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## 1. INTRODUCTION

Florida is considered as the fishing capital of the world due to its abundant fishing resources and sport fishing activities (Allen et al., 2012). Diverse fish species, fishing destinations, year-round angling, strong tourism base, and business-friendly environment have made Florida one of the most attractive destinations for fishing-based recreational activities (FFWCC, 2022a; Pierce and Mozumder 2014). Moreover, Florida has the highest number of adult angler's population, with three million anglers who have bought 1,866,045 Florida fishing licenses in 2011 (USFWS, 2011; USFWS, 2015). The updated information reveals that trip expenditures for for-hire fishing trips in 2017 provided by guides and outfitters in West and East Florida were $53.7 million and $242.6 million respectively and created 5,103 jobs and $183 million income in Florida in 2017 (Lovel et al., 2020). Considering the significant benefits of for-hire recreational fishing in Florida, it is important to assess anglers' preferences for sustaining the benefits gained from for-hire recreational fishing trips.

In the state of Florida, each fisherman who has a state fishing license can go for for-hire fishing trips (FFWCC, 2022b). Any fisherman who selects a fishing site for recreational fishing, directly or indirectly puts a value on the characteristics and services provided by that fishing site (Pitts et al., 2012). The Florida guides and outfitters offer similar fishing trips and opportunities as those available for solo fishermen. The outfitter/guide market offers heterogeneous fishing packages where price