tourism, Seafood, Consumer Preferences

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Abstract

This dissertation is organized into three topics using nonmarket valuation applications. The first topic examines the demand behavior of recreational participants to the coastal counties in Alabama and Mississippi and their preferences for a variety of recreational attributes. The second topic examines these same tourists, and how preferences for specific seafood products affect seafood consumption during visits. The final topic examines households' valuation for locational choice attributes using hedonic price applications. The results are presented in three separate chapters (2, 3, 4).

The first topic estimates recreational site demand to the Alabama & Mississippi Gulf Coast Region (GCR) for multiple attributes using travel cost analysis and contingent valuation of beach access. This research is important for understanding tourists' recreational demand for attributes in the GCR. These communities are heavily dependent on tourism, therefore this research is especially important to policy makers and local stakeholders in need of accurate estimates of the benefits of offering specific attributes to tourist during visits. Negative binomial and zero inflated binomial modeling are used to estimate both the visitation rate and recreational values of GCR attributes (ie: beach, boating, ecotourism, casinos, lodging, etc.). Moreover, these models are used because of they deal with issue of data truncation resulting from the non-negative and integer nature of trip counts and the over dispersion of zeros in the data.

The second topic analyzes GCR tourists' preferences for specific attributes of seafood when choosing to consume during visits. When modeling the choice to consume GCR seafood,

the perceptions of product attributes are determined endogenously. To control for this endogeneity, a random utility model is used to examine tourists' choice to consume seafood during coastal visits. Moreover, how tourists' preferences for specific attributes (i.e., labels) affect this choice, specifically after considering the Deep Water Horizon oil spill. How tourist value these attributes is important to GCR policy makers and the local seafood industry, specifically on how to create value-added for local resources.

The final topic investigates changes in local governmental policies in Los Angeles, California that impact medical marijuana dispensary (MMD) locations. Using MMD data for the county of Los Angeles CA, as well as property sales data and demographic census data, a difference in difference (DD) hedonic housing price model will be used to calculate the change in price due to a change in neighborhood quality before and after a change in city statutes that caused the closing of over 70% of MMD facilities. I follow using a selection model to estimate the impact on residential location choice and neighborhood stratification. My hypothesis is that the closer a MMD site is located to a specific property; the price of the property will decrease at an increasing rate.

Acknowledgements

I would like to acknowledge everyone who has helped provide support in any capacity throughout this process. I would like to especially thank Dr. Diane Hite, because without her guidance this completion of this process would not have been possible. I would like to acknowledge the Department of Agricultural Economics & Rural Sociology for all the support provided at the departmental level, and for helping to fill our hallways and offices with insightful faculty who were willing to engage and push students forward. I would also like to thank my committee members, Dr. Valentina Hartarska, Dr. Denis Nadolnyak, and Dr. Terrill Hanson for their invaluable comments and help they provided over the years. Last but not least my parents, Samuel & Pamela Robinson who have pushed me towards excellence my entire life. Also, I want to thank the rest of my family and friends for keeping me grounded and encouraging me to keep pursuing my goals.

This publication was supported by the National Sea Grant College Program of the U.S. Department of Commerce's National Oceanic and Atmospheric Administration under NOAA Grant *USM-GR03924-R/SCD-02*, the Mississippi-Alabama Sea Grant Consortium, and Auburn University. The views expressed herein do not necessarily reflect the views of any of those organizations.

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List of Abbreviations

GCR	Coastal counties of Alabama (Baldwin, Mobile) & Mississippi (Jackson, Hancock, Harrison)
WTP	Willingness to Pay
MWTP	Marginal Willingness to Pay
POI	Poisson count model
NB	Negative Binomial model
ZINB	Zero-inflated negative binomial model
TCM	Travel Cost Model
CS	Consumer Surplus
DWH	Deep Water Horizon oil spill
MMD	Medical Marijuana Dispensary

Chapter 1: Introduction

Economist use recreational demand models to estimate benefits received by visitors to an area from consumption of recreational activities and to determine the value consumers place on the factors that influence their choice of consumption. The travel cost method is a commonly used estimation technique. The model estimates the number of trips to a site which are assumed to be related to travel cost incurred traveling to the site, the time cost of traveling to and from the site along with time spent at the site, as well as other demographic and/or locational variables (Parsons, 2003). Survey sampling is the most common method for gathering information on visitors to a specific area and what types of amenities are consumed during these visits. The data collected is then used to estimate recreational trip demand for sites.

In chapter two, count data models are used to estimate the demand curve for trips to the Alabama & Mississippi Gulf Coast Region (GCR) for consumption of specific coastal attributes. This is the common technique used in travel cost analysis. The main models used in the literature include Poisson, negative binomial, and double-hurdle. This research is important for understanding the resiliency of areas that share characteristics with the GCR, are frequented by tourist and experience frequent negative market shocks (ie: Deep Water Horizon oil spill, hurricanes, recessions, etc.).

Since the 1960s there has been an increased demand for seafood at the consumer level. This may be contributed to the growing perception that fresh seafood taste good and contributes to positive health benefits. During that same time there has been a steady trend of increased per capita seafood consumption along with increasing seafood prices (Edwards, 1992). The implication is that there has been a structural change in consumer preferences for seafood. This structural change can be seen in the increased willingness to prepare seafood at home versus other types of protein sources such as red meats and poultry. This is especially true for consumers of seafood landed in the GCR. The area has a rich history in seafood and plentiful fisheries.

In chapter three, I analyze the impacts of differentiated GCR seafood products specifically looking at consumers' perceptive preferences and how these products impact consumer seafood choice in the GCR. The first section deals with a brief introduction to the existing literature on seafood consumption, impacts of the Deepwater Horizon oil spill to GCR fisheries, and how public policy can help. Followed by a conceptual model using a framework based on the seminal "lens" model (Brunswick, 1952). In this study it's used to examine the impact of GCR tourists' valuations of seafood attributes on the choice to consume during coastal visits, both past and future. These attributes specifically identify consumers' perceptions of safety of products, more specifically seafood products. These perceptions of product attributes are determined endogenously when looking at the choice to consume GCR seafood. A stated preference discrete choice random utility model will be used to examine these consumers' product perceptions on the stated preference to consume seafood when traveling to the GCR. Afterwards, there is a discussion of the survey and the data used for this analysis. The next section focuses on the econometric estimation and results, and the final section considers the implication to the public decision maker agencies for deciding on potential value added information labeling for consumers. Also, how to inform local harvesters, processors, and retailers of these value added opportunities in the GCR seafood supply chain.

The final chapter investigates the effects of local governmental policies that impact medical marijuana dispensary (MMD) locations on residential location decisions and neighborhood stratification. Using MMD data for the county of Los Angeles CA, as well as property sales data and demographic census data, a difference in difference (DD) hedonic housing price model will be used to calculate the change in price due to a change in neighborhood quality before and after a change in city statutes that caused the closing of over 70% of MMD facilities. The proposed hypothesis is that the closer a MMD site is located to a specific property; the price of the property will decrease at an increasing rate. A selection model is used to capture the effects of the policy and utility changes.

Chapter 2:
Recreational Demand of Visits to the Gulf Coast Region

Economist commonly use recreational demand models to estimate benefits visitors receive from consumption of a specific site. These models also capture impacts of recreational activities consumed and help to determine the value consumers place on the factors that influence their choice to visit a site. Households spend leisure time pursuing a variety of recreational activities. Policy makers need accurate estimates of the benefits and costs of actions that affect the quality and quantity of available recreation activities. The travel cost method (TCM) is a commonly used estimation method. The model estimates that the number of trips to a site are assumed to be related to travel cost incurred getting to the site, time traveling to and from the site along with time spent at the site, as well as other demographic and/or locational variables (Parsons, 2003). Survey sampling is the most common method used to gather information on visitors to a specific area and what types of amenities these visitors are consuming. The data collected from the surveys is used to estimate recreational trip demand for sites.

However, some issues have to be addressed when using travel cost estimation and the interpretation of recreational demand. First, the dependent variable is often based on a count of recreational trips taken in a specific period (i.e.: year). Therefore, the individual counts of the trips taken can only take on values that are nonnegative integers. Also, data may not be collected on those who didn't make a trip, specifically when only on-site surveying techniques are used to obtain counts. Sampling on site also leads to endogenous stratification issues in the data, since frequent visitors are more likely to be sampled than less frequent visitors. This pattern can also lead to overdispersion of data, where the variance is greater than the mean usually caused by a few in the population making many trips while the majority of the population are making very few trips. However, in this study surveys were distributed to a general sample population via email thereby controlling for endogenous stratification issues. Because of these issues, negative binomial approaches are best used to obtain appropriate estimates.

Truncated count data models were first used by Shaw (1988) to estimate travel cost using survey data and Monte Carlo experiments. Count data models have been used considerably to model recreation demand (Gurmu and Trivedi, 1996; Bowker et al., 2006; English, 2008; Rolfe and Dyack, 2011) including truncated Poisson (POI) and negative binomial distribution of dependent variables, looking at demand for deer hunting (Creel and Loomis, 1990), fishing (Grogger & Carson, 1991), and boating access (Hellerstein, 1991). Englin and Shonkwiler (1995) developed a truncated, endogenously stratified negative binomial model (NB) to estimate demand of recreational hiking sites. Englin et al. (1998) applied microeconomic utility theory of demand equations to count data analysis and stressing the importance of linking economic theory in recreational demand estimation. However, empirical applications that attempt to correct for the issues associated with on-site sampling are relatively few (Ovaskainen et al., 2001; Curtis, 2002; McKean et al., 2003, 2005; Englin et al., 2003; Hagerty and Moeltner, 2005).

In this chapter, count data models are used to estimate recreational demand and consumer surplus for trips to the Alabama & Mississippi Gulf Coast Region (GCR). This is a common technique used in obtaining surplus estimates. The main models used include Poisson and negative binomial approaches, as well as a double-hurdle model approach (Shonkwiler & Shaw, 1996). Ordered logit can also be used modeling the frequency of past, present and in the future visits. The data allows for consumer surplus estimates of multiple attribute bundles. These bundles form the choice sets of local consumable attributes. Negative binomial and zero inflated binomial modeling are used to estimate both the visitation rate and recreational values of GCR attributes (ie: beach, boating, ecotourism, casinos, lodging, etc.). Moreover, these models are used because of data truncation resulting from the non-negative and integer nature of trip counts and the over dispersion of zeros in the data. The double-hurdle model Contingent behavior modeling is used to estimate the value of potential increases in GCR beach quality. Marginal effects are estimated for travelers to the GCR with a willingness to pay for a 1% increase in beach nourishment.

This research is important for understanding the resiliency of areas that are frequented by tourist and experience frequent negative market shocks (ie: Deep Water Horizon oil spill, hurricanes, recessions, etc.). Many GCR communities are heavily dependent on tourism, therefore this research is especially important to policy makers and local stakeholders dependent on the health and vitality of the coast. Specifically, as it relates to lost usage during certain types of shocks, policy makers want to understand the estimated losses as well as the estimated loss of intrinsic brand value of an area (Larkin et al., 2013).

Estimation of recreational site demand by consumers using survey data is a common practice in non-market valuation literature. Count data models are mainly used to estimate recreation demand for beach access (Hof & King, 1992; Bin et al., 2005; Oh et al., 2008; Piriyapada and Wang, 2015), public park access (Bowker et al. 2006), tropical forests (DeShazo et al., 2015), wildlife and habitat restoration benefits to sports hunting (Creel & Loomis, 1990; Zawacki, 2000; Knoche et al., 2015), recreational water quality (Englin & Shonkwiler, 1990;

Loomis, 2003; Martínez-Espiñeira, 2006; Keeler et al., 2015) and recreational fishing quality and access (Train, 1998; Rolfe & Prayaga, 2007; Melstrom et al, 2015).

Methods

The TCM is a nonmarket valuation technique based in microeconomic theory. The technique is widely used to estimate economic values associated with recreational sites. TCM is a revealed preference approach; that is, the actual expenditures by recreational participants are used to derive demand and economic benefits (Loomis, 2003). Although the demand for a recreational site can be modeled as aggregate or market demand, usually demand functions are estimated at the individual level and an aggregate value is estimated as the sum of individuals' values (Parsons, 2003). This model can be further modified to treat all observations to multiple sites as belonging to a single demand equation (Parsons 2003).

Zawacki *et al*. (2000) estimated national TCM of recreational wildlife watching using the single equation approach for multiple sites TCM. The basic conceptual framework for estimating demand for recreational trips using this model is set up as utility maximization function

$$MaxU_Y = f(y, z, S, R);\ s.t. \begin{cases} Z + C \cdot Y = I + p_w t_w\ (income\ constraint) \\ t_w + (t' + t'')Y = T(time\ constraint) \end{cases} \quad (2.1)$$

where $U(\cdot)$ is a quasi-concave utility function, y is the number of recreational GCR trips taken, z is a vector of consumed GCR goods, C is the cost of a trip, S is socioeconomic characteristics of individuals, A is the cost of substitutes, R is the resource supply of site attributes, I is visitor's income that is exogenous to the model, t_w is the time spent working, t' is the travel time to the GCR, t'' is the time spent in the GCR, and T is the total time available. Taking the first order condition

$$\frac{\partial U / \partial Y}{\lambda} = C + \frac{\mu}{\lambda}(t' + t'') \tag{2.2}$$

the Lagrangian multiplier μ represents the marginal utility of time while $\frac{\mu}{\lambda}$ is the marginal WTP for time. Therefore, (2.2) shows that the marginal willingness to pay (MWTP) should be the same as a household's full cost of visit (Parsons, 2003). Therefore, the model is able to estimate a demand function dependent on the TC of visiting the GCR, the resource supply of attributes and amenities, and the income of the visitor. Consumer surplus (CS) is usually estimated as a measure of economic welfare (Zawacki et al., 2000). CS is the difference between a consumer's MWTP for a good or service and the actual expenditure. In the TCM framework, CS is the area under the estimated demand curve for trips but above the price line.

The model assumes that time is an opportunity cost and can serve as a proxy for travel cost. According to Becker's (1965) theory of household production, household's demand for market and non-market goods are not just a means of consumption, but a way to produce utility from the movement of these goods and services. Therefore, utility is not only derived directly from the consumption of a product, but also from the indirect utility gains from convenience of use. This theory is important for understanding the relationship between consumers and non-market goods. More specifically, that there is an intrinsic value in non-market goods as well as explicit value explained directly in the utility function. Thereby, making time spent away from production can be used as an appropriate proxy for estimating opportunity cost during travel to the GCR.

Recreational site visits are generated by a stochastic process; dependent on the sampling method used. The dependent variable representing the number, or count, of visits is assumed to have a continuous discrete distribution. Count data models have grown in usage because the recreation visits are non-negative integers, and count data models are best for estimation. These models also assume a semi-log demand functional form, which is quite useful for interpretation of estimates. Standard Poison (POI) and negative binomial (NB) count data models are commonly used in recreational demand studies to account for the integer nature of trip data (Loomis, 2003; Hellerstein, 1991; Shaw, 1988). Since a few recreational participants usually make a large number of trips compared to the others, the variance is often larger than the mean for trip data (Martinez-Espineira and Amoako-Tuffour, 2008). This phenomenon is called overdispersion. In the presence of overdispersion the POI model gives biased and inconsistent estimates (Grogger and Carson, 1991). The NB model is appropriate to use with over dispersed data. The double-hurdle model (DH) model controls for this problem by separating the decision to make visits into two parts, one being some potentially observable characteristic that led to non-participation and the traditional non-participation corner solution (Shonkweiler & Shaw, 1996)

The Poisson probability mass function is

$$\Pr(Y = y_i) = \frac{e^{-\lambda}\lambda_i^{y_i}}{y_i!}, y_i \in \{0\} \cup \mathbb{Z}^+ \tag{2.3}$$

with i=1,….,n observations. The mean *E[Y]*= λ_i and *Var(Y)*= λ_i. Equation (2.3) is assumes y_i to be *i.d.d. Poisson* (λ_i), and λ_i is assumed to be a function of a 1 x k vector of covariates x_i and k x1 vector of coefficients β_i, where the functional form of the parameterization for the conditional mean is

$$E[Y|X] = \lambda_i = \exp(x_i'\beta) \tag{2.4}$$

The Poisson model assumes the conditional mean, λ_i, is equal to conditional variance, overdispersion occurs when the conditional variance exceeds the conditional mean. See Cameron and Trivedi (2009) for more information on issues involving the estimator. While there have been attempts to correct for this specification issue, the more popular approach is to use a NB technique.

The NB probability density function for the NB can be written as

$$\Pr(Y=y_i)=\frac{\Gamma(y_i+r)}{\Gamma(r)\Gamma(y_i+1)}p^r(1-p)^{y_i}, y_i\in\{0\}\cup\mathbb{Z}^+ \tag{2.5}$$

where $\Gamma(\cdot)$ is the gamma function, with mean and variance as $E[Y]=\mu=r\frac{1-p}{p}$ and $Var(Y)=r\frac{1-p}{p^2}$. Parameterizing r and p in terms of α and μ, defines $\alpha=\frac{1}{r}$, and $\mu=\frac{1-p}{\alpha p}$, while solving yields $p=\frac{1}{1+\alpha p}$, and finally rewriting (2.5) as

$$\Pr(Y=y_i)=\frac{\Gamma(y_i+\frac{1}{\alpha})}{\Gamma(\frac{1}{\alpha})\Gamma(y_i+1)}(\frac{1}{1+\alpha\mu})^{\frac{1}{\alpha}}(\frac{\alpha\mu}{1+\alpha p})^{y_i} \tag{2.6}$$

The mean and variance of (2.6) is $E[Y]=\mu$ and $Var(Y)=\mu+\alpha\mu^2$ (Cameron & Trivedi, 2009). This is especially interesting for two reasons. First, (2.6) has a quadratic variance function, which allows for versatility of the model to reduce to a POI when $\alpha=0$. Secondly, the error term is specified in the mean, and reflects unobserved heterogeneity with a gamma distribution. Some studies have estimated (2.6) mixing the distribution between Poisson-gamma and Poisson-beta (Johnson et al., 2005). The NB likelihood function is

$$\ell(\mu_i|\alpha,y_i)=\sum_{i=1}^{n}[y_i\ln\left(\frac{\alpha\mu_i}{\alpha\mu_i+1}\right)-\frac{1}{\alpha}\ln(\alpha\mu_i+1)+ln\Gamma\left(y_i+\frac{1}{\alpha}\right)-ln\Gamma(y_i+1)-ln\Gamma\left(\frac{1}{\alpha}\right)] \tag{2.7}$$

If the conditional mean is correctly specified, βs will consistently produce the correct standard errors, but α will not be. Cameron & Trivedi (2009) give an in-depth analysis of the asymptotic maximum likelihood estimator, first order conditions, and Fisher information matrix. This study also estimates counts using the zero-inflated negative binomial model (ZINB), which by design helps to control for large counts of nonparticipation.

However, this study uses the double hurdle model (DH) introduced by Shonkwiler & Shaw (1996) where they focused specifically on nonparticipation.

Data

A survey of adult tourists was conducted during the summer of 2013. The surveys were used to obtain information about tourists' recreational usage of coastal resources and changes in intended behavior of visitors to the Alabama (Baldwin & Mobile) and Mississippi (Jackson, Hancock, Harrison) coastal counties based on improved beach quality after the Deepwater Horizon oil spill (DWH). Surveys were created and distributed using Qualtrics survey software. Survey Sampling International (SSI), a third party distributor, was used to access a nationally representative population. Directions for the survey along with an access link were distributed to SSI panels. A total of 11017 people were invited to participate. Overall, 2478 adults responded, for a response rate of 22%. The complete survey with summary statistics can be found inside the Appendix.

The survey was used to collect information pertaining to respondents' visits to the area, visits to alternative coastal areas, and germane demographic information. Of the 2478 respondents, 563 respondents reported visiting the GCR, about 23% of the sample. They provided information on activities consumed during visits, how accessibility to specific coastal attributes contributes to the decision to visit the area, and attribute/activity information for alternative sites. This information included expenditures by category on the most recent visit. Expenditure categories included travel expenses, lodging, restaurants, and various other recreational activities associated with coastal resource accessibility (i.e.: beaches, natural areas for ecotourism, recreational boating, seafood consumption etc.). The survey collected additional information on observed and contingent value of beach preservation following the aftermath of the DWH. Respondents reported the count of past, current year, and future trips taken to the GCR and alternative coastal destinations. They also reported time spent traveling, distance travelled, and size of traveling party. Table 2.1 gives a detailed description of some of the variables used in estimation. These variables are the primary variables used in recreational demand recreation.

Table 2.1. Variable Description

	Obs	Description
GCR Visits	1430	Count of trips taken to either Alabama and/or Mississippi coastal counties
GCR Travel Cost (Fixed Zip)	11009	Travel cost to visit GCR= Opportunity Cost of Income for travel time, Car depreciation, and expenditures within the GCR, interacted with zip code of place of origin.
Alternate Site Travel Cost	1262	Travel cost to visit Alternative Site= Opportunity Cost of Income for travel time, Car depreciation, and expenditures within the Alternative site during visit
Income	2408	Predicted income= f(age, gender, race, ethnicity, upper/lower level intervals of stated income categories)
Days Spent in the GCR	1430	Days spent during most recent GCR visit
Size of Party during Visit	1431	Size of traveling party during most recent GCR visit

Travel cost was predicted following Parsons (2003) method, which incorporates opportunity cost of round trip travel to site and time spent while visiting site. First round trip travel time was calculated as distance in miles from zip code of origin centroid, calculated using ArcGis 10, multiplied by two (round trip) and dividing the product by fifty five to convert to time variable. The same method was used to round trip time to alternate sites as well. Car depreciation was calculated as distance in miles from zip code of origin centroid multiplied by forty five one hundredths, which is the mileage rate offered for travel by the State of Alabama to employees. Next, income is estimated, using interval regression techniques, as a function of demographic variables observed in the data. Table 2.2 gives the estimation results for the predicted income variable. These results are consistent with expectations of sociodemographic impacts to income prediction. The variable for age ranges show that those between from 25-64 increase income, as well as those who identify racially as Asian. While those reporting to be female decrease income estimates, those who are from racial minority communities other than

Asian decrease income estimates in comparison to those who racially identify as white. These parameter estimates are consistent with nationally representative demographic information. The estimated income value is then used to calculate opportunity cost of lost income resulting from visiting a site, where opportunity cost equals predicted income divided by two thousand[1] then divided by three[2], the quotient is then multiplied by round trip travel time. This provides a value of lost income during travel. The product is then added to car depreciation cost and total visit expenditures[3] to develop a variable meant to represent revealed travel cost from respondents.

Table 2.2. Predicted Income From Categories Using Interval Regression

VARIABLES	Predicted Income
25-34	11,312.36397***
	(2,485.532)
35-44	18,493.72576***
	(2,818.050)
45-54	13,219.46643***
	(2,675.335)
55-64	15,332.19946***
	(5,472.343)
Female	-6,249.43181***
	(1,822.670)
Black or African American	-11596.58099***
	(2,244.351)
American Indian and Alaska Native	-18769.75482***
	(6,575.580)
Asian	5,560.80376*
	(3,365.968)
Two or More Races	-9,816.32889*
	(5,660.225)
Non-Hispanic	-1,449.69023
	(3,958.423)
zip	-0.06157*
	(0.032)
Constant	56,555.94713***
	(4,893.647)
lnsigma	10.65353***
	(0.023)
Observations	2,407

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

[2] Proportion of income lost
[3] Calculated for GCR and alternate site visits

Table 2.3 lists these variables and summary statistics. In the nationally representative population, mean car usage cost to travel to the GCR is about $300.00 more than car usage cost to alternative sites. This could represent that alternative coastal sites visited are on average closer to the place of origin for GCR visitors. Examining the difference between miles traveled can also capture this. However, alternate site expenditures are more while travel time is less. Therefore, the alternate sites are closer to the point of origin for visitors and visitors spend more at alternate site locations.

Table 2.3. Summary Statistics for Calculation of Travel Cost Variables

Variable	Observations	Mean	Std. Dev.	Min	Max
Car Usage Cost	10891	456.4896	286.4822	2.80E-08	2546.472
GCR Miles Traveled	10891	1014.421	636.6271	6.21E-08	5658.826
Alternate Site Car Usage Cost	2606	144.0209	413.4533	0	9000
Alternate Site Miles Traveled	1427	584.4718	1177.903	0	20000
GCR Travel Cost	11009	687.3237	93.02247	527.0974	871.5966
Opportunity Cost/Hour	2412	9.605717	1.452339	4.339078	12.7394
GCR Round Trip Travel Time	10891	36.88805	23.15008	2.26E-09	205.7755
GCR Stated Expenditure	1430	546.1042	1710.299	0	45542
Alternate Site Travel Cost	1262	1196.263	1561.043	0	11076.5
Alternate Site Round Trip Travel Time	2606	11.63806	33.41037	0	727.2727
Alternate Site Stated Expenditure	1427	1080.92	1713.183	0	25000

Contingent value (CV) information was collected to estimate willingness to pay (WTP) for future beach access at pre-DWH quality levels. Respondents were given two categories of CV questions, with future beach access for future family generations at pre-DWH quality levels, the bequest value, and without future access or the existence value. Both questions used random assignment of CV at different WTP levels, from less than or equal to $5.00 to greater than or equal to $80.00. Respondents also reported if they were willing to give any positive amount and if so were given the option to report the WTP amount. Table 2.4 reports summary statistics of the variables used to estimate GCR bequest and existence value. The mean bequest price is $37.91, and the mean existence price is $29.18. This suggest that ensuring GCR resource attribute supply quality for future generations garners a higher WTP for access then just allowing the attribute supply quality to exist without expected future usage. Therefore, it is necessary to look deeper into what impacts the MWTP.

Table 2.4a. Summary Statistics for Calculation of Contingent Valuation of Recreational Coastal Quality Enhancement Variables

Variable	Observations	Mean	Std. Dev.	Min	Max
Pr(Bequest Payment)	1208	0.4684041	0.0939055	3.94E-13	0.8547641
Bequest Access	1407	0.4712154	0.4993482	0	1
Bequest Price	1362	37.91373	192.9992	0	6787
Pr(Existence Value)	1237	0.4461831	0.1177795	0.0142035	0.8487005
Existence Access	1396	0.4348138	0.4959102	0	1
Existence Price	1396	29.17913	31.52423	0	427
GCR Trip Count	1430	1.154545	5.382295	0	79
19-24	2865	0.1762653	0.3811122	0	1
25-34	2865	0.2450262	0.4301778	0	1
35-44	2865	0.2069808	0.4052124	0	1
45-54	2865	0.2509599	0.4336411	0	1
55-64	2865	0.0499127	0.2178027	0	1
65 or over	2865	0.0356021	0.1853283	0	1
Female	2478	0.5613398	0.4963233	0	1
Black or African American	2474	0.1879547	0.390755	0	1
American Indian and Alaska Native	2474	0.0105093	0.1019954	0	1
Asian	2474	0.069523	0.2543929	0	1
Two or More Races	2474	0.0270816	0.1623542	0	1
Native Hawaiian and other Pacific Islander	2474	0.0036378	0.0602168	0	1
Other (please specify)	2474	0.0181892	0.133662	0	1
Non-Hispanic	2427	0.9233622	0.2660707	0	1
$15,000-24,999	2480	0.1044355	0.3058863	0	1
$25,000-34,999	2480	0.1483871	0.355555	0	1
$35,000-49,999	2480	0.1552419	0.3622082	0	1
$50,000-74,999	2480	0.2020161	0.4015852	0	1
$75,000-99,999	2480	0.1270161	0.3330582	0	1
$100,000-149,999	2480	0.0931452	0.2906944	0	1
$150,000-199,999	2480	0.028629	0.1667952	0	1
over $200,000	2480	0.0193548	0.1377965	0	1

Other data used in the study are demographic and socioeconomic variables. They include age, income, and the total expenditure for the visit, miles traveled to and days spent on site, and size of traveling party. Total travel expenditure includes living accommodations, shopping and recreational expenditure, as well as food expenditures. However, the proportion that is spent on food is assumed to be relatively low. There is also data on racial demographics, as well as ethnicity.

Table 2.4b gives summary statistics of the variables used in estimation. These results are nationally representative, and include those who participated in visits to the GCR and those who chose not to participate. The mean number of visits was 1.15, in comparison to 2.3 for the population of GCR visitors, with mean days spent on GCR 1.6 days, and average party size approximately 2. Mean travel cost for visiting the GCR is $687.32, while mean travel cost to alternate sites is $1196.26. Average predicted income is $57, 638.06, signaling that GCR recreational resource supply primarily attracts middle-income earners, who primary reason for making visits is to see family and friends, to go shopping, go to the beach, and/or eat seafood. Thee variables help to describe the bundle of GCR recreational resources that are consumable by GCR visitors.

Table 2.4b. Summary Statistics for Visits and Non-Visits

	Obs	Mean	Std. Dev.	Min	Max
GCR Visits	1430	1.154545	5.382295	0	79
GCR Travel Cost (Fixed Zip)	11009	687.3237	93.02247	527.0974	871.5966
Alternate Site Travel Cost	1262	1196.263	1561.043	0	11076.5
Income	2408	57638.06	8886.968	25494.04	79920.09
Primary Reason for GCR Visit (Categorical Variable)					
Beach going (swimming/sunbathing/etc.)	1430	.0741259	.2620673	0	1
Biking	1430	.0083916	.0912525	0	1
Sport fishing	1430	.0111888	.1052205	0	1
Concerts/Festivals/Special Events	1430	.0132867	.1145397	0	1
Cruises (dolphin watching/leisure)	1430	.0083916	.0912525	0	1
Golf	1430	.0048951	.069818	0	1
Shopping	1430	.0342657	.1819746	0	1
All types of recreational boating/boarding/kayaking	1430	.0111888	.1052205	0	1
Visiting family/friends	1430	.1055944	.3074253	0	1
Ecotourism/Wildlife viewing/Hiking	1430	.0223776	.14796	0	1
Casinos/gambling	1430	.0272727	.162934	0	1
Eat seafood	1430	.034965	.1837555	0	1
Other Sightseeing	1430	.0237762	.1524046	0	1

Table 2.4c. Summary Statistics for Visits and Non-Visits cont'd

Primary Reason for Alternative Site Visit (Categorical Variable)	Obs	Mean	Std. Dev.	Min	Max
Beach going (swimming/sunbathing/etc.)	1427	.235459	.4244341	0	1
Biking	1427	.0126139	.11164	0	1
Sport fishing	1427	.0140154	.1175954	0	1
Concerts/Festivals/Special Events	1427	.024527	.1547326	0	1
Cruises (dolphin watching/leisure)	1427	.024527	.1547326	0	1
Golf	1427	.0098108	.0985969	0	1
Shopping	1427	.0469516	.2116095	0	1
All types of recreational boating/boarding/kayaking	1427	.0224247	.148112	0	1
Visiting family/friends	1427	.1920112	.3940199	0	1
Ecotourism/Wildlife viewing/Hiking	1427	.0287316	.1671098	0	1
Casinos/gambling	1427	.0259285	.1589778	0	1
Eat seafood	1427	.0392432	.194241	0	1
Other Sightseeing	1427	.0770848	.2668194	0	1
Days Spent in the GCR	1430	1.64965	2.921827	0	42
Size of Party during Visit	1431	1.651992	6.677312	0	200

Results

Table 2.5 provides the results of the contingent valuation estimates for bequest access and existence. Price is negatively related to the probability of paying a one-time fee to ensure future quality of beach resource at pre-DWH oil spill levels. Figures 2.1 and 2.2 give a graphical illustration of this relationship. Using the parameter estimates to estimate CS for ensured beach resource quality, the bequest value CS is $909.09 while the existence value CS is $153.84. Therefore, visitors' receive eight times more benefit from having future generational access to pre-DWH oil spill beach resource quality versus having the same quality without visiting. This shows the importance of the GCR beach resource, the perception of resource quality, and accessibility. Therefore, policy makers can use this information to propagate for larger share of state resources for maintaining and improving quality of the GCR beach resource. This information can also be used to support specific types of coastal beachside development, as well as regulations for surrounding interrelated resources (i.e., near-shore, estuarine, coastal watershed, urban wetland, bay, etc.). This is especially vital for the GCR, which has a diversified working waterfront with industries spanning mineral resource extraction, extensively developed fishery, shipbuilding, natural ecosystem resource and tourism.

Table 2.5. Contingent Valuation Probit Estimation Results, Bequest and Existence Value

VARIABLES	MWTP Bequest Value	MWTP Existence Value
CV Price	-0.0011*	-0.0065***
	(0.001)	(0.002)
25-34	0.2618**	
	(0.111)	
Age 55-64	-0.5001**	-0.5234**
	(0.247)	(0.254)
Female	0.0483	
	(0.074)	
Black	0.2407**	0.2534**
	(0.115)	(0.112)
Asian	0.2748*	0.3505**
	(0.147)	(0.149)
Non-Hispanic	0.0130	0.0016
	(0.145)	(0.142)
$15,000-24,999	0.4514**	
	(0.214)	
$25,000-34,999	0.3787**	
	(0.191)	
$35,000-49,999	0.4788**	0.4994***
	(0.189)	(0.184)
$50,000-74,999	0.5258***	0.4749***
	(0.179)	(0.175)
$75,000-99,999	0.5675***	0.4415**
	(0.187)	(0.182)
$100,000-149,999	0.5392***	0.4776**
	(0.191)	(0.188)
GCR Visit Count	0.0121*	0.0002
	(0.007)	(0.008)
Constant	-0.6140***	-0.5141**
	(0.223)	(0.227)
Observations	1,203	1,237

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

$\hat{Y}_{i,j}$ estimates provide predicted probabilities of paying bequest (i) and existence (j) values. Figure 1.1 graphically illustrates the negative relationship between CV price and the probability to pay for pre-DWH beach quality with future generation accessibility, (i). As CV price presented increases, the likelihood of choosing to pay the one-time fee decreases. This is consistent with economic theory of the relationship between prices and quantities demanded. Around 47% of respondents were willing to pay some amount, with $46 as the mean amount willing to pay for bequest value and $10 receiving the highest frequency of yes responses to the CV behavior question.

Figure 2.1. Probability of Bequest Value as a Function of WTP Price

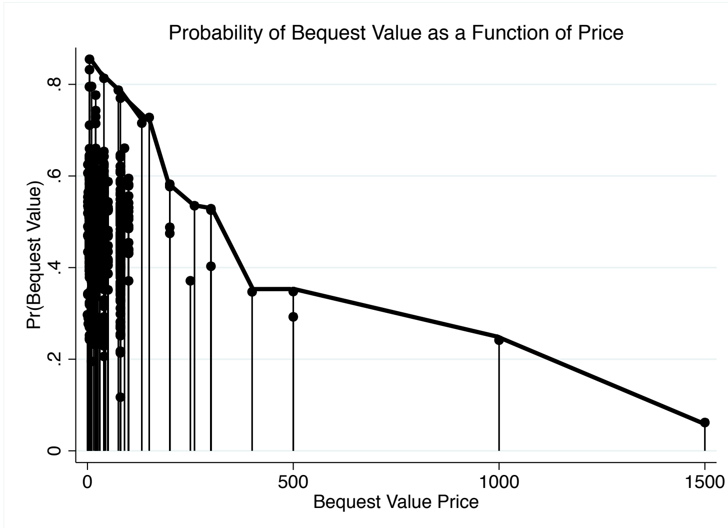
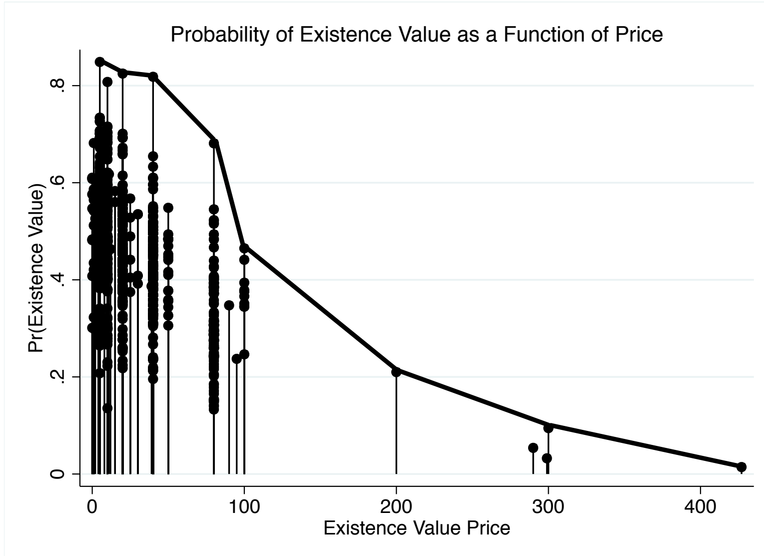


Figure 2.2 graphically illustrates the negative relationship between CV price and the probability to pay for pre-DWH beach quality regardless of future accessibility, (*j*). As CV price presented increases, the likelihood of choosing to pay the one-time fee decreases. This is consistent with economic theory of the relationship between prices and quantities demanded. Around 43% of respondents were willing to pay some amount, with $23.62 as the mean amount willing to pay for existence value and $5 receiving the highest frequency of yes responses to the CV behavior question.

Figure 2.2. Probability of Bequest Value as a Function of WTP Price



The results from three of the count models are shown in Table 2.6. These results are consistent with results from other previous studies. Travel cost and income are both negative and significant across models. This is interpreted as an increase in travel cost to visit the GCR will decrease the likelihood of visits, and those with higher incomes have a decreased likelihood of making visits compared to other income earners. These interpretations are consistent across models; with the POI model seeming to overstate parameter estimates for the travel cost variable, in comparison to the NB and ZINB models, leading to understating consumer surplus estimates. This is consistent with the NB and ZINB models ability to better control for overdispersion issues caused by zero visits. The variables used to control for zeros in the ZINB were The interpretation of these estimates can be important in determining targeted marketing or development strategies especially as it relates to surplus gains from undertaking such projects. For example, instead of investing in a high-end marina for expensive yachts to attract high-income travelers, development resources could be placed into a mixed-use marina meant to target middle-income visitors.

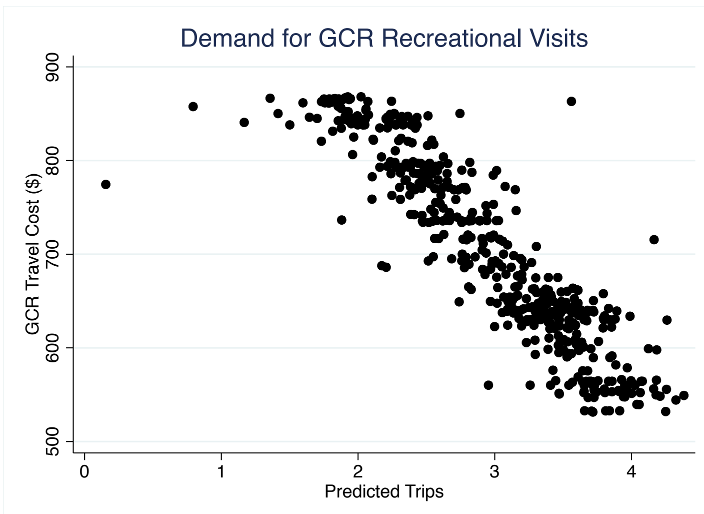
Table 2.6 . GCR Visit Count Estimates

	Poisson	Negative Binomial	Zero-Inflated
GCR Travel Cost	-0.0023*	-0.0014**	-0.0013**
	(0.001)	(0.001)	(0.001)
Alternate Site Travel Cost	0.1047*	0.0452*	0.0433*
	(0.006)	(0.003)	(0.003)
Income	-0.7818	-0.7284**	-0.7906***
	(0.614)	(0.347)	(0.328)
Beach	7.0464***	6.8378***	6.8312***
	(0.749)	(0.714)	(0.722)
Biking	6.8305***	6.7755***	6.7744***
	(0.784)	(0.755)	(0.818)
Sport Fishing	9.0477***	8.6553***	8.4369***
	(0.859)	(0.856)	(0.752)
Festivals	7.9229***	7.4974***	7.6114***
	(0.913)	(0.804)	(0.761)
Cruises	8.8212***	8.4875***	8.4749***
	(1.061)	(1.008)	(0.771)
Golf	7.5665***	7.3331***	7.3369***
	(0.900)	(0.869)	(0.858)
Shopping	6.6642***	6.6235***	6.6441***
	(0.736)	(0.721)	(0.734)
Boating	6.4211***	6.3760***	6.4323***
	(0.830)	(0.766)	(0.838)
Family/Friends	7.2545***	6.9480***	6.9525***
	(0.791)	(0.721)	(0.717)
Ecotourism	6.8576***	6.8273***	6.8772***
	(0.756)	(0.739)	(0.742)
Casinos	7.5779***	7.5725***	7.5685***
	(0.859)	(0.820)	(0.732)
Seafood	7.4005***	7.0260***	7.0400***
	(0.766)	(0.729)	(0.731)
Other Leisure	6.4233***	6.3370***	6.3213***
	(0.737)	(0.712)	(0.745)
Alternate Site Beach	-0.6606**	-0.3794**	-0.4207**
	(0.278)	(0.167)	(0.175)
Days	-0.0999*	-0.0481**	-0.0504***
	(0.055)	(0.019)	(0.017)
Pr(Bequest Value)	3.1496**	3.7708*	4.2669***
	(1.5604)	(1.9912)	(1.5266)
Zero-Inflated Variables[1]			
Constant	-4.8093***	-6.1365***	-5.9604***
	(1.394)	(1.242)	(1.165)
Observations	1,202	1,202	1,186

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1
[1]Alternate trip count, alternate site days, GCR travel distance were variables used to account for zeros in the ZINB model.

Figure 2.3 shows the graphical illustration of GCR recreational trip demand as a function of travel cost to the GCR. This is consistent with economic theory of the relationship between prices and quantities demanded. It shows that as the price (travel cost) increases for visits to the GCR, predicted trips taken decreases. The predicted trips derived from estimates obtained from the ZINB model.

Figure 2.3. Predicted GCR Recreational Demand for Visits



These results also show consistency in describing the effects of specific visitation attributes, especially as it relates to the GCR. Cruises and sports fishing provide the most amount of visits. These are closely followed by festival attendance and casino recreation, as well as golfing and seafood consumption. These results show what specific attributes can lead to increased visits to the GCR. Support of these resources attributes can allow for increased visitation rates and benefits to visitors to the GCR. Considering the consistent shocks to the area, this information could be used to guide development funds meant to promote sustainable tourism in the GCR. The parameter for probability of bequest value gives the impact on likelihood of taking an additional trip from MWTP for bequest access. The interpretation is those who have a higher probability to pay the bequest value also have a higher likelihood to take frequent trips. This is important in the context that current frequent visitors want their offspring to have availability to consume attributes of the GCR at the same levels of quality as they did.

Other parameter estimates are consistent with previous travel cost studies. Alternate site costs parameter estimates are positive and significant. The interpretation is that increasing costs to alternative sites will cause an increase in the likelihood of visits to the GCR, which is consistent with alternative coastal sites being substitute goods for GCR. The parameter for days spent in the GCR during most recent visit is negative and consistent, signaling that as visitors' length of stay increased in their last trip, the likelihood of increasing visits to the GCR will decrease. The understanding here is visitors who stay for long periods make less frequent visits. The variables alternate site trip count, days spent at alternate site, and distance to GCR are used to explain non-participation using the zero-inflated negative binomial model. While these variables were not found to be statistically significant, they all have signs that correspond to the intuition behind nonparticipation in GCR site visits, specifically considering these variables are interpreted as altering the likelihood of experiencing nonparticipation.

The hurdle model has been used to explain non-participation when surveys are meant to capture the general population of visitors versus those who are captured through onsite surveying. Table 2.7 displays the results of DH estimation. Parameter estimates for GCR Visit are positive and statistically significant, which signals that those who have taken a trip to the GCR are more likely to make frequent trips than those that have not taken a trip. The travel cost parameter is negative and statistically significant. This matches with the POI, NB, and ZINB models estimated in this study. The parameter estimate seems higher than those generated by the NB and ZINB because the DH model allows for estimates to be independently determined outside of the probability visits during the past season. These estimates show the impact of cost on the choice to take an additional trip after already choosing to visit the site.

Table 2.7 . Double-Hurdle Visit Count Estimation

VARIABLES	Pr(GCR Trip)	Above Hurdle (GCR Trip Count)
GCR Visit		31.2798***
		(2.659)
GCR Travel Cost		-0.0064*
		(0.004)
Income		-0.7342
		(0.043)
Days Spent		-0.0691*
		(0.115)
Party Size		0.0385
		(0.036)
Alternative Site Days	0.0636	
	(924.880)	
Alternative Site Cost	0.0381*	
	(3.191)	
Constant	7.4731	-22.7182***
	(1,036.918)	(4.766)
Uncensored	508	510
Total Observations	1260	1269

Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

The primary parameter of interest is associated with the travel cost variable. This parameter is used to provide CS estimates. These estimates are listed in Table 2.8 The POI model clearly underestimates CS related to increased visits to the GCR compared to the NB and ZINB. The DH model, while seemingly underestimates the benefits of trips, actually provides estimates for additional trips controlling for the probability of taking the initial trip. The DH model provides more concise marginal CS specifically by focusing on those who have chosen to visit, crossing the first hurdle, then choosing to take an additional trip, crossing the second hurdle.

Table 2.8. Count Model Estimates of Consumer Surplus

	Poisson	Negative Binomial	Zero-Inflated	Double-Hurdle
Travel Cost	0.0023	0.0014	0.0013	0.0064
Consumer Surplus	$434.78	$714.29	$769.23	$156.25

Conclusions

In this chapter, count data models were used to estimate GCR recreational trip demand. Comparisons were made across estimated models, POI, NB, ZINB, and DH. The parameter estimates were consistent across the NB and ZINB estimation methods. The GCR travel cost variable was statistically significant and negatively correlated with the GCR trip count, as expected. Also, the alternative site cost variable was statistically significant and positively correlated with GCR trip counts, as expected. The DH model also provided consistent parameter estimates in comparison to the POI model. The DH model is especially important to this study because the population group of interest includes nonuser and potential users (Shonkwiler and Shaw, 1996). The survey tool used was distributed to a nationally representative population, versus traditional recreation demand data collection instruments are mainly design and implemented for onsite distribution and collection.

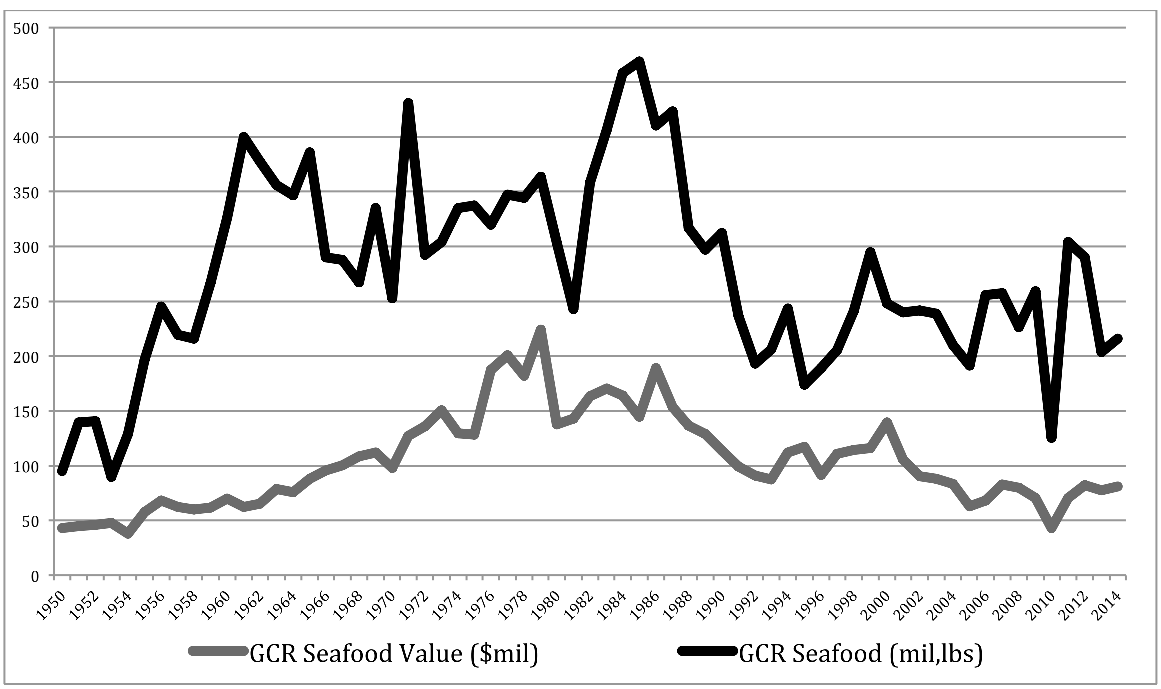
Contingent behavior relating to pre-DWH beach conditions was estimated using data collected from survey respondents. Estimation results show that individuals have a higher WTP for bequest value versus existence value. This may be representative of the GCR visitor. GCR visitors are characterized as consuming beach resources, retail shopping, and seafood consumption. However, these visitors also mainly make GCR trips to visit with family and friends, therefore exhibiting some specific intrinsic value with preserving the GCR, especially for usage by future generations.

Chapter 3:
An Analysis of Tourists' Preferences for Seafood Attribute Perceptions as it Impacts Their Choice to Consume Gulf Coast Region Seafood.

Since the 1960s there has been an increased demand for seafood at the consumer level. This may be contributed to the growing perception that fresh seafood taste good and contributes to positive health benefits (Pieniak et al, 2008). During that same time there has been a steady trend of increased per capita seafood consumption along with increasing seafood prices (Edwards, 1992). The implication is that there has been a structural change in consumer preferences for seafood. This structural change can be seen in the increased willingness to prepare seafood at home versus other types of protein sources such as red meats and poultry. Growth and development in aquacultural production and marketing have also led to a change in consumers preferences for seafood, from wild caught, higher priced to similar quality, cheaper farm-raised substitute seafood products (Gempesaw et al, 1995). This is especially true for consumers of seafood landed in the GCR. The area has a rich history in seafood and plentiful fisheries, as well as a mixed seafood production system between wild caught and farm-raised. This mixture is important in the context that markets for certain species (i.e. Eastern Oysters) maybe noncompeting in the GCR market but competing in other regional markets. Therefore, cultured oysters could be used as a sustainable alternative method of production versus wild fisheries. According to Norman-López (2009) farm-raised tilapia, while not competing with catfish, is a substitute good for red snapper, sea dab, and blackback flounder. This implies that less costly, higher yielding substitutes of tilapia could lower prices of overly exploited wild fisheries. This shows the importance of access to a safe fishery ecosystem for aquaculturalist and wild harvester, as well as the potential for an extensively developed market for seafood value added during processing and retail distribution.

Figure 3.1 gives GCR commercial fishery landings and harvest value. The GCR seafood industry experienced about 30 years of growth, 1950-1980s. However following this period, the GCR fishery experienced moderate but continued decline. Recent shocks (i.e., Great Recession, oil spill, hurricanes, etc.) have also impacted the fishery in this area. Therefore, the importance of access to a safe fishery ecosystem, as well as the potential for an extensively developed market for seafood processing and consumption is important for sustainable development in the GCR.

Figure 3.1. GCR Seafood, 1950-2014



Data: National Fisheries Service, National Oceanic & Atmospheric Association; 2005$=100;

Markets have developed for new product forms produced for the away-from-home food industry as well as for supermarket suppliers to at home consumers. This has been a direct result of the structural change argument of Edwards (1992). He stresses that these changes occurred as a direct result of medical findings showing that seafood contains elements that are beneficial to heart health and can help improve the quality of life for individuals suffering from certain ailments such as arthritis, and certain other metabolic and neurological disorders.

While the health benefits associated with seafood consumption are usually positive, certain health risks are also associated with seafood consumption (Pieniak et al, 2008). These risks are specifically associated with individuals' consumption of raw shellfish such as oysters, clams, and mussels that have been exposed to some type of environmental contamination (National Academy of Sciences, 1991). This is especially important to those who consume GCR seafood, which specializes in providing a significant portion of these shellfish to the local and regional markets.

Consumer's risk perception plays an important role in consumer's behavior and willingness to pay for particular products. If consumers perceive a product to be hazardous, the consumer will change its behavior towards the purchasing that product if the change has a strong likelihood of reducing the risk of hazard. (McIntosh et al., 1994). Consumer's attitudes and behaviors towards food consumption have been thought to be influenced more by their sociodemographic characteristics, Adu-Nyako and Thompson show that information and awareness of hazard influence these behaviors and attitudes to a greater extent (1999). Therefore, it is important for regulators to help inform the consumer of potential risk and how they may be affected. Nocella et al. (2014) find that trust towards food information provided by public organizations versus private organizations. Therefore, opportunity for increased value added exists within the seafood industry for policy makers.

While federal, state, and local regulatory agencies are partially responsible for helping to curb the impacts of these risks, a larger portion of responsibility lies in the hands of consumers, especially since consumers select and/or prepare the seafood being consumed. The Food & Drug Administration (FDA) is the main federal agency responsible for determining the safety of our food. The National Oceanic & Atmospheric Administration (NOAA) is the primary federal agency responsible for maintaining the safety of our fisheries. These two organizations work together to make sure that the seafood consumed within our borders is deemed safe and nonhazardous to our health. However, many consumers still perceive the seafood supply as potentially unsafe, and therefore look for specific information to help quell their uncertainty (Nocella et al, 2014). This perception can have a negative impact on consumer demand for seafood. Dedah et al. (2011) showed that labels meant to differentiate a product as unsafe can decrease the market for that product as well as other similar products even if produced in a region unaffected by the negative externality. However, this demand for information can allow for product differentiation and be both beneficial to consumers and producers.

It is important to identify what information will have the largest positive impact on consumer behavior. With this knowledge, important policy-based measures can be taken by producers to encourage consumers towards safer, less risky purchases. However, policy makers should take into consideration that producers will only supply information in which the marginal cost of providing the information is less than the marginal benefit (Wessells, 2002). While the information can give a producer a competitive edge through an increase in market share over producers who cannot provide products with certain levels of information, they have to decide if it is worth the investment. For seafood producers in the GCR this could mean an increase in fuel costs to harvest from fisheries not impacted by the oil spill. However, as long as the consumers are aware of the attributes of the products and how to differentiate the products based on the attributes, the value added to the products for the producers could be worth the investment into providing the information.

This paper analyzes the impacts of differentiated GCR seafood products specifically looking at consumers' perceptive preferences and how these preferences impact consumer seafood choice in the GCR. The first section deals with a brief introduction to the existing literature on seafood consumption, impacts of the Deepwater Horizon oil spill to GCR fisheries, and how public policy can help. Followed by a conceptual model, which examines the impact of product differentiation on consumer preferences through attribute perception valuation using a framework based on the Lens Model of social judgment theory (Brunswick, 1952; Kinnucan et al., 1993; Gempesaw et al, 1995; Wessells et al, 1996; González-Vallejo and Lavins, 2014; Thappa et al, 2015). This type of labeling specifically identifies consumers' perceptions of safety of products, more specifically seafood products. These perceptions of product attributes are determined endogenously when looking at the choice to consume GCR seafood. To improve on the model, use of a stated preference discrete choice random utility model will be used to examine these consumers' product perceptions on the stated preference to consume seafood when traveling to the GCR. Afterwards, there is a discussion of the survey and the data used for this analysis. The next section focuses on the econometric estimation and results, and the final section considers the implication to the public decision maker agencies for deciding on labeling opportunities for providing consumers information and support of sustainable fishery ecosystems and value added products for GCR seafood producers, processors, and distributors.

Literature Review

A quick review of the literature shows that there has been a small amount of research done on what impacts the choices made by tourists, specifically as it relates to seafood consumption. Previous studies of seafood demand have mainly been focused on factors that impact consumers' attitudes and how attitudes impact choice decision. This is important for helping policy makers, producers, and marketing agents decide courses of action to combat the potential negative impacts of a shock. For the GCR, it would help combat negative attitudes towards seafood that may have been affected by the DWH oil spill.

According to Gempesaw et al., consumers decisions to purchase seafood for at home consumption are based on perceptions of taste, ability to provide dietary variation, and nutritional capacity (1995). They show how consumers are not particularly aware of the variety of products that are available, and that generic advertising can be an effective way of increasing demand of particular types of seafood. Applying this idea to GCR seafood, local organizations responsible for the maintaining and increasing GCR seafood market share should see increased demand as a result of generic advertising to local markets. However, the generic advertising to markets where tourists are traveling from may not crossover to purchases made for away from home consumption. According to Herrman et al., factors that impact consumers' attitudes about seafood have less of an impact on seafood consumed away from home, more specifically in restaurants (1994). Therefore, consumption of seafood in restaurants by visitors to the GCR should be unaltered by the DWH oil spill.

This could be explained by how the consumer understands risk. Traditionally, the consumer perceives risk in two ways, hazard and outrage. (Sandman, 2000) Hazard is linked with how much actual damage occurs, while outrage is the magnitude of reaction to the perceived risk. Therefore, differentiation can be made between actual risk (based on hazard) and perceived risk (based on outrage). Previous studies have estimated food safety risk as a function of actual damages resulting from consumption of products (Adu-Nyako & Thompson, 1999; Schupp et al., 1998; Wessells et al., 1996). In the case of GCR seafood, where specific potentially negatively impacting shocks have occurred within GCR fisheries, the effects on the fisheries are still being investigated (Upton, 2011, Dedah et al, 2011).

Other authors have attempted to explain risk perception. Von Neumann & Morgenstern introduced the expected utility model, which has been foundational for most health belief theories especially as it is concerned with the behavior of economic agents (1947, 2007). They show how the decision maker response can differ when presented with a decision that could be seen as risky versus a decision with little or no risk. In this study, the consumer is presented with both the decision of whether to eat seafood when visiting the GCR on a regular visit, the less risky decision, and whether they would consume seafood visiting the GCR two years after the DWH oil spill. This allows for the random utility of two discrete choices two be measured and compared.

Many factors can affect how consumers perceive risk, and how these perceptions influence preferences. These factors could vary from socioeconomic demographic factors such as age, gender, location, and income to experience with prior illness or family members who have been ill (Weinstein, 1989; Viscusi, 1989; Adu-Nyako & Thompson, 1999; Olsen, 2003). While those factors are more closely associated with hazard risk, factors such as media coverage of potential safety issues and governmental positions and policies are more closely associated with outrage risk, but can still weigh just as heavily on consumers perceptions and preferences (Wessells & Anderson, 1995). All these factors can be influential on household seafood consumption. According to Liu et al., consumers' choice for consuming oysters is significantly linked to age, gender, residence, labeling, and preferred values (2006). They concluded that promotions that educate consumers on nutritional value, proper preparation, and special activities such as festivals are beneficial for increasing oyster consumption. Lin et al. show that consumers' preferences and perceptions to seafood, especially shellfish, are closely related to hazard risk based on past experiences and health outcomes and frequency of consumption as well as outrage risks dealing with how much exposure consumers received from negative media publicity (1991, 1993). Spinks & Bose found that seafood quality, preparation knowledge and ability, and retail availability are the primary influences impacting household consumption decisions (2002). Consumers are also looking for freshness and healthy appearance when looking to consume seafood, and that these differences vary across nationalities (Thapa et al., 2015).

These perceptions can be signaled using information labeling, whether initiated by a third party, the seafood industry, or the government. Consumers have been shown to respond to labeling, especially labeling that can signal a product is nonthreatening to health and safe to eat (Parsons et al., 2006; Nocella et al., 2014; Vellejo and Lavins, 2015). More specifically, consumers of GCR labeled seafood that was meant to encourage the perception of potential health hazard associated with consumption (Dedah et al., 2011). Morgan et al. (2012) estimated WTP for consumption risk reductions in oysters included in the GCR. They find that those at the highest risk of consumption held the highest WTP for information to reduce risk of consumption of GCR oysters, specifically after following the DWH oil spill.

This study adds to the literature by presenting findings specifically relevant to visitors to the GCR because visitors have a higher frequency of consumption during their time spent in the area. This is because while visiting, majority of those who visited and consumed seafood during that visit did so at a restaurant. According to Table 3.1, data collected from a survey of GCR visitors show those who visited the GCR most frequently timed their visits to match when specific seafood was in season. Therefore, the a priori expectation for visitors is that those who are more frequent visitors to the GCR have a higher likelihood to perceive GCR seafood as safe relative to less frequent visitors. This is based in the understanding that the GCR frequent visitors have developed a stock of experiences with seafood products that increase the positive perception in the evoked set of the choice to consume during visits. Results reported later in this study match with these expectations.

Table 3.1. Choice of Type of Seafood Consumption Across Frequency of Visits

	# of Visits			
Consumer Type	***1***	***2***	***3***	***More than 3***
Restaurants	70%	59%	57%	46%
Timed Travel with Seafood Season	20%	43%	39%	61%
Purchase Fresh to Consume at Coastal Residence	20%	24%	31%	34%
Festivals/Events	21%	23%	33%	30%
Ordered Seafood for Permanent Residence	1%	2%	3%	4%

This paper extends the literature by incorporating the "lens" model into a regional framework, specifically looking at the GCR. The seafood attributes that tourists gave ranked values are used as psychosocial cues in the model. These cues are incorporated in the tourists' evoked set of choices, specifically to consume seafood during visits to the GCR and in future visits. The evoked set for future visits includes the perception of the potential decreased seafood quality as a result of the DWH oil spill. These cues, theoretically, should help tourists make more informed judgments about the product, for example if a product is safe to eat after considering it originated in an area where safety be have been compromised. The choice to consume seafood after considering the oil spill can bring disutility or distasteful effects caused by potential hazardous perceptions of seafood landed in GCR fisheries. The effects of these negative externalities are captured using a stated preference discrete choice random utility model to understand the value of the cues, seafood attributes, and frequency of visits effect the evoked set choice to consume in future visits.

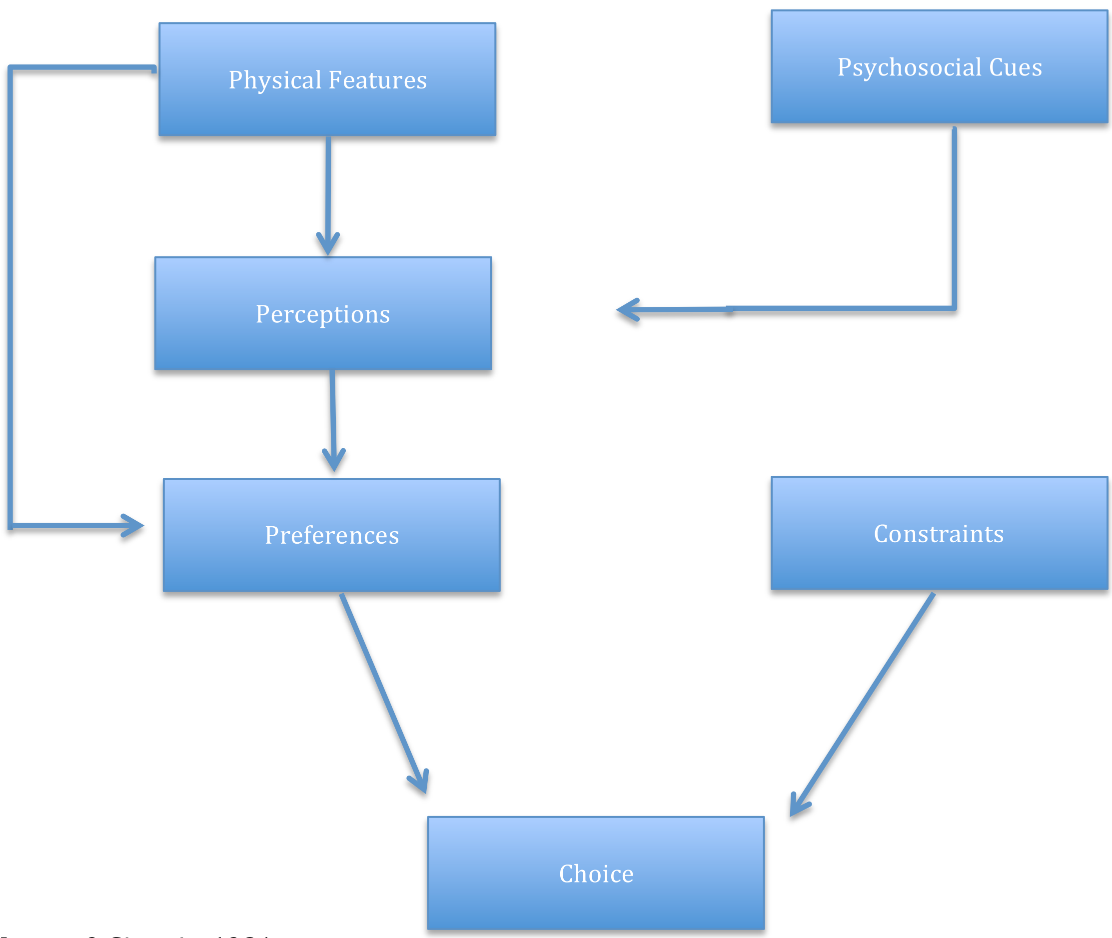
Conceptual Model

The paper uses a conceptual model based partially on the lens model of social behavior theory first introduced by Brunswick (1952) and then applied to issues of economics and consumer choice by Hauser & Simmie (1981), Kinnucan et al. (1993), Gempesaw et al. (1995), Wessells et al. (1996), and Vallejo and Lavins (2015). In their models, consumers' perceptions of a product are considered to be endogenous and part of a system of equations that relate preferences for specific seafood products with the frequency of consumption of said products. The endogeneity of products' perceptions in the model is based on consumers' experiences with the products, where these perceptions are captured in consumers' evoked sets. Perceptions are formed using judgments of observed attributes. These attributes are placed in dimensions of perceptions that encourage preferences towards making a positive choice to consume a product, GCR seafood, during visits.

The variety of products makes up an individuals' evoked set. In terms of this study, these products are GCR seafood, both before and after considering the DWH. This evoked set is expected to perceive GCR seafood after considering the DWH as a potentially lower quality product. Products are also differentiated by methods of consumption. This is estimated as a different evoked set of choice.

Figure 3.2 gives an illustration of how perceptions can be altered in the evoked set of factors influencing visitors' decision choice for seafood when visiting the GCR. The psychosocial cues give weight to the consumer decision to consume. In the case of GCR visitors, a principal component factor analysis was used to create these weights used in the model.

Figure 3.2. *Lens Model of Preference Formation and Consumer Choice*[1]



[1]*Hauser & Simmie, 1981*

When the bundle of attributes of a particular product (i.e.: GCR seafood) are abstracted into a subgroup of labels (i.e.: certified sustainable, certified safe to eat by NOAA, certified safe to eat by the State of Alabama, etc.) they form the perception cues that lead to decisions by the consumer. In this analysis, these perceptions of these labels are absent they could be seen as a negative externality to consumers, producers, and the surrounding GCR which is partially dependent on the seafood industry. Figure 1 shows how these cues impact consumers' choice. The model can be illustrated in a two-stage sequence,

$$R = f[E, Z_1] \qquad (1)$$

$$CC_i = g_i[R, Z_2] \qquad (2)$$

where R is a variety of consumers' ratings of products, E is a vector of variables representing consumers' experience, CC_i is consumers' anticipated change in consumption due to a given hypothetical event I (i.e., DWH oil spill), and Z_1 and Z_2 are vectors of social/cultural, demographic economic factors, and the perception of control of choice. However, these previous studies have estimated both equations separately making inference and interpretation of R difficult due to sequential econometric error issues. Therefore, this study applies a random utility discrete choice model (Lancaster, 1971; Hausman et al, 1995; Hite, 2000; Thapa et al., 2015) to the lens model framework in order to examine consumers' preferences over differentiated products while including other variables for experience, frequency and differentiation then the traditional lens model. A double-hurdle count model is also used to differentiate users and products consumed controlling for excess non-participation for those making no coastal visits. A multinomial logit is used to understand changes in preferences across alternate forms of consuming GCR seafood. A factor analysis is used to create variables representing weights for psychosocial cues derived by grouping seafood attributes that share similar statistical dimensions with other variables, and thereby potentially share underlying themes.

Data

The data used in this study comes from an Internet survey of adult tourists that was conducted during the summer of 2013. The surveys were used to obtain information about tourists' recreational usage of coastal resources and changes in intended behavior of visitors to the Alabama (Baldwin & Mobile) and Mississippi (Jackson, Hancock, Harrison) coastal counties based on improved beach quality after the Deepwater Horizon oil spill (DWH). The survey was created and distributed using Qualtrics survey software. Survey Sampling International (SSI), a third party survey distributor, was used to access a nationally representative population. Directions for the survey along with an access link were distributed to SSI panels. A total of 11017 people were invited to participate. Overall, 2478 adults responded, for a response rate of 22%.

Information collected in the survey was to understand households travel expenditures and attribute preferences when visiting the GCR. Of the 2478 respondents, 563 respondents reported visiting the GCR, about 23% of the sample. Respondents provided information on activities consumed during visits, how accessibility to specific coastal attributes contributes to the decision to visit the area, and attribute/activity information for alternative sites. Respondents also provided specific information on seafood preference for method of consumption during GCR visits, as well as rankings for specific seafood attributes that relate to perceptions of the product (i.e. Low price, freshness, healthy, safe), method of harvesting (i.e. Caught in season, caught that day, caught by local harvester), and certification authority (i.e. State of Alabama, National Oceanic & Atmospheric Administration, local seafood industry). Table 3.2 provides a description of variables and summary statistics for method of seafood consumption.

Table 3.2. Summary Statistics for Methods of Seafood Consumption

Variable	Obs	Mean	Std. Dev.	Min	Max
Time travel for in season	537	0.310987	0.4633291	0	1
Purchased seafood to take to coastal residence	530	0.2075472	0.4059338	0	1
Purchased to mail home for future consumption	526	0.026616	0.1611115	0	1
Timed travel to seafood festival	531	0.2090395	0.4070061	0	1
Seafood restaurant	545	0.6018349	0.4899695	0	1

Table 3.3 describes the variables used for ranking of seafood characteristics. The survey also provided information on expenditures by category during the most recent visit. The survey collected additional information on observed and contingent value of beach preservation following the aftermath of the DWH.

Table 3.3. Respondent Percentage for Seafood Characteristic Rankings

Question	*Not important*	*Somewhat not important*	*Neutral*	*Somewhat important*	*Extremely important*	*Total Responses*
Low price	6%	8%	28%	34%	25%	100%
Freshness	4%	2%	12%	23%	59%	100%
Healthy to eat	4%	3%	14%	30%	50%	100%
Safe to eat	3%	3%	11%	16%	67%	100%
In season	7%	5%	24%	37%	27%	100%
Caught that day	6%	6%	27%	37%	24%	100%
Caught in the coastal waters off Alabama or Mississippi	11%	8%	34%	31%	16%	100%
Caught in Gulf coastal waters by U.S. shrimp harvesters	9%	7%	32%	31%	20%	100%
Certified sustainable	6%	5%	25%	33%	30%	100%
Certified safe to eat by National Oceanographic & Atmospheric Administration (NOAA)	7%	4%	21%	28%	39%	100%
Certified safe to eat by the State of Alabama	7%	4%	22%	31%	35%	100%
Inspected by the shrimp industry	6%	4%	23%	33%	33%	100%
Wild-caught	8%	8%	30%	31%	23%	100%
Farm-raised	10%	12%	42%	22%	14%	100%
Reputation of the seller (restaurant, processor, etc.)	5%	4%	19%	35%	37%	100%

Looking at the methods of consumption allows for product differentiation of GCR consumed seafood. An assumption used in this analysis is that prices across products are not equal and must be included in the consumers' evoked set. Table 3.4 shows the distribution of seafood consumption methods across frequency of visits. One can see that majority of tourists consume seafood at restaurants, followed by seafood that is currently in season, and next by seafood consumed freshly caught and/or at local festivals/events.

Table 3.4 Choice of Type of Seafood Consumption by Trip Count

	# of Trips			
Consumer Type	***1***	***2***	***3***	***More than 3***
Restaurants	70%	59%	57%	46%
Timed Travel with Seafood Season	20%	43%	39%	61%
Purchase Fresh to Consume at Coastal Residence	20%	24%	31%	34%
Festivals/Events	21%	23%	33%	30%
Ordered Seafood for Permanent Residence	1%	2%	3%	4%

The questions meant to measure consumers' preferences for particular seafood attributes are also of importance. Table 3.5 lists these particular choices and associated summary statistics for those who chose to visit the GCR. Simply looking at the means of the characteristics one can see that perception of safety seems to be the most important, followed by freshness of the product, perception of health benefits provided, reputation of seller, and certification of seller, which all have mean values over four. This signifies that on average the tourist consumer deemed these characteristics to be ranked important.

Table 3.5. Tourists' Ranking Of Seafood Attributes

Variable	Obs	Mean	Std. Dev.	Min	Max
Low price	552	2.344203	2.002087	0	5
Freshness	551	2.733212	2.205688	0	5
Healthy to eat	546	2.734432	2.149671	0	5
Safe to eat	551	2.803993	2.240467	0	5
In season	553	2.415913	2.020878	0	5
Caught that day	549	2.338798	2.025829	0	5
Caught in the coastal waters off Alabama or Mississippi	549	2.3898	1.944758	0	5
Caught in Gulf coastal waters by U.S. shrimp harvesters	555	2.434234	1.957283	0	5
Certified sustainable	547	2.484461	2.055377	0	5
Certified safe to eat by National Oceanographic & Atmospheric Administration (NOAA)	549	2.697632	2.071622	0	5
Certified safe to eat by the State of Alabama	548	2.536496	2.118203	0	5
Inspected by the shrimp industry	549	2.56102	2.069595	0	5
Wild-caught	546	2.271062	1.981512	0	5
Farm-raised	545	2.062385	1.85894	0	5
Reputation of the seller (restaurant, processor, etc.)	543	2.548803	2.092182	0	5

A principles component factor analysis was conducted using the variables from Table 3.5. Most commonly, factor analysis is used to make a subset group of variables thought to be correlated to each other and to create an index that can measure the conceptual similarities between the variables. The variables used in this data are conceptual primers, or psychosocial cues, hypothesized to be signaling for safety, freshness, and experience with seafood products within the evoked set. Using this method produces orthogonal factors that are uncorrelated. This is important to control for correlations existing between variables that share underlying relationship.

Table 3.6 list the results of the factor analysis are. The figures listed in the table show the weights of the variables on the factors (i.e.: seafood safety, seafood freshness, overall seafood consumption, experienced seafood consumer, frequent visitor). The results of the factor: seafood safety confirms the hypothesis that the consumer relates specific variables to the perception of safety when making choices to consume during GCR visits. The primary variables contributing to seafood safety are: healthy to eat, safe to eat, caught in season, certified safe by the state of Alabama, and certified safe by the seafood industry. The primary variables contributing to seafood freshness are: freshness, caught by local harvesters, and caught in local waters. The primary variables contributing to overall seafood consumption are: choice to consume during most recent visit, choice to consume during future visit, and restaurant consumer as primary means of consumption. The primary variables contributing to experienced seafood consumer are: timed travel with seafood seasonality and timed travel with attending of festival or special events. The primary variables contributing to frequent visitor are: consumers who purchase fresh to consume at coastal residence and consumers who ordered seafood to sent to their permanent residence.

Table 3.6. Factor Analysis, Principle Component Factor Weights[4]

Variable	Frequent Visitor	Consumption	Seafood Safety	Freshness	Experienced Seafood Consumer
Count of GCR Trips	0.7095				
Seafood Consumption					
Most Recent Visit		0.836			
Future Visit (Post Oil spill)		0.8161			
Consumer Type					
Timed Travel with Seafood Season					0.7627
Purchase Fresh to Consume at Coastal Residence	0.4966				0.3344
Ordered Seafood for Permanent Residence	0.624				
Festivals/Events					0.6458
Restaurants		0.481			-0.5561
Seafood Characteristics					
Low Price		0.3044	0.3265		
Freshness				0.5613	
Healthy to Eat			0.6278		
Safe to Eat			0.4894		
Harvest Methods					
In season			0.4826		
Caught that Day				0.3386	
Caught in AL/MS Coastal Waters	0.332			0.3764	
Caught by US Shrimp Harvesters				0.4884	
Wild-Caught		0.3664		0.3156	
Farm-Raised	0.3601		0.371		
Reputation of Seller			0.3224		
Seafood Certifications					
Certified Sustainable			0.3062	0.3351	
Certified Safe to Eat by NOAA			0.3696		
Certified Safe to Eat by AL			0.591		
Certified Safe to Eat by Seafood Industry			0.467		

[4] Note, values are weights of attributes on factors, and not correlations of attributes with factors

Other data used in the study are demographic and socioeconomic variables. They include age, income, and the natural log of total expenditure for the stated trip. Stated seafood expenditures were used to represent cost. Total travel expenditure includes living accommodations, shopping and recreational expenditure, as well as food expenditures. However, the proportion that is spent on food is assumed to be relatively low. Therefore, estimated travel cost from Chapter 2 was used for marginal willingness to pay for visitation to consume GCR seafood. There is also data on racial demographics, as well as ethnicity. A count of individuals traveling in a party was also included.

Estimation

This study uses a stated preference discrete choice random utility model to examine consumers' choice of differentiated seafood products. Some previous studies have used a nested legit regression analysis to model the impact of seafood safety perception rankings and the choice of consuming food products (Morey et al, 1998; Jakus & Shaw, 2003). Morey illustrates how nested logit models are applicable in estimating impacts of simultaneous decisions for participation and choice, while Jakus & Shaw apply the method to recreational site choice with perceived hazard constraints. This estimation method helps the researcher to avoid estimation biases and helps to provide a clear connection between perception of risk and consumers' choice.

However, this study uses the bivariate probit estimation procedure to model the direct impacts of potential product characteristics on the consumers' discrete choice on whether to consume seafood when visiting the GCR. The technique allows for estimation with two outcomes across different products, along with accommodation of the binary dependent variable (Maddala, 1983; Cameron & Trivedi, 2009).

$$y_1^* = x_1'\beta_1 + \epsilon_1$$

$$y_2^* = x_2'\beta_2 + \epsilon_2$$

Kinnucan et al (1993) and Wessells et al (1996) used probit estimation for their analysis. However, this study expands on the estimation method by allowing for two outcomes. One outcome is very the tourist consumer choice to consume seafood when visiting the GCR, and the other outcome variable is the choice to consume seafood framing the question to make the respondent consider the DWH oil spill. This type of framing should allow the probability difference to be observed between the different perception of seafood safety in the context of no perceived risk and perceived potential risk. Linear estimation techniques are also analyzed for consumer choice and for expenditure demand.

Results

In terms of this study, products in the evoked set are GCR seafood, both before and after considering the DWH. This evoked set is expected to perceive the latter product, consumption of GCR seafood on future visits considering the DWH, as a lower quality product. Products are also differentiated by methods of consumption. These methods are listed on Tables 3.2 and 3.4. This is estimated as a different evoked set of choice using multinomial logit regression.

The results from the bivariate probit estimation of choice to consume GCR seafood by visitors are shown in Table 3.7. Seafood expenditure is positive and significant, indicating that those who spend more money on seafood are more likely to consume. This impact is stronger for the perceived higher quality product. Frequent visits increase visitor likelihood to consume seafood, and increasingly so for the perceived lower quality product. This can be attributed to that those who frequent the GCR are more likely have more experience with GCR resources. In the evoked set, experience can make up for negative attribute perception.

Table 3.7. Bivariate Probit Seafood Consumption Choice

VARIABLES	GCR Seafood	GCR Seafood Post DWH
Seafood Expenditure	0.0027*	0.0018**
	(0.001)	(0.001)
GCR Visits	0.1818***	0.2097***
	(0.029)	(0.028)
Restaurant	0.0351**	0.0061
	(0.016)	(0.009)
Seafood Attributes		
Low Price	0.1059***	0.0893***
	(0.020)	(0.020)
Freshness	0.0504***	-0.0441**
	(0.018)	(0.018)
Healthy to Eat	0.0404**	0.0347*
	(0.018)	(0.019)
Safe to Eat	0.1023***	0.0705***
	(0.017)	(0.018)
Seller Rep	0.0676***	0.0864**
	(0.019)	(0.020)
Methods of Harvest		
In Season	0.0470**	0.0745***
	(0.020)	(0.020)
Caught that Day	0.0541***	-0.0396*
	(0.020)	(0.021)
GCR Caught	0.0677***	0.0345
	(0.022)	(0.022)
Local Harvester	0.0723***	0.1190***
	(0.021)	(0.022)
Wild-Caught	0.1180***	0.0812***
	(0.020)	(0.021)
Farm-Raised	0.0351	0.0305
	(0.023)	(0.023)
Certifications		
Sustainable	0.0264*	0.0937***
	(0.020)	(0.020)
NOAA	0.0372*	0.0678*
	(0.019)	(0.019)
Alabama	0.0143***	0.0635***
	(0.019)	(0.020)
Fish Industry	0.0561***	0.0616***
	(0.020)	(0.020)
Constant	-1.6117***	-1.4146***
	(0.088)	(0.065)
Ath Rho	1.1385***	
	(0.116)	
Observations	507	507
Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1		

The parameter estimate for those who frequent restaurants is statistically significant and positive for the higher quality product. The interpretation is those who frequent restaurants have an increased likelihood to consume the perceived higher quality product. However, the parameter estimate for restaurant frequency is not significant. This can be interpreted, as restaurants are not able to increase likelihood of evoked set choice of the perceived lower quality product.

Most seafood attribute variables show a positive relationship with choice of consumption of seafood products. Looking at the products separately, the perceived lower quality product does not have as strong of a weight on the evoked set product choices being modeled, with the exception of the positive relationship of the reputation of the seller parameter. So as consumers increase their preference of the product perception that the seller has a good reputation their likelihood to consume both seafood products will increase. Table 3.2 gives a description of seafood attributes by respondent ranking of the attribute. These estimates show that there may be underlying relationships between certain variables in the evoked set. Therefore, a factor analysis was done to express the dimension of potential relationships in the variance of the seafood attribute variables. This relationship may be present as a result of the respondent sharing similar values for certain attributes not because of the direct utility received from consumption, but because of some underlying dimensional unobservable. The results of the factor analysis are in Table 3.6. The results support the intuition of underlying dimensional relationships between many of the attributes.

Parameter estimates from the DH model are reported in Table 3.8. The DH model allows for differentiation between three different consumers: those who consume both the perceived higher quality and perceived lower quality product, those who only consume the higher quality product, and those who do not consume either product. Willingness to consume the higher quality product is predicted in the first hurdle. The DH model obtains parameter estimates of the perceived lower quality product controlling for the likelihood of consuming the higher quality product, focusing on the impact of the variables on the lower quality product independently.

Table 3.8. Double Hurdle GCR Seafood Consumption Choice

VARIABLES	Pr(GCR Seafood Choice)	Pr (Future Visit Seafood Choice)
Constant	-0.2222***	-0.0278
	(0.021)	(0.095)
GCR Visit	0.8807***	
	(0.085)	
GCR Distance	-0.0001**	
	(0.000)	
GCR Seafood		0.8485***
		(0.020)
Seafood Expenditure		0.0002
		(0.000)
GCR Visits		0.0571***
		(0.005)
Seafood Characteristics		
Low Price		0.0329***
		(0.004)
Freshness		0.0302**
		(0.003)
Healthy		0.0692*
		(0.004)
Safe		0.0287*
		(0.003)
In Season		0.0351***
		(0.004)
Caught Day		0.0285)*
		(0.004)
Wild Caught		0.0296*
		(0.004)
Local Harvester		0.0286***
		(0.004)
Certifications		
Sustainable		0.0281***
		(0.004)
NOAA		0.0250**
		(0.004)
Alabama		0.0260*
		(0.004)
Seafood Industry		0.0227*
		(0.004)
Uncensored	364	
Observations	525	525
Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1		

GCR trip count parameter estimates are statistically significant and positive. The interpretation is as number of visits to the GCR increase the likelihood of consuming the higher quality product will increase. While parameter estimates for distance to travel to the GCR are statistically significant and negative. Distance can be considered a cost variable, and negatively correlated with choice to consume a product. Therefore, those who live further way are less likely to consume GCR seafood. Potentially, respondents who live further away also live in areas with similar characteristics for recreational consumption as the GCR.

Choice to consume higher quality product and GCR trip count are both statistically significant and positive. These parameter estimates are expected. Both variables represent cues that could increase the impact of experience in the evoked set of product choice. Seafood attributes parameters estimates are all statistically significant and positive. Therefore, these variables can increase consumption of the perceived lower quality product. This signals that there is areas of opportunity to provide extended value added to GCR seafood products for consumption by GCR tourists, specifically after shocks that lower the perceived quality of GCR resource supply of seafood.

Parameter estimates for the second evoked set of consumption method product choices results are reported in Table 3.9. Parameter estimates are results of multinomial logit estimation, with results being reported with mail home consumption method being the base comparison. Only GCR trip count parameter estimate for timing travel with seafood season is statistically significant. The interpretation of the parameter is that those who frequent the GCR have a higher probability of consuming seafood as a result of timing their trip to coincide with the seafood season. This is expected, as frequency of GCR trip count can be considered under the dimension of experience in the evoked set. Safety parameter is statistically significant and positive across methods of consumption. Those who have increase their values for safe seafood will have a higher probability to consume across methods of consumption. Sustainable product certification is the only certification parameter that is statistically significant and positive. As value for sustainable product certification increases the likelihood of consuming across methods of consumption increases. Farm-raised parameter is negative, meaning that as value for farm-raised products increase, the probability of consumption method for festivals or restaurants decreases.

Table 3.9. Type of Seafood Consumption By Trip Motivation

VARIABLES	In Season	Take Home	Festival	Restaurant
GCR Trips	0.3685*	0.3570	0.3297	-0.0855
	(0.327)	(0.331)	(0.341)	(0.320)
Seafood Characteristics				
Low Price	0.0104	0.0472	-0.1330	-0.0553
	(0.277)	(0.281)	(0.286)	(0.273)
Freshness	0.4202	0.4469	0.7335**	0.5389***
	(0.306)	(0.308)	(0.316)	(0.303)
Healthy	-0.4884	-0.4628	-0.3752	0.3626*
	(0.406)	(0.408)	(0.411)	(0.403)
Safe	0.5925**	0.6617**	0.6662**	0.6749**
	(0.293)	(0.296)	(0.300)	(0.290)
In Season	-0.0170	-0.0116	-0.0190	0.0130
	(0.289)	(0.291)	(0.296)	(0.284)
Caught Day	-0.4419	-0.3792	-0.5931	-0.4607
	(0.392)	(0.395)	(0.398)	(0.389)
GCR Caught	0.5795*	0.5699*	0.6246*	0.4828
	(0.318)	(0.322)	(0.328)	(0.314)
Local Harvest	0.5520*	0.5136	0.6861**	0.5841*
	(0.321)	(0.324)	(0.331)	(0.317)
Wild Caught	-0.0207	0.0911	-0.0424	0.0354
	(0.285)	(0.289)	(0.293)	(0.281)
Farm Raised	-0.2959	-0.3950	-0.5878***	-0.4979***
	(0.398)	(0.401)	(0.405)	(0.394)
Seller Rep	0.2258	0.2412	0.1141	0.2211
	(0.309)	(0.312)	(0.316)	(0.306)
Certifications				
Sustainable	0.7218**	0.7111*	0.7899**	0.7458**
	(0.367)	(0.370)	(0.374)	(0.364)
NOAA	-0.1699	-0.3763**	-0.2766	-0.2996
	(0.357)	(0.358)	(0.363)	(0.353)
Alabama	0.3719	0.4710	0.3986	0.4536
	(0.293)	(0.296)	(0.300)	(0.289)
Seafood Ind	-0.0602	-0.0994	-0.0391	-0.1072
	(0.296)	(0.299)	(0.305)	(0.292)
Constant	0.1955	-0.2915	-0.8198	3.0695*
	(1.994)	(2.051)	(2.140)	(1.918)
Observations	417	412	438	470

Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Conclusion

This paper analyzes the impacts of differentiated GCR seafood products specifically looking at consumers' perceptive preferences and how these preferences impact consumer seafood choice in the GCR. Estimation results show that higher values of seafood attributes positively influence the evoked set choice to consume seafood products. These values represent areas of GCR seafood product development to obtain increased value added per unit of GCR seafood consumed. Specifically, these attributes are can increase visitors perceptions of GCR seafood after shocks that can increase the perceived risk of product consumption.

These seafood attributes were consistently statistically significant across model specifications for evoked set product choices. The DH model was used to estimate the impacts of independent variables specifically on the choice to consume the perceived lower quality product, controlling for experience with perceived higher quality product consumption choice. Results were consistent for seafood attributes. Implications are that these attributes can provide extended product value-added.

The multinomial logit model was used to estimate impacts of seafood attribute values of the evoked sets of differentiated products across methods of consumption. These estimates concentrated specifically on the attributes safety and sustainable product certification. This illustrates the robustness of the results, specifically as it relates to visitors valuing information that can be used in the evoked set for GCR seafood products. These perceptions can help increase utility to the visitor, and provide value added to harvesters and processors to expand the local market for GCR seafood. The implication of results to the public decision makers are that labeling opportunities exist for providing consumers information and support of sustainable fishery ecosystems and value added products for the GCR seafood supply chain.

Chapter 4:
Implications of Los Angeles, California's Medical Marijuana Dispensary Policy:
An Examination of Housing Effects

This chapter investigates the effects of local governmental policies that impact medical marijuana dispensary (MMD) locations on residential location decisions and neighborhood stratification. Using MMD data for the county of Los Angeles CA, as well as property sales data and demographic census data, a difference in difference (DD) hedonic housing price model is used to calculate the change in price due to a change in neighborhood quality before and after a city statute was enacted ordering the closing of over 70% of existing MMD facilities. This implies that MMD's are neighborhood disamenities, with the expectation of lowering the value of the areas around them. Therefore, the proposed hypothesis is that the closer a MMD site is located to a specific property; the price of the property will decrease at an increasing rate. A selection model is used to estimate the changes in direct and indirect utility as a result of locating within specific distances of MMDs. Finally, an equilibrium-sorting model framework is used discussed as a way to measure the general equilibrium impacts to the overall metropolitan area.

The first step is to identify a model that can capture how local governmental policies have indirect impacts on residents of areas surrounding MMD sites specifically as buyers and sellers sort into neighborhoods that have houses with the bundle of attributes that help each buyer maximize his/her utility from the residential choice decision. The consumer's willingness to pay for certain policies allows us to understand better consumers willingness to pay for local public goods. However, households are influenced by not only public goods within a neighborhood, but also heterogeneity in the structural attributes of housing stocks and other endogenous characteristics of other consumers who have chosen to locate within a particular neighborhood. This is done by examining the impact of MMD closures on housing prices and residential choice decisions to sort into a particular neighborhood, especially looking at Los Angeles County. If MMDs are thought to be disamenities, such as businesses and industries that decrease environmental quality are so often considered, then they will be a negative attribute.

Using a difference in difference (DD) hedonic model approach, this chapter estimates the impact on housing price resulting from a MMD facility being forced to close by Los Angeles city mandate. The difference observed will be between housing prices transacted before and after the policy change. This method is effective given that local policy makers used a lottery system to randomize which MMDs were allowed to continue legal operation or close. The next step is to estimate an equilibrium-sorting model using a selection model. This approach builds off of a multitude of theoretical studies that use sorting models to analyze how individual decisions in the housing market can be used to understand the housing equilibrium of a particular metropolitan area (Epple et al., 2001; Benabou, 1996; Anas, 2002; Nechyba, 2000). Sieg et al. (2004) helped to relate this theory to empirical analysis while examining the impacts of air quality improvements in the Los Angeles area. Using a similar approach, this study attempts to truly understand the welfare incidence felt by local homeowners as a result of current policies that directly target MMDs and at what distance do MMD sites loose influence on house prices.

The hypothesis is that the closer to a MMD site is located to a specific property; the price of the property will decrease at an increasing rate. A spatial analysis will be done to give a point distance variable. This will be used as a treatment variable for housing transactions located within a certain distance of a MMD. As housing markets reach equilibrium clearing prices for those homes transacted around MMDs, the true incidence will be able to be estimated.

The beginning portion of the study will specifically look at the effects of state-card issuing policy on the housing transactions in the study area in the year 2003. In this framework, households are choosing residential locations from the locational preferences that maximize utility for the household. This portion of the study examines the transacted housing prices during 2003-2011. In 2003, California began issuing state medicinal marijuana caregivers/user cards. This would increase demand for MMD sites, which could impact utility maximization of an individual whose locational attribute bundle is being changed by this new statewide policy. In 2005, the City of Los Angeles began a lottery system to decide which MMDs would be allowed to operate and which would not. In 2007, the City of Los Angeles placed a moratorium on opening any new MMDs and all current MMDs had to register with the city to maintain legal operation capacity. In 2010, the City of Los Angeles ordered roughly 700 stores to close who were said to be operating illegally, while in December of the same year a judge barred the city from enforcing the closures. Therefore, the city placed a cap on how many licenses would be distributed. Using the DD approach, this study will attempt to estimate the impacts of these policies on housing prices, and the study will use sorting models to examine how distance to MMD sites impacts housing market equilibriums for Los Angeles. Because in equilibrium no individual can gain more utility from changing residential choice, therefore endogenous switching regression model will also be used to understand the impacts of these policies. The counterfactual results from the switching model could be compared with the counterfactual results of the equilibrium-sorting model to see if they are consistent.

The equilibrium-sorting model is estimated econometrically using a two-stage Heckman selection model. The approach is similar to one used by Bayer, Ferreira, and McMillan (2007). This approach allows for unobserved neighborhood characteristics to be introduced into the discrete-choice housing demand model originally introduced by McFadden (1978). In order to address the endogeneity issues affiliated with this approach, instruments are created for housing price that control for exogenous neighborhood characteristics, such as MMD sites (Berry et al., 1995).

The estimation of the model allows for reasonable estimates of individual's willingness to pay for included choice attributes. The equilibrium model also allows for reasonable exploration of the implications for changes in the model based on neighborhood stratification and individual's choices for attribute preferences. This is accomplished using counterfactual simulations that show what factors influence said stratification.

The chapter is structurally arranged with the next section consisting of a brief background on the market for MMDs, followed by a brief literature review. This will then be followed by a section describing the data in detail for each step in the process along with the proposed methodology of the estimation model and selection model used with an equilibrium-sorting model. The equilibrium-sorting model is important to understanding how MMD sites interact with movement of individual choices to create market-clearing prices. The following section will present the results of the estimated models and the related counterfactual results. The final section will be used for concluding remarks regarding the results and potential future analysis.

Background

Marijuana is a large cash crop in the United States. According to Gettman, marijuana crops are more valuable than the combined corn and wheat markets (2006). Using Gettman's method, the domestic marijuana market has a total estimated value of $64.4 billion for 2012, an increase of 80% from Gettman's 2006 estimate of $35.8 billion. This market exists and has been expanding despite the fact that marijuana is considered a Schedule I Controlled Substance according to federal law (Mikos, 2009). Therefore, it is important to understand how domestically produced marijuana has proliferated and what are some of the possible effects of this proliferation. Much of this growth is due directly to changes in states' laws with the intentions of partial or full marijuana decriminalization. This decreases barriers that once stymied producers, wholesalers, and retailers from distribution to markets that are now available.

According to data from dispensaries and state registries compiled by the National Organization for the Reform of Marijuana Laws (NORML, 2011), there are over one million legal marijuana users supporting a market for legalized marijuana worth over six billion dollars. This demonstrates that there is a large potential market for legalized marijuana, and conversely there is a large market for marijuana law enforcement. Sixteen states and the District of Columbia have some form of decriminalization or punitive exemption for users who consume marijuana for medical purposes (Jacobson et al, 2011). Table 4.1 gives a state-by-state overview of marijuana decriminalization (NORML, 2011). According to the table, California has both medicinal marijuana and some minor forms of marijuana decriminalization. With the proliferation of MMD sites in California, it has become imperative for policy makers to find some way to implement regulation as to not allow the burgeoning marijuana markets to grow out of control and into problems for the public. For example, the Department of Justice's Drug

Analysis 2011 for the Los Angeles High Intensity Drug Trafficking Area, indoor and outdoor marijuana production is increasing in the region. This increase is attributed mainly to local criminals exploiting California's medical marijuana laws. Crime has shown to be an endogenous negative neighborhood attribute for those involved in housing transactions (Hellman & Naroff, 1979; Gibbons, 2004). Therefore, growth of marijuana markets could be perceived by the public to be associated with crime, and seen as a negative when weighing location options for home purchasers.

Table 4.1. Summary of State Medical Marijuana Laws

State	*Year Passed*	*Dispensary Regulations*
Alaska	1998	n/a
Arizona	2010	State Regulated
California	1996	City/County Business License
Colorado	2000, 2012*	State Department of Revenues Regulated
Delaware	2011	State Regulated
District of Columbia	2010	City Regulated
Hawaii	2000	n/a
Maine	1999	State Regulated
Michigan	2008	n/a
Montana	2004	Dispensaries Prohibited; but are in operation
Nevada	2000	Dispensaries Prohibited; but are in operation
New Jersey	2010	State Regulated
New Mexico	2007	State Regulated
Oregon	1998	n/a
Rhode Island	2006	State Regulated
Vermont	2004	n/a
Washington	1998, 2012*	State Regulation Pending

* Decriminalization
Data: (Medical Marijuana Pro Con.org, 2013)

Opponents of legalization argue that crime and negative health statistics would increase with the passing of medical marijuana or decriminalization laws. According to the Department of Justice 2011 National Drug Threat Assessment public administrators expect the passage of marijuana decriminalization policies to become a burden on the public well-being in terms of increased costs as a result of crime and prosecution, lost productivity as a result of missed work days associated with marijuana usage, increased cost of healthcare because of drug associated injuries and rehabilitation programs, and decreased tax revenues as a result of disposable income consumption being shifted to black market enterprises. However, the increase is not captured in the statistics that show, with the exception of Maine and Rhode Island, all the other states experienced decreases in usage rates among teenagers between 12 and 17, highway fatalities of individuals at all ages, and workplace injuries and/or illnesses of individuals of all ages when some form of marijuana decriminalization was implemented. Although there are a myriad of other factors that could have influenced these statistics, these are potentially the types of statistics that public policy makers use when deciding how impactful a change in policy can be. Therefore, it is important to concentrate more research on the social/economic/environmental impacts of marijuana regulatory policy changes.

The state of California has become one of the largest beneficiaries of the devolution of marijuana policies from a federal to a state level regulatory strategy. California is consistently the largest shareholder of domestically produced marijuana, both indoor and outdoor (Gettman, 2006). In 1996, California became the first state to allow use of marijuana for medicinal purposes through the passage of Proposition 215: The Compassionate Use Act. Facing issues with legal obstacles to purchasing medical marijuana, the citizens of California formed cooperatives, which later became MMD sites. The first cooperative, or buyer's club, actually predates the passing of Proposition 215 (Cohen, 2000). These first dispensaries, like the first medical marijuana laws, came as a partial result of AIDS activism, which was one of the least controversial uses for medical marijuana (Reiman, 2010). The number of dispensaries increased exponentially after the passage of California Senate Bill 420, which took effect in 2004 establishing a voluntary patient identification card program through the state and recognized patients' rights to cultivate and obtain marijuana through nonprofit collectives and cooperatives. (Brown, 2008) As of May 2011, 42 cities and nine counties in California have ordinances regulating dispensary operations (American for Safe Access, 2011). The effort to regulate MMD sites in Los Angeles began in 2005 with a request by the City Council for a comprehensive study of the city's MMD sites in order to set comprehensive land use regulations for these sites (Doherty, 2010). The report concluded that dispensaries were currently operating within city limits, and many more were operating from mobile facilities (Bratton, 2005). Findings also suggested that these MMD sites were generating crimes, including narcotics distribution, theft, robbery, and assault. However according to Jacobson et al. (2011), crime was found to have increased around MMD sites that were forced closed by city ordinance in comparison to those that were allowed to stay open. Hence, why this study is necessary for understanding individual's willingness to pay for MMDs vicinity choice in deciding residential location choice

Literature Review

The existing literature on the subject of marijuana markets is not large. Much of the work that exists on marijuana and drug markets are often by the same authors (Clements & Zhao, 2005, 2009). Most of the previous studies have focused on estimating supply and demand, production, consumption, etc. based on information supplied by law enforcement agencies on arrest and eradication activities. Data based on eradication statistics is used regularly to determine how much marijuana is being produced, who are the main exporters and importers, and to get an idea of the market for the final produced good (Gettman, 2006). In the study, marijuana is found to be the top cash crop in 12 states, one of the top 3 in 30, one of the top 5 in 39 states. Domestic marijuana production is the largest agricultural crop in Alabama, California, Georgia, North Carolina, and South Carolina. Studies looking at these aspects of marijuana are done to try to understand some of the market dynamics as they relate to marijuana markets, and what could be the potential market for marijuana. (Rasmussen & Benson, 1999)

Others (Becker et al, 2004; Harkins, 2004) have examined the issue from the standpoint of an illegal drug market. While studying the economic implications of continuing to keep marijuana illegal, Becker et al (2004) find it better to tax a legal good than try to enforce laws on a illegal good, even when controlling for the transfer of producers from legal to illegal operations to avoid taxation. This is in line with the current clash over legalization between state and federal governmental agencies. Also, in the study area a fight is occurring at the local level, where law enforcement agencies, business owners, and public administrative entities are all at odds over how to fully implement and capitalize with minimum losses on California's Prop 215 (Compassionate Use Act of 1996) and Senate Bill 420 (Medical Marijuana Program Act of 2003)

There is also literature examining the potential public health and social issues associated with marijuana consumption. According to Damrongplasit & Hsiao (2009), the goals of marijuana policy are usually to minimize public health and safety hazards related to consumption, as well as to minimize social costs and negative individual consequences resulting from consumption regulation. However, this could be counterintuitive when examining the impacts of MMD sites on housing prices. MMD sites are presumed to be a disamenity, so if they lower housing prices and set premiums on the supply of houses located further away from MMD sites than they are causing a social costs. Many times these objectives work counter to one another and therefore should be reconsidered as related to plausibility of reaching both goals. According to a report prepared by the City of Los Angeles Narcotics Division, medical marijuana facilities help to promote various crimes in areas around the facilities. However, Jacobson et al (2011) found the opposite showing that MMD locations are safer than areas without MMDs. This can be a result of certain policies followed by MMDs to ensure compliance with local laws, which require video surveillance and security staff to operate a MMD, as well as the facility taking measures to ensure the safety of its products. According to a report prepared by the Los Angeles Sheriffs Department, there is still a shroud of illegal activity and operatives who engage in criminal malice within the markets of retail medical marijuana (Bratton, 2005). Therefore, MMD facilities have incentive to keep the areas in which they operate as safe as possible.

Nonetheless, MMD sites may be perceived as a disamenity by those purchasing homes nearby. As for preferences, peoples preferences are expressed daily by the tradeoffs, or opportunity costs, made for the choice of consumption of one good versus another. This is especially true for housing purchases, where houses are considered heterogeneous goods. They have characteristics that vary to the extent of creating a distinct product (i.e. multi-family homes, condominiums, mobile homes, craftsman homes, townhomes, etc.). The variation in characteristics also transcends to a variation in product prices in each market. The price of homes reflects many of its characteristics, whether physical, environmental, or demographic. These implicit price factors are becoming more explicit, using the hedonic method for non-market valuation. (Taylor, 2003) In application to this study, the hedonic model will use housing price to help reflect the value in locating within a half mile of a MMD. This is what makes the hedonic method an "indirect" valuation method in which the value of the consumers revealed preferences for certain housing characteristics are inferred from an observable market transaction.

In the literature it has been found that some of these implicit factors have had significant effects on housing prices, such as environmental quality where houses in areas with cleaner air have higher values than properties in more polluted areas, which have resulted in welfare losses. (Brookshire et al., 1982; Reichart et al., 1991; Nelson et al., 1992; Hite et al., 2001; Case et al., 2006; Decker et al., 2005) However, measuring the impacts of these disamenities on a dynamic housing market can be challenging. Bayer et al. (2003, 2004, 2008) have done extensive research into looking at some of these dynamics, especially as it relates to locational choice, preferences for the locations, and demographic differences. Hence, why information plays such a pivotal role in the perception of the qualities surrounding properties. So the true question is does the actual physical appearance of MMD sites affect prices or is it an information effect. (i.e.: Does seeing the physical structure have more of a price effect then the potential informational positives that are an indirect result of the MMD locational choice).

Jacobson et al (2011) showed that there have been several policy adjustments that have affected the City of Los Angeles addressing the issue of medical marijuana regulation. Of particular concern for this study is the passing of Senate Bill 420: Medical Marijuana Program Act of 2003 (SB 420). The law was meant to show force the government to begin distribution of state issued medical marijuana licenses and begin to potentially have some form of oversight in the MMD consumer market at the state level. However, the state left regulation of MMDs to the local administrators, and local administrators have been trying to understand which method is best to regain some form of oversight in this fairly new industry. Jacobson et al. (2011) introduce ideas specific to Los Angeles to begin regulation of the supply of medical marijuana. These ideas include capping the number of licenses distributed to MMDs or just complete prohibition of MMDs. These were the measures implemented by the Los Angeles City Council and Los Angeles County (Jacobson et al., 2011). However, their study points out that crime increased in the areas surrounding MMDs compared with those allowed to remain open. If crime increases where MMDs are closing, this could go counter to the hypothesis proposed in this study. If facilities being closed are also associated with more crime in the surrounding areas, then houses that are located to closed facilities may experience more of negative impact then those located closer to MMDs. This idea also poses contrary to what law enforcement and proponents of MMDs in the Los Angeles market would suggest.

Assuming criminals are utility maximizing individuals, the same as homeowners, where the preference for committing crime is influenced by the cost undertaken because of punishment for being caught (Becker, 1968). The closed facilities offer opportunities for crimes through multiple outlets. One is that they take away the traffic, crowds, and security that are usually associated with MMDs and detract from the usual opportunity to commit crime. With those factors withdrawn, there is higher potential for crimes to occur because of the increase potential opportunity especially for property and violent crime.

An alternative theory is that as the amount of MMDs increases drug suppliers who used to produce for black markets will shift from costly production inputs (i.e. producing illegal marijuana) to less costly ones (i.e. producing legal marijuana that is distributed through MMDs) (Rasmussen and Benson, 1999). The costly inputs are those whose costs increase as a result of decreased MMD site accessibility. An example of this can be seen in the labor inputs for street level drug retailers. When medical marijuana regulatory policies began giving more accessibility to business owners to start MMD operation, street level retailers began losing revenues and substituting over to other forms of labor. Therefore, MMD site proliferation had the potential to push street retailers into more legitimate forms of revenue generation, or either into more lucrative criminal activities.

If proper regulation were introduced, the growth in production and retail facilities could provide a large potential revenue source for local and state governments, as well as a potential savings to public coffers due to the decreased need for law enforcement to pursue criminals who have transferred labor to legitimate business operations. The same is not particularly true at the federal level because the ability to tax a listed controlled substance is prohibited at the federal level. This is partly why local public administers have chosen to focus on the supply side of marijuana consumption. According to Becker et al (2004), legalization as a means to tax consumption may be more effective than the current method of punitive consequences for consumption.

Data & Methodology

The area that will be examined in this study is the County of Los Angeles, California from 1964-2012. Housing transaction data from 2003-2012 was used to identify addresses for the proposal. This study uses housing sale price data from the Los Angeles County Office of Property Assessment in the form of sales list, which contained transacted price, structural characteristics and physical location. The physical location was used to derive point estimates using address reference geocoding techniques through ArcGIS software. These distance points reflect the distance homes are located from the nearest MMD site. Near distances were calculated from elementary and high schools that performed above the state average on the California Assessment of Student Performance and Progress (CAASPP) exams. There ares dummy variable signaling whether a MMD is closed or open within a one mile and three mile buffer of transacted houses. Demographic census data was collected using ArcGIS Business Analyst data derived from the U.S Census American Community Survey and Decennial Census. The demographic data is at the census block group level. Table 4.2 gives a detail list of the data used for the study. There are many more housing transactions concentrated towards the later years than the earlier years of the study time. This is consistent with national trends that were associated with the housing market growth in the early and mid 2000s, followed by decline after the housing market crash during the Great Recession from 2007-2009. However, the housing sales in 2012 show that the housing market in Los Angeles have mostly recovered to pre-2007 levels.

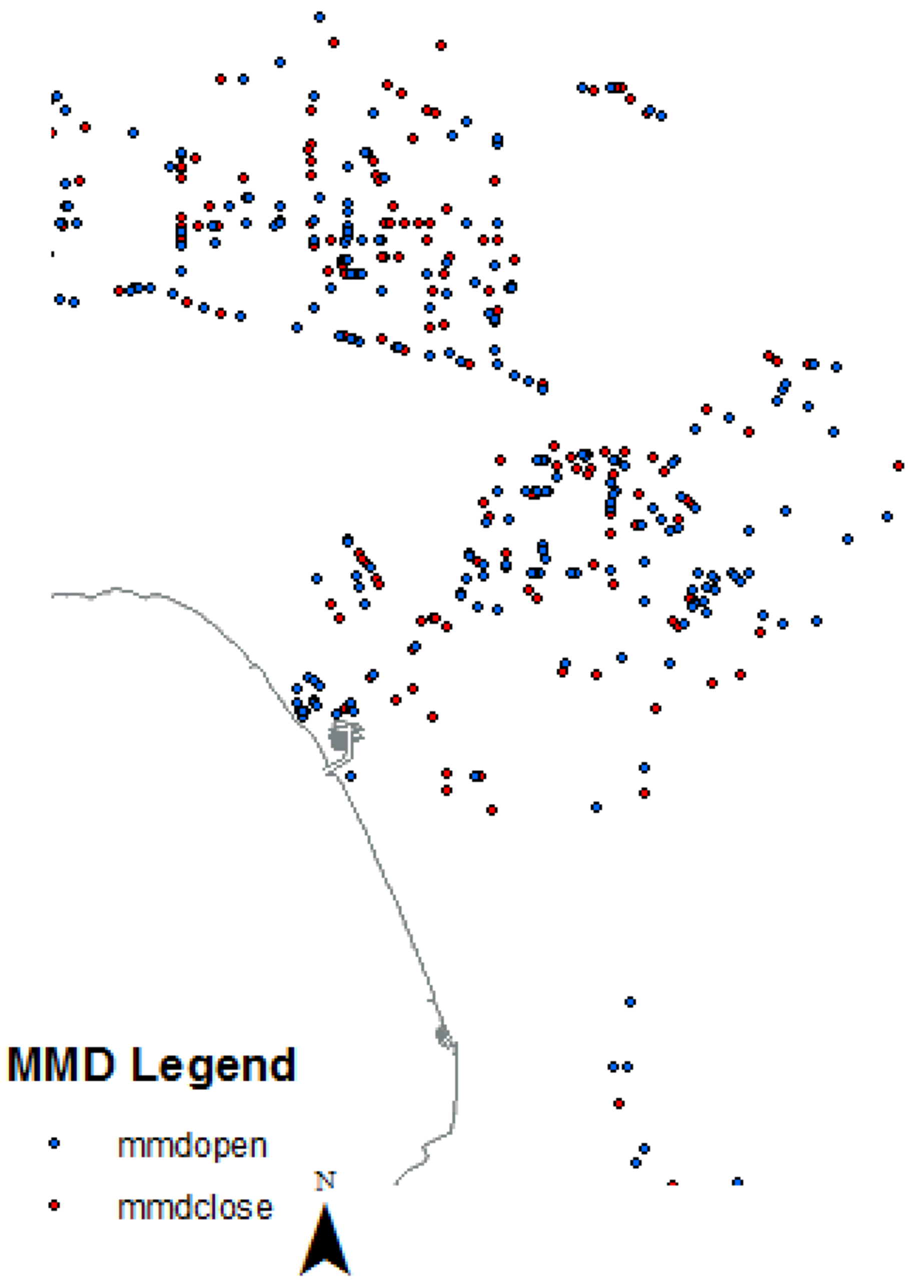
Table 4.2. Summary Statistics for variables used for MMD Impact Estimation

Variable	Observation	Mean	Std. Dev.	Min	Max
Natural Log of Housing Price	204579	13.1616	0.8171818	0.0623265	18.70602
# of Bathrooms	207146	2.130116	1.049997	0	28
# of Bedroom	207146	2.72529	1.101126	0	36
Natural Log of Building Square Foot	204541	7.274653	0.4567855	1.098612	11.78625
Age of House	207146	44.31267	27.16735	0	132
Age of House^2	207146	2701.674	2583.049	0	17424
Distance to Council District Voting Yes	207146	5.000148	5.687528	0.0121767	58.54964
Distance to Beach/Marina	207146	14.1057	9.583408	0.0403463	82.30296
Distance to Elem School Above State Avg Test	207146	0.5658481	0.4133768	0.0074487	17.06999
Distance to High School Above State Avg Test	207146	1.407104	0.9506606	0.0176159	36.01844
Distance to Sheriff Report District with Above State Avg Crime Rate	207146	6.222852	3.446878	0.1185863	31.94868
Distance to Landfill	207146	12.13974	5.567201	0.2244429	54.93998
Distance to Business Center	207146	3.275585	1.811054	0.0123805	29.07338

Percentage of Owner occupied	207095	0.4852796	0.2558296	0	1
Proportion of CBG with Low Income	207095	0.0443017	0.0490874	0	0.5201238
Proportion of CBG with High Income	207095	0.0298081	0.0434571	0	0.2530992
Distance to Nearest Open MMD	207146	2.559045	5.229042	0.0012225	57.70946
Distance to Nearest Closed Facility	207146	2.806345	5.45413	0.008281	57.98637

This area was chosen because of the constant policy changes that directly impact MMDs. The area has vast heterogeneous characteristics in population demographics, socioeconomic levels, and housing while also being one of the originating places for marijuana law reform. Los Angeles also has a large number of MMD facilities that are densely located. Figure 4.1 illustrates the location of MMDs that were ordered closed versus those allowed to remain open. According to statistics from the Drug Enforcement Agency, the marijuana grow operations have grown larger in the area surrounding Los Angeles County, specifically on federal lands (2007). This boost in production is partly related to the growth of MMDs and changes in policies.

Figure 4.1. Map of MMD Facilities, Ordered Closed and Allowed to Stay Open



The basis for hedonic regression is when individuals choose to buy a home; the home assumes a variety of structural and locational characteristics that can be used to estimate the likely effect, or marginal effect of these attributes on the price of a house. Home purchasers search for properties within a specific mixed attribute bundle that allows them to maximize household/individual utility (U) based more specifically on where those attributes are located. This can be seen in the indirect utility function:

$$MaxV_i = \alpha_X^i X_h + \alpha_Z^i Z_h - \alpha_P^i P_h + \alpha_D^i D_h + \xi_h^i + \varepsilon_h^i \quad (1)$$

Where X_h is observable structural and neighborhood housing characteristics of choice (h), Z_h is the average sociodemographic attributes of the neighborhood determined in equilibrium, P_h is housing price, and D_h is distance from a MMD. The error term is divided into a two separate parameters, one portion is correlated with each housing bundle that is a shared value by all households (ξ_h) and another portion that is the error term of the individual purchaser (ε_h^i) (Brueckner, 2011).

The hedonic model was originally developed by Rosen (1974) to provide a theoretical framework that could demonstrate the relationship between prices and characteristics. While most widely used to estimate value of non-market goods (i.e.: environmental quality {Brookshire et al., 1982; Hite et al., 2001; Case et al. 2006}, crime {Linden & Rockoff, 2006}, school quality {Black, 1990; Bayer et al., 2003}). However, these bundle of attributes are heterogeneous (Rosen, 1974; Berry, 1994; Sheppard, 1999; Epple et al. 2012) and make it difficult to identify the hedonic price function of a specific amenity because the variation may be correlated with some unobservable features. Therefore, a DD approach has to be applied to the hedonic framework to allow inference of the value homeowners place on MMDs and their location in relationship to these MMDs.

The most common methods used for hedonic analyses have been quasi-experiments taken ex ante controlling for time and/or space to try to avoid omitted variable bias and accurately identify. Examples of quasi-experimental applications can be seen in most hedonic research as well as Hite (1998), Black (1999), and Lindon & Rockoff (2008). This approach allows for the description of the size and sign of MMDs effects on housing prices. However, an exogenous shock to the spatial distribution of a nonmarket good (i.e.: creation of a lottery for MMD licenses, capping the number of licenses distributed, thereby spatially shocking consumers willingness to pay for spatial convenience to a MMD) may also shift the hedonic price function to allow for market clearing. Therefore, both implicit prices differences may not deliver an estimate of consumer willingness to pay for locational attribute of vicinity to MMDs. Hence, this study attempts to measure welfare effects using a selection model on the basis of the discrete choice model developed in Bayer et al. (2009).

First, the DD hedonic specification derived from Rosen (1974) seminal theory, can be written as follows:

$$lnP_i = \alpha_{i,t} + \beta X_{i,t} + \gamma Z_{i,t} + \delta_0 C_{i,t} + \theta_0 D_{i,t} + Post_{i,t} + (\theta_n D_{i,t}) * Post_{i,t} + \varepsilon_{i,t} \qquad (2)$$

Where $lnP_{i,t}$ is the natural log of the transacted housing price, $\beta X_{i,t}$ is a vector of housing characteristics, $\gamma Z_{i,t}$ is a vector of neighborhood demographics, $\delta C_{i,t}$ is a dummy variable indicating whether a MMD was opened in the same cluster as the transacted home, and $\theta D_{i,t}$ is the dummy variable indicating whether there was a MMD closing in the cluster. The post or treatment is the change in policy based on a time dummy based on the date listing in Table 4.3 (Angrist & Pischke, 2009). This allows for observation of whether the treatment had any effect on location decision of being near an MMD through the hedonic housing estimation of attributes and exploitation of time of policies allowing opening or closing of MMDs. To estimate equation (1), housing data is examined both before and after policy 'treatments'. The key parameters from the equation are the spatial variables $(\hat{\delta}; \hat{\theta})$ for MMD location that have been interacted with a dummy variable used to indicate whether the housing transaction took place after one of four policies were enacted.

Table 4.3: Timeline of Policy Changes, Los Angeles, CA

6-Nov-96	California Approves Medical Use of Marijuana
1-Jan-04	California establishes voluntary ID program for medical marijuana patients
22-Jun-06	County of Los Angeles allows dispensaries to operate
14-Sep-07	City of Los Angeles places moratorium on opening of MMD
13-Nov-07	City of Los Angeles orders more than 400 MMDs to close
25-Jan-11	City of Los Angeles places cap of 100 on MMDs allowed to operate

Data: (Jacobson et al., 2011)

Difference in difference (DD) specification allows for spatial fixed effects to be observed before and after treatments, so that time-invariant omitted variables can be differenced away. The structure of the hedonic DD model implicitly assumes that the treatment group and control group have similar characteristics and are trending in the same way over time. This means that the treatment group will experience the same effects had they not received the treatment as the control group.

However, the model could have self-selectivity bias (Maddala, 1986), because where an individual decides to reside is voluntary. The likelihood is that those who live in the study area will have different neighborhood and individual characteristics, as it relates to locating within the vicinity of a MMD, then those who live outside the observed study area. This becomes troublesome econometrically because unobserved preferences and characteristics have different distributions across treatment/non-treatment groups. Since these unobservable preferences have the ability to influence $\widehat{P_{\iota,t}}$ and $(\widehat{\delta_n},\ \widehat{\theta_n})$ thereby potentially making estimates of the effects inconsistent.

Therefore, comparison between the hedonic price model and a discrete choice model of product differentiation can give a better illustration of neighborhood price effects. This study looks to develop a discrete choice model known as the endogenous switching regression (Willis & Rosen, 1979; Quandt & Ramsey, 1979; Quandt, 1982; Maddala 1983, 1986; Cameron &

Trivedi, 2005). The model looks at equations for $P_{i,t}\ when\ (\delta_n,\ \theta_n)$ is inside and outside the study area. Using this approach, the revealed preference choice of $(\delta_n,\ \theta_n)$ is able to be modeled using standard limited dependent variable methods. At that point, equations can be estimated separately for those who transacted before and after the policy change, as well as inside and outside of a predetermined distanced buffer zone around a MMD.

The decision to live within the cluster area is a dichotomous choice that is consequential on maximization of an individual's utility. Lee (1978) saw this choice as a function of consumption for a living domain for those sorting into neighborhood clusters. The cost involved with consuming the location of domicile space is both fixed and variable. This can be explained in the idea that one has to have some type of shelter to occupy (fixed), however the monetary value associated with that cost can be different from location to location (variable). The expected utility of living within the buffer zone with a MMD (δ_1^*) is evaluated against those who do not stay in the buffer zone with a MMD (δ_0^*). If $\delta_1^* > \delta_0^*$ then the individual will live within the buffer zone, and when $\delta_1^* \leq \delta_0^*$ individuals will not live in the buffer zone Defining living in the buffer zone of *i*th amount of willingness to pay for MMD location choice for the *j*th individual consumer as: $I_{ij} = 1$ if $\delta_1^* > \delta_0^*$ and $\mathrm{I}_{ij} = 0$ if $\delta_1^* \leq \delta_0^*$. Then the choice to live within the buffer zone or not can be described as:

$$\delta_{ij}C_{i,t} = \alpha_{i,t} + \beta X_{i,t} + \gamma Z_{i,t} + lnP_{i,t} + \theta_0 D_{i,t} + Post_{i,t} + (\theta_n D_{i,t}) * Post_{i,t} + \varepsilon_{i,t} \qquad (3)$$

where the parameters to be estimated are the same as from above, with the exception that the binary choice of whether a transacted house is located within a buffer zone of an open MMD or not.

Relating this concept to demand theory, those who do not live in the zone area may have different housing consumption behaviors than those living within, therefore different sorting preferences. If P_{ij} is defined as the observed ith amount of willingness to pay for housing for the jth consumer, then P_{ij1} and P_{ij0} as the ith amount of WTP for those who live within the cluster area $j(\delta_{ij} = 1)$ and those who do not live within the area $j(\delta_{ij} = 0)$. Now separate WTP equations can be stated for those living in the area and those living outside of the area:

$$P_{ij1} = \beta_{i1}'\mathbf{X}_j + \varepsilon_{ij1} \rightarrow \text{Living in Buffer Zone,} \tag{4}$$

$$P_{ij0} = \beta_{i0}'\mathbf{X}_j + \varepsilon_{ij0} \rightarrow \text{Not Living in Buffer Zone} \tag{5}$$

where $\mathbf{X}_j$ is a vector of the jth consumer's observed preferences that could affect maximum WTP for housing, β_{i1} and β_{i0} parameter vectors, and ε_{ij1} and ε_{ij0} are error terms. The error terms from the above equations (μ_{ij}, ε_{ij1}, ε_{ij0}) are assumed to have a trivariate normal distribution with mean vector zero and covariance matrix:

$$\text{cov}(\varepsilon_{ij1}, \varepsilon_{ij0}, \mu_{ij}) = \begin{bmatrix} \sigma_{i1}^2 & \sigma_{i1,0} & \sigma_{i1\mu} \\ \sigma_{i1,0} & \sigma_{i0}^2 & \sigma_{i\mu 0} \\ \sigma_{i1\mu} & \sigma_{i0\mu} & 1 \end{bmatrix}$$

where $\text{var}(\varepsilon_{ij1}) = \sigma_{i1}^2$, $\text{var}(\varepsilon_{ij0}) = \sigma_{i0}^2$, $\text{var}(\mu_{ij}) = 1$, $\text{cov}(\varepsilon_{ij1}, \varepsilon_{ij0}) = \sigma_{i1,0}$, $\text{cov}(\varepsilon_{ij1}, \mu_{ij}) = \sigma_{i1\mu}$, and $\text{cov}(\varepsilon_{ij0}, \mu_{ij}) = \sigma_{i0\mu}$.

Therefore, the choice of living in the buffer zone is endogenous, and the error terms are conditional on the sample selection criterion and have nonzero expected values.

$$\mathrm{E}\left[\varepsilon_{ij0} \middle| I_{ij} = 1\right] = -\sigma_{i1\mu}\frac{\varphi(\gamma_i'\mathbf{Z}_j)}{\phi(\gamma_i'\mathbf{Z}_j)} \tag{6}$$

$$\mathrm{E}\left[\varepsilon_{ij0} \middle| I_{ij} = 0\right] = \sigma_{i0\mu}\frac{\varphi(\gamma_i'\mathbf{Z}_j)}{1-\phi(\gamma_i'\mathbf{Z}_j)} \tag{7}$$

where φ and ϕ are the standard normal probability density function (PDF) and the standard normal cumulative density function. Therefore, the maximum WTP relationships defined in the above equations should not be estimated using ordinary least squares (OLS). A two-step estimation method is the most commonly used method for estimating endogenous switching regression models. However, Maddala (1983) recommends the full information maximum likelihood (FIML) estimation for endogenous switching regressions. The reason is that the parameters are consistent and asymptotically efficient (Lee & Trost, 1978).

This model is for a maximum likelihood function, which differs slightly from the FIML as it relates to the distribution of the error terms. (Lokshin & Sajaia 2004) The terms still have the same trivariate distribution in the covariance matrix. Given that the model is constructed through nonlinearities and the assumption of the covariance matrix distribution, the log likelihood function is:

$$lnL = \sum_i \left(I_i w_i \left[\ln\{F(\eta_{1i})\} + \ln\left\{ f^{\left(\frac{\varepsilon_{1i}}{\sigma_1}\right)} \Big/ \sigma_1 \right\} \right] + (1 - I_i) w_i \left[\ln\{1 - F(\eta_{2i})\} + \ln\left\{ f^{\frac{\varepsilon_{2i}}{\sigma_2}} \Big/ \sigma_2 \right\} \right] \right) \quad (8)$$

where F is a cumulative normal distribution function, f is a normal density distribution function, w_i is an optional weight for observation i, and

$$\eta_{ij} = \frac{(\gamma Z_i + {}^{\rho_j \varepsilon_{ji}}/_{\sigma_j})}{\sqrt{1 - \rho_j^2}} \qquad j = 1,2 \quad (9)$$

where $\rho_1 = \frac{\sigma_{1\mu}^2}{\sigma_\mu \sigma_1}$ is the correlation coefficient between ε_{1i} and μ_i and $\rho_2 = \frac{\sigma_{2\mu}^2}{\sigma_\mu \sigma_2}$ is the correlation between ε_{2i} and μ_i. In order to be sure that $\widehat{\rho_1}$ *and* $\widehat{\rho_2}$ are bounded between -1 and 1 and that

$\widehat{\sigma_1}$ *and* $\widehat{\sigma_2}$ are always positive, the maximum likelihood directly provides $ln\widehat{\sigma_1}$, $ln\widehat{\sigma_2}$, and atanh $\hat{\rho}$: (Maddala, 1983, 1986; Poirier & Frazao 1994; Loshkin & Sajaia, 2004).

$$\text{atanh}\,\widehat{\rho_j} = \frac{1}{2}\ln\left(\frac{1+\rho_j}{1-\rho_j}\right) \tag{10}$$

While the DD hedonic model and the endogenous switching regression model attempts to capture the effect of the treatment on willingness to pay for housing location vicinity to MMD sites, this study would like to also show the welfare effects of the policy treatments. In order to capture the true welfare effects of the different policy changes, this study would need to follow Bayer et al.'s (2009) residential sorting model. The model consists of the individual's residential location decision problem and a market-clearing condition. The counterfactuals simulated from the endogenous switching can be compared with the counterfactuals simulated using the multivariate probit model to see are the results of the endogenous switching model consistent with the Bayer et al. (2009) approach.

This approach uses the same indirect utility function from equation (1), and it allows household valuation of choice bundle attributes to vary with the characteristics of the individual according to:

$$\alpha_j^i = \alpha_{0j} + \sum_{k-1}^{K} \alpha_{rj} z_k^i \tag{11}$$

where equation (11) describes the individual's preference for choice characteristic *j*. This specification is unique by creating a horizontal model of sorting specific household preferences that estimate specific effects defined over each bundle of choice attributes. This differs from vertical models by relaxing the restriction that only allows individuals to have observable preferences over a single locational index and doesn't allow observable sorting across clusters areas.

According to Bayer et al. (2009), housing markets can be fully understood as a set of housing attribute bundles that is a subset of the full availability of housing attributes. Supply of attributes of house h S_h, where each sample individual is sharing observable characteristics with other individuals in the sample. Given the implications to the individual housing consumer given in equations (1) and (11), individual *i* chooses house *h* if the utility from this choice is greater than the utility that is received from all other possible alternative choices:

$$V_h^i > V_k^i \Rightarrow W_h^i + \varepsilon_h^i > W_k^i + \varepsilon_k^i \Rightarrow \varepsilon_h^i - \varepsilon_k^i > W_k^i - W_h^i \quad \forall\, k \neq h \qquad (12)$$

Here we can see the utility is decomposed into observable and unobservable, and the inequalities allow for observance of the relationship between utility for purchase of *h* by *i* and the probability of gaining utility from alternative choice *k*. Therefore, probability P_h^i can be written as a function of the vectors from equation (1) that describe housing, neighborhood, individual characteristics, and prices:

$$P_h^i = f_h(z', Z, X, p, \xi) \qquad (13)$$

And now the demand function for each housing type h, D_h:

$$W_h^i D_h = \sum_i P_h^i \qquad (14)$$

Therefore the market clearing condition is:

$$D_h = S_h, \forall h \Rightarrow \sum_i P_h^i = S_h, \forall h \qquad (15)$$

In order for this to hold true, one has to assume that prices will adjust to clear the market. Bayer et al. (2009) showed that there is a distinct set of prices to clear the market that follows with the indirect utility function (1) and a fixed housing bundle of attributes. In the sorting equilibrium, a set of residential location decisions are simulated based on housing characteristics, neighborhood characteristics, and individual characteristics. This study specifically aims to understand the attribute of living near a MMD that is opening and closing due to policy changes, and understand how these policy changes effect sorting of individuals in specific neighborhoods with desired attributes in the house chosen. However, in practice it is often not possible to establish that equilibrium is unique. It is important that the equilibrium should express how sociodemographic attributes should correspond with market clearing prices and produce choice probabilities (13) that lead to the same neighborhood attributes. Therefore, there can be multiple equilibriums depending specifically on choice preferences, availability of particular housing choices, and the utility parameters in the model. (Bayer & McMillan 2010)

Results

The first analysis of results comes from estimation of a difference-in-difference hedonic price model (2). The housing data used consist of observations of 192423 housing transactions in the Los Angeles County area and whether those transactions were experienced within a buffer of an open MMD. This buffer is interacted with a treatment time, where the Los Angeles city council ordered the closing of over 400 MMDs. Results are reported in Table 4.4. The interaction variable shows that MMDs remaining open after the treatment date, had a negative impact on housing prices. However, the negative impact continues at an increasing rate, interpreted as you move further away from the site remaining open after the treatment the greater the decrease in housing price as a result. This is contrary to the hypothesis that housing prices would increasingly decrease as houses transacted closer and closer to MMDs remaining open. The treatment is a change in policy on November 15, 2007, the experimental group is open

MMDs, and the control group had no openings before or after the treatment. The results of the DID models are in Table 4.4.

Table 4.4. Medical Marijuana Dispensary Difference in Difference Estimation of Hedonic Housing Price

VARIABLES	NLog House$ 0.5 mile	NLog House$ 1 mile
Bathroom	0.2173***	0.0189***
	(0.002)	(0.003)
Bedroom	-0.5355***	-0.5366***
	(0.006)	(0.027)
Building Sq Foot	0.8228***	0.8218***
	(0.013)	(0.000)
Bedroom * SqFt	0.0614***	0.0603***
	(0.003)	(0.003)
Age of House	0.0009***	0.0012***
	(0.000)	(0.000)
Distance Variables		
Marina/Beach	-0.0181***	-0.0152***
	(0.000)	(0.000)
High Test Elem	-0.3629***	-0.2684***
	(0.004)	(0.004)
High Test HS	-0.0469***	-0.0450***
	(0.001)	(0.002)
Business City	-0.0129***	-0.0698***
	(0.000)	(0.000)
Landfill	0.0095***	0.0117***
	(0.001)	(0.000)
High Crime Area	0.0494***	0.0326***
	(0.000)	(0.000)
Council District	0.0177***	0.0249***
	(0.000)	(0.001)
MMD Open	0.0415***	0.0209***
	(0.002)	(0.002)
MMD Close	-0.0662***	-0.0029***
	(0.001)	(0.002)
Difference in Difference Variables		
MMD Open	0.2717***	0.2597***
	(0.005)	(0.005)
Post Treated	-0.4129***	-0.4344***
	(0.006)	(0.006)
Post Treated	-0.3789***	-0.4038***
	(0.006)	(0.006)
Constant	7.9121***	7.6501***
	(0.019)	(0.017)
Observations	192423	192423
R-squared	0.4265	0.4425

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

Table 4.5a, b, c provides results to the selection models, which uses a two-stage sequence to capture the likelihood of a sale as a function of neighborhood effects. The results show the marginal price contributions of various property attributes. These results correspond to the DID estimation.

Table 4.5a. Half Mile MMD Selection Model Estimates

VARIABLES	Pr(Transaction)	Hedonic House Price
Bathroom		0.0573***
		(0.020)
Bedroom		0.5946***
		(0.112)
Natural Log Sq Ft		0.8149***
		(0.053)
Bedroom * Sq Ft		0.0645***
		(0.015)
House Age		0.0021***
		(0.000)
% of Owned Homes (CBG)	0.8369***	
	(0.175)	
% White (CBG)	0.6839***	
	(0.061)	
% Black (CBG)	-0.1239*	
	(0.072)	
% HiInc- % LoInc	-0.6485***	
	(0.169)	
Distance Variables		
High Crime Area (Sheriff Reporting District)	-0.0023*	0.0448***
	(0.004)	(0.004)
City Center	-0.0045	
	(0.006)	
Business Center (CBG group)	0.0439***	-0.0062
	(0.006)	(0.007)
Beach Marina	0.0007*	-0.0223***
	(0.002)	(0.002)
Elementary Testing Above State Average	0.1276***	-0.0019
	(0.033)	(0.031)
High School Testing Above State Average	0.0368***	-0.0061
	(0.014)	(0.013)
Landfill	0.0220***	0.0102***
	(0.002)	(0.003)
Council District Voting to Close MMD	0.0823***	-0.0035
	(0.006)	(0.007)
Near Close MMD	0.0215*	-0.0339***
	(0.012)	(0.011)
Near Open MMD	-0.0204	0.0438***
	(0.012)	(0.010)
DID Variables		
Open		-0.0341*
		(0.041)
Treatment		-0.4708***
		(0.027)
Post Treatment		-0.0889**
		(0.049)
Mills lambda	-4.8827***	
	(0.490)	
Constant	1.0141***	7.6431***
	(0.185)	(0.367)
Observations	206,951	206,951

Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Table 4.5b. One Mile MMD Selection Model Estimates

VARIABLES	Pr(Transaction)	Hedonic House Price
Bathroom		0.0563***
		(0.020)
Bedroom		0.6057***
		(0.113)
Natural Log Sq Ft		0.8116***
		(0.053)
Bedroom * Sq Ft		0.0659***
		(0.015)
House Age		0.0020***
		(0.000)
% of Owned Homes (CBG)	0.8369***	
	(0.175)	
% White (CBG)	0.6839***	
	(0.061)	
% Black (CBG)	-0.1239*	
	(0.072)	
% HiInc- % LoInc	-0.6485***	
	(0.169)	
Distance Variables		
High Crime Area (Sheriff Reporting District)	-0.0023*	0.0448***
	(0.004)	(0.004)
City Center	-0.0045	
	(0.006)	
Business Center (CBG group)	0.0439***	-0.0069
	(0.006)	(0.007)
Beach Marina	0.0007*	-0.0226***
	(0.002)	(0.002)
Elementary Testing Above State Average	0.1276***	-0.0043
	(0.033)	(0.031)
High School Testing Above State Average	0.0368***	-0.0079
	(0.014)	(0.013)
Landfill	-0.0220***	0.0099***
	(0.002)	(0.003)
Council District Voting to Close MMD	0.0823***	-0.0042
	(0.006)	(0.007)
Near Close MMD	0.0215*	-0.0329***
	(0.012)	(0.011)
Near Open MMD	-0.0204	0.0442***
	(0.012)	(0.010)
DID Variables		
Open		0.0308
		(0.041)
Treatment		-0.5035***
		(0.027)
Post Treatment		-0.0982**
		(0.049)
Mills lambda	-4.8939***	
	(0.490)	
Constant	1.0141***	7.6718***
	(0.185)	(0.368)
Observations	206,951	206,951

Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Table 4.5c. Two Mile MMD Selection Model Estimates

VARIABLES	Pr(Transaction)	Hedonic House Price
Bathroom		0.0564***
		(0.019)
Bedroom		0.6140***
		(0.107)
Natural Log Sq Ft		0.8129***
		(0.050)
Bedroom * Sq Ft		0.0655***
		(0.014)
House Age		0.0020***
		(0.000)
% of Owned Homes (CBG)	0.8369***	
	(0.175)	
% White (CBG)	0.6839***	
	(0.061)	
% Black (CBG)	-0.1239*	
	(0.072)	
% HiInc- % LoInc	-0.6485***	
	(0.169)	
Distance Variables		
High Crime Area (Sheriff Reporting District)	-0.0022*	0.0449***
	(0.004)	(0.004)
City Center	-0.0041	
	(0.006)	
Business Center (CBG group)	0.0439***	-0.0012
	(0.006)	(0.007)
Beach Marina	0.0007*	-0.0223***
	(0.002)	(0.002)
Elementary Testing Above State Average	0.1276***	-0.0006
	(0.033)	(0.031)
High School Testing Above State Average	0.0368***	-0.0032
	(0.014)	(0.013)
Landfill	-0.0220***	0.0107***
	(0.002)	(0.003)
Council District Voting to Close MMD	0.0823***	0.0002
	(0.006)	(0.007)
Near Close MMD	0.0215*	-0.0384***
	(0.012)	(0.011)
Near Open MMD	-0.0204	0.0438***
	(0.012)	(0.010)
DID Variables		
Open		-0.0219
		(0.041)
Treatment		-0.5154***
		(0.053)
Post Treatment		-0.0889*
		(0.057)
Mills lambda	-4.6398***	
	(0.461)	
Constant	1.0141***	7.6668***
	(0.185)	(0.349)
Observations	206,951	206,951
Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1		

Conclusion

This paper set out to investigate the effects of MMD site growth on housing prices after Los Angeles, CA developed regulations discouraging the growth of retail marijuana facilities. Using MMD data for the Los Angeles, as well as property sales data and census information, a DD hedonic housing price model was used to calculate the change in price due to a change in neighborhood quality before and after a change in state statutes that discouraged MMD growth, and city statutes that ordered MMDs to close. The proposed hypothesis was that the closer an individual decided locate to an MMD site, the lower the individuals willingness to pay will be. The results show that according to the DD estimation the hypothesis could not be rejected. Individual home consumers were willing to pay a premium to purchase a home when policies affecting the location of MMD sites were implemented.

This discounting of MWTP for locating in a buffer where an MMD site closed, seems to follow directly with the changing public views of MMDs. Jacobson et al. (2011) showed how local law enforcement began to see MMDs as unfavorable bringing increased crime rates and urban decay. However, they also showed that the law enforcements' views were unfounded and that MMDs actually lowered crime rates in the areas where they were located. However, public opinion seems to be that the market for these facilities may grow to fast and became a problem for unobservable reasons. MMD sites also seem to have been located in areas where housing values are higher, as well as levels of income distribution of the CBG populations.

So while MMDs seemed to bring a social benefit through decreased crime around the facilities as a result of more traffic, security, and larger police presence, they social costs grew even higher to the point where individuals didn't particularly care about if they were closed down or not, they just did not want to pay a premium to locate to an area where one was closed.

People are content with that they exist, they just don’t want to have to directly be involved with their existence. We could call it the: “Not-in-My-Backyard Effect.

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Appendix:

1. What is your age?

#	Answer	
1	18 or younger	
7	19-24	
2	25-34	
6	35-44	
3	45-54	
4	55-64	
5	65 or over	

Statistic	Value
Min Value	1
Max Value	7
Mean	4.13
Variance	3.95
Standard Deviation	1.99
Total Responses	2,914

2. What ZIP code do you live in?

Statistic	Value
Total Responses	2,398

3. What is your gender?

#	Answer	
1	Male	
2	Female	

Statistic	Value
Min Value	1
Max Value	2
Mean	1.56
Variance	0.25
Standard Deviation	0.50
Total Responses	2,480

4. What is your race?

#	Answer	
1	White	
2	Black or African American	
3	American Indian and Alaska Native	
4	Asian	
5	Two or More Races	
6	Native Hawaiian and other Pacific Islander	
7	Other (please specify)	

Statistic	Value
Min Value	1
Max Value	7
Mean	1.65
Variance	1.61
Standard Deviation	1.27
Total Responses	2,476

5. What is your ethnicity?

#	Answer	
1	Hispanic	
2	Non-Hispanic	

Statistic	Value
Min Value	1
Max Value	2
Mean	1.92
Variance	0.07
Standard Deviation	0.27
Total Responses	2,429

6. Choose the category into which your household income falls?

#	Answer	
1	under $15,000	
2	$15,000-24,999	
3	$25,000-34,999	
4	$35,000-49,999	
5	$50,000-74,999	
6	$75,000-99,999	
7	$100,000-149,999	
8	$150,000-199,999	
9	over $200,000	

Statistic	Value
Min Value	1
Max Value	9
Mean	4.22
Variance	4.11
Standard Deviation	2.03
Total Responses	2,482

7. Have you taken a vacation trip to a U.S. Coastal Destination (Gulf of Mexico, Atlantic or Pacific Ocean)?

#	Answer	
1	Yes	
2	No	

Statistic	Value
Min Value	1
Max Value	2
Mean	1.47
Variance	0.25
Standard Deviation	0.50
Total Responses	2,479

8. Have you ever taken a vacation trip to coastal Alabama or Mississippi? (AL counties: Baldwin & Mobile; MS counties: Jackson, Harrison & Hancock)

#	Answer	
1	Yes	
2	No	

Statistic	Value
Min Value	1
Max Value	2
Mean	1.61
Variance	0.24
Standard Deviation	0.49
Total Responses	1,462

9. Where specifically did you stay? (Hotel and/or City/Town/State)

Statistic	Value
Total Responses	564

10. Prior to last year, how many vacation trips did you typically take each year to coastal Alabama?

#	Answer	
1	0	
2	less than 2	
3	2-5	
4	more than 5	

Statistic	Value
Min Value	1
Max Value	4
Mean	2.12
Variance	0.59
Standard Deviation	0.77
Total Responses	565

11. Prior to last year, how many vacation trips did you typically take each year to coastal Mississippi?

#	Answer	
1	0	
2	less than 2	
3	2-5	
4	more than 5	

Statistic	Value
Min Value	1
Max Value	4
Mean	2.05
Variance	0.58
Standard Deviation	0.76
Total Responses	563

12. Did you take vacation trips to coastal Alabama this year? (Include amount of trips)

#	Answer	
1	Yes	
2	No	

Statistic	Value
Min Value	1
Max Value	2
Mean	1.46
Variance	0.25
Standard Deviation	0.50
Total Responses	562

13. What was the primary reason for not visiting coastal Alabama this year?

#	Answer	
1	Environmental	
2	Financial	
3	Time Constraints	
4	Chose alternative location	
5	Other (please specify)	

Statistic	Value
Min Value	1
Max Value	5
Mean	3.09
Variance	1.27
Standard Deviation	1.13
Total Responses	258

14. Did you take vacation trips to coastal Mississippi this year? (Include amount of trips)

#	Answer	
1	Yes	
2	No	

Statistic	Value
Min Value	1
Max Value	2
Mean	1.53
Variance	0.25
Standard Deviation	0.50
Total Responses	562

15. What was the primary reason for not visiting coastal Mississippi this year?

#	Answer	
1	Environmental	
2	Financial	
3	Time Constraints	
4	Chose alternative location	
5	Other (please specify)	

Statistic	Value
Min Value	1
Max Value	5
Mean	3.09
Variance	1.22
Standard Deviation	1.11
Total Responses	298

16. What will be the total number of vacation trips to coastal Alabama you plan to take in next year?

#	Answer	
1	0	
2	less than 3	
3	3-5	
4	more than 5	

Statistic	Value
Min Value	1
Max Value	4
Mean	1.94
Variance	0.45
Standard Deviation	0.67
Total Responses	560

17. What will be the total number of vacation trips to coastal Mississippi you plan to take in next year?

#	Answer	
1	0	
2	less than 3	
3	3-5	
4	more than 5	

Statistic	Value
Min Value	1
Max Value	4
Mean	1.91
Variance	0.55
Standard Deviation	0.74
Total Responses	562

18. On your most recent vacation trip to coastal Alabama and/or Mississippi, how many people were in your party?

Text Response

Statistic	Value
Total Responses	562

19. On your most recent vacation trip to coastal Alabama and/or Mississippi, how many miles did you travel one way from your residence to the coast?

Text Response

Statistic	Value
Total Responses	558

20. On your most recent vacation trip to coastal Alabama and/or Mississippi, how many days did you stay?

Text Response

Statistic	Value
Total Responses	543

21. What type of accommodation(s) did you use on your most recent trip? (Check all that apply & fill in total dollar amount for each type)

#	Answer	
1	Bed & Breakfast	
2	Rented condo or beach house	
3	Owned condo or beach house	
4	Hotel	
5	Stay with relatives/friends	
6	Resort	
7	State Parks (RV/Primitive Camping)	
8	Casino	
9	Other (please specify)	

Statistic	Value
Min Value	1
Max Value	9
Total Responses	550

22. About how much of the lodging total was spent on the coast?

Text Response

Statistic	Value
Total Responses	543

23. What type(s) of activities did you pursue on your most recent vacation trip to the coast (Choose all that apply & fill in total dollar amount for each type)

#	Answer	
1	Beachgoing (swimming/sunbathing/etc.)	
2	Biking	
3	Sport fishing	
4	Concerts/Festivals/Special Events	
5	Cruises (dolphin watching/leisure)	
6	Golf	
7	Shopping	
8	All types of recreational boating/boarding/kayaking	
9	Visiting family/friends	
10	EcoTourism/Wildlife viewing/Hiking	
11	Casinos/gambling	
12	Eat seafood	
13	Other (please specify)	

Statistic	Value
Min Value	1
Max Value	13
Total Responses	546

24. From the listed activities, choose the primary reason for your most recent vacation trip to coastal Alabama and/or Mississippi?

#	Answer	
1	Beachgoing (swimming/sunbathing/etc.)	
2	Biking	
3	Sport fishing	
4	Concerts/Festivals/Special Events	
5	Cruises (dolphin watching/leisure)	
6	Golf	
7	Shopping	
8	All types of recreational boating/boarding/kayaking	
9	Visiting family/friends	
10	EcoTourism/Wildlife viewing/Hiking	
11	Casinos/gambling	
12	Eat seafood	
13	Other (please specify)	

Statistic	Value
Min Value	1
Max Value	13
Mean	7.30
Variance	15.77
Standard Deviation	3.97
Total Responses	552

25. About how many times did you eat in a restaurant during your most recent vacation trip? (# of times)

Text Response

Statistic	Value
Total Responses	548

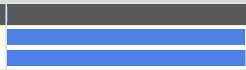
26. What amount accurately reflects your total vacation trip expenditure to visit coastal Alabama and/or Mississippi? (including airfare, gas purchases, food purchases, activity expenditures, car/boat rentals, lodging, etc)

Text Response

Statistic	Value
Total Responses	545

27. It is expected that oil from the Deep Water Horizon oil spill will wash ashore for many years to come. Suppose that the local city governments in Alabama and Mississippi want to create organizations to keep their coastal lands cleaned to pre-oil spill levels. To fund the groups, the local governments would rely on local income taxes and contributions by the general public. Would you be willing to make a one-time contribution of $5 or less in order for your children and grandchildren to be able to visit the coast in its pre-oil spill condition in the future?

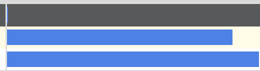
#	Answer	
1	Yes	
2	No	



Statistic	Value
Min Value	1
Max Value	2
Mean	1.50
Variance	0.25
Standard Deviation	0.50
Total Responses	278

28. It is expected that oil from the Deep Water Horizon oil spill will wash ashore for many years to come. Suppose that the local city governments in Alabama and Mississippi want to create organizations to keep their coastal lands cleaned to pre-oil spill levels. To fund the groups, the local governments would rely on local income taxes and contributions by the general public. Would you be willing to make a one-time contribution of $10 in order for your children and grandchildren to be able to visit the coast in its pre-oil spill condition in the future?

#	Answer	
1	Yes	
2	No	



Statistic	Value
Min Value	1
Max Value	2
Mean	1.53
Variance	0.25
Standard Deviation	0.50
Total Responses	315

29. It is expected that oil from the Deep Water Horizon oil spill will wash ashore for many years to come. Suppose that the local city governments in Alabama and Mississippi want to create organizations to keep their coastal lands cleaned to pre-oil spill levels. To fund the groups, the local governments would rely on local income taxes and contributions by the general public. Would you be

willing to make a one-time contribution of $20 in order for your children and grandchildren to be able to visit the coast in its pre-oil spill condition in the future?

#	Answer	
1	Yes	
2	No	

Statistic	Value
Min Value	1
Max Value	2
Mean	1.66
Variance	0.23
Standard Deviation	0.48
Total Responses	280

30. It is expected that oil from the Deep Water Horizon oil spill will wash ashore for many years to come. Suppose that the local city governments in Alabama and Mississippi want to create organizations to keep their coastal lands cleaned to pre-oil spill levels. To fund the groups, the local governments would rely on local income taxes and contributions by the general public. Would you be willing to make a one-time contribution of $40 in order for your children and grandchildren to be able to visit the coast in its pre-oil spill condition in the future?

#	Answer	
1	Yes	
2	No	

Statistic	Value
Min Value	1
Max Value	2
Mean	1.59
Variance	0.24
Standard Deviation	0.49
Total Responses	283

31. It is expected that oil from the Deep Water Horizon oil spill will wash ashore for many years to come. Suppose that the local city governments in Alabama and Mississippi want to create organizations to keep their coastal lands cleaned to pre-oil spill levels. To fund the groups, the local governments would rely on local income taxes and contributions by the general public. Would you be willing to make a one-time contribution of $80 or more in order for your children and grandchildren to be able to visit the coast in its pre-oil spill condition in the future?

#	Answer	
1	Yes	
2	No	

Statistic	Value
Min Value	1
Max Value	2
Mean	1.64
Variance	0.23
Standard Deviation	0.48
Total Responses	281

32. If you answered NO above, then would you be willing to contribute any amount?

#	Answer	
1	Yes (Specify Amount)	
2	No	

Statistic	Value
Min Value	1
Max Value	2
Mean	1.70
Variance	0.21
Standard Deviation	0.46
Total Responses	1,280

33. It is expected that oil from the Deep Water Horizon oil spill will wash ashore for many years to come. Suppose that the local city governments in Alabama and Mississippi want to create

organizations to keep their coastal lands cleaned to pre-oil spill levels. To fund the groups, the local governments would rely on local income taxes and contributions by the general public. Would you be willing to make a one-time contribution of $5 or less regardless of if you were to be able to visit the coast in the future?

#	Answer	
1	Yes	
2	No	

Statistic	Value
Min Value	1
Max Value	2
Mean	1.43
Variance	0.25
Standard Deviation	0.50
Total Responses	288

34. It is expected that oil from the Deep Water Horizon oil spill will wash ashore for many years to come. Suppose that the local city governments in Alabama and Mississippi want to create organizations to keep their coastal lands cleaned to pre-oil spill levels. To fund the groups, the local governments would rely on local income taxes and contributions by the general public. Would you be willing to make a one-time contribution of $10 regardless of if you were to be able to visit the coast in the future?

#	Answer	
1	Yes	
2	No	

Statistic	Value
Min Value	1
Max Value	2
Mean	1.56
Variance	0.25
Standard Deviation	0.50
Total Responses	281

35. It is expected that oil from the Deep Water Horizon oil spill will wash ashore for many years to come. Suppose that the local city governments in Alabama and Mississippi want to create organizations to keep their coastal lands cleaned to pre-oil spill levels. To fund the groups, the local governments would rely on local income taxes and contributions by the general public. Would you be willing to make a one-time contribution of $20 regardless of if you were to be able to visit the coast in the future?

#	Answer	
1	Yes	
2	No	

Statistic	Value
Min Value	1
Max Value	2
Mean	1.70
Variance	0.21
Standard Deviation	0.46
Total Responses	286

36. It is expected that oil from the Deep Water Horizon oil spill will wash ashore for many years to come. Suppose that the local city governments in Alabama and Mississippi want to create organizations to keep their coastal lands cleaned to pre-oil spill levels. To fund the groups, the local governments would rely on local income taxes and contributions by the general public. Would you be willing to make a one-time contribution of $40 regardless of if you were to be able to visit the coast in the future?

#	Answer	
1	Yes	
2	No	

Statistic	Value
Min Value	1
Max Value	2
Mean	1.81
Variance	0.15
Standard Deviation	0.39
Total Responses	280

37. It is expected that oil from the Deep Water Horizon oil spill will wash ashore for many years to come. Suppose that the local city governments in Alabama and Mississippi want to create organizations to keep their coastal lands cleaned to pre-oil spill levels. To fund the groups, the local governments would rely on local income taxes and contributions by the general public. Would you be willing to make a one-time contribution of $80 or more regardless of if you were to be able to visit the coast in the future?

#	Answer	
1	Yes	
2	No	

Statistic	Value
Min Value	1
Max Value	2
Mean	1.82
Variance	0.15
Standard Deviation	0.38
Total Responses	289

38. If you answered NO above, then would you be willing to contribute any amount?

#	Answer	
1	Yes (Specify Amount)	
2	No	

Statistic	Value
Min Value	1
Max Value	2
Mean	1.70
Variance	0.21
Standard Deviation	0.46
Total Responses	1,288

39. Have you ever taken a vacation trip to coastal sites elsewhere in the US?

#	Answer	
1	Yes	
2	No	

Statistic	Value
Min Value	1
Max Value	2
Mean	1.19
Variance	0.15
Standard Deviation	0.39
Total Responses	1,415

40. Where specifically did you visit?

Text Response

Statistic	Value
Total Responses	1,105

41. Prior to last year, how many vacation trips did you typically take each year to coastal areas other than Alabama and/or Mississippi?

#	Answer	
1	0	
2	less than 3	
3	3-5	
4	more than 5	

Statistic	Value
Min Value	1
Max Value	4
Mean	2.13
Variance	0.58
Standard Deviation	0.76
Total Responses	1,134

42. How many vacation trips did you take to coastal areas other than Alabama and/or Mississippi this year?

#	Answer	
1	0	
2	less than 3	
3	3-5	
4	more than 5	

Statistic	Value
Min Value	1
Max Value	4
Mean	1.82
Variance	0.53
Standard Deviation	0.73
Total Responses	1,133

43. What was the primary reason for not visiting coastal areas other than Alabama and/or Mississippi?

#	Answer	
1	Environmental	
2	Financial	
3	Time Constraints	
4	Other (please specify)	

Statistic	Value
Min Value	1
Max Value	4
Mean	2.62
Variance	0.75
Standard Deviation	0.86
Total Responses	381

44. What will be the total number of vacation trips to coastal areas other than Alabama and/or Mississippi you plan to take in 2013?

#	Answer	
1	0	
2	less than 3	
3	3-5	
4	more than 5	

Statistic	Value
Min Value	1
Max Value	4
Mean	1.87
Variance	0.50
Standard Deviation	0.71
Total Responses	1,133

45. On your most recent vacation trip to coastal areas other than Alabama and/or Mississippi, how many people were in your party?

Text Response

Statistic	Value
Total Responses	1,119

46. On your most recent vacation trip to coastal areas other than Alabama and/or Mississippi, how many miles did you travel one way from your residence to the coast?

Text Response

Statistic	Value
Total Responses	1,119

47. On your most recent vacation trip to coastal areas other than Alabama and/or Mississippi, how many days did you spend?

Text Response

Statistic	Value
Total Responses	1,081

48. What type of accommodation did you use on your most recent vacation trip to coastal areas other than Alabama and/or Mississippi? (Check all that apply & fill in total dollar amount for each type)

#	Answer	
1	Bed & Breakfast	
2	Rented condo or beach house	
3	Owned condo or beach house	
4	Hotel	
5	Stay with relatives/friends	
6	Resort	
7	State Parks (RV/Primitive Camping)	
8	Casino	
9	Other (please specify)	

Statistic	Value
Min Value	1
Max Value	9
Total Responses	1,092

49. What type(s) of activities did you pursue on your most recent vacation trip to coastal areas other than Alabama and/or Mississippi? (choose all that apply & fill in total dollar amount for each type)

#	Answer	
1	Beachgoing (swimming/sunbathing/etc.)	
2	Biking	
3	Sport fishing	
4	Concerts/Festivals/Special Events	
5	Cruises (dolphin watching/leisure)	
6	Golf	
7	Shopping	
8	All types of recreational boating/boarding/kayaking	
9	Visiting family/friends	
10	EcoTourism/Wildlife viewing/Hiking	
11	Casinos/gambling	
12	Eat seafood	
13	Other (please specify)	

Statistic	Value
Min Value	1
Max Value	13
Total Responses	1,090

50. From the listed activities, choose the primary reason for your most recent vacation trip to coastal areas other than Alabama and/or Mississippi?

#	Answer	
1	Beachgoing (swimming/sunbathing/etc.)	
2	Biking	
3	Sport fishing	
4	Concerts/Festivals/Special Events	
5	Cruises (dolphin watching/leisure)	
6	Golf	
7	Shopping	
8	All types of recreational boating/boarding/kayaking	
9	Visiting family/friends	
10	EcoTourism/Wildlife viewing/Hiking	
11	Casinos/gambling	
12	Eating seafood	
13	Other (please specify)	

Statistic	Value
Min Value	1
Max Value	13
Mean	6.46
Variance	19.15
Standard Deviation	4.38
Total Responses	1,096

51. About how many times did you eat in a restaurant during your most recent vacation trip?

Text Response

Statistic	Value
Total Responses	1,100

52. What amount accurately reflects your total vacation trip expenditure to visit coastal areas other than Alabama and/or Mississippi? (including airfare, gas purchases, food purchases, activity expenditures, car/boat rentals, lodging, etc)

Text Response

Statistic	Value
Total Responses	1,095

53. When visiting coastal Alabama and/or Mississippi, do you typically eat local seafood?

#	Answer	
1	Yes	
2	No	

Statistic	Value
Min Value	1
Max Value	2
Mean	1.42
Variance	0.24
Standard Deviation	0.49
Total Responses	1,360

54. Prior to the oil spill, which of the following most describes your seafood purchases while visiting coastal Alabama and/or Mississippi (check all that apply):

#	Answer	
1	I timed my travel to the coast when seafood was in season	
2	I purchased fresh caught seafood to bring to my home or to where I was staying during my visit	
3	I ordered seafood to be mailed to me at my home	
4	I ate seafood at local festivals or events	
5	I ate seafood at restaurants	

Statistic	Value
Min Value	1
Max Value	5
Total Responses	1,169

55. Next, thinking about your seafood purchases before the oil spill, please rate the following characteristics from not important to extremely important:

#	Question	Not important	Somewhat not important	Neutral	Somewhat important	Extremely important	Total Responses	Mean
1	Low price							3.63
2	Freshness							4.31
3	Healthy to eat							4.18
4	Safe to eat							4.41
5	In season							3.73
6	Caught that day							3.68
7	Caught in the coastal waters off Alabama or Mississippi							3.33
8	Caught in Gulf coastal waters by U.S. shrimp harvesters							3.45
9	Certified sustainable							3.76
10	Certified safe to eat by National Oceanographic & Atmospheric Administration (NOAA)							3.89
11	Certified safe to eat by the State of Alabama							3.83
12	Inspected by the shrimp industry							3.84
13	Wild-caught							3.54
14	Farm-raised							3.17
15	Reputation of the seller (restaurant, processor, etc.)							3.94

Statistic	Low price	Freshness	Healthy to eat	Safe to eat	In season	Caught that day	Caught in the coastal waters off Alabama or Mississippi	Caught in Gulf coastal waters by U.S. shrimp harvesters	Certified sustainable	Certified safe to eat by National Oceanographic & Atmospheric Administration (NOAA)	Certified safe to eat by the State of Alabama	Inspected by the shrimp industry	Wild-caught	Farm-raised	Reputation of the seller (restaurant, processor, etc.)
Min Value	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Max Value	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Mean	3.63	4.31	4.18	4.41	3.73	3.68	3.33	3.45	3.76	3.89	3.83	3.84	3.54	3.17	3.94
Variance	1.25	1.04	1.07	0.99	1.25	1.16	1.39	1.34	1.28	1.39	1.38	1.24	1.32	1.27	1.17
Standard Deviation	1.12	1.02	1.04	0.99	1.12	1.08	1.18	1.16	1.13	1.18	1.17	1.11	1.15	1.13	1.08
Total Responses	877	878	874	876	870	860	877	899	862	889	866	893	866	858	867

56. It has been over two years since the oil spill. Do you plan to buy seafood on your next visit to coastal Alabama and/or Mississippi?

#	Answer	
1	Yes	
2	No	

Statistic	Value
Min Value	1
Max Value	2
Mean	1.41
Variance	0.24
Standard Deviation	0.49
Total Responses	1,327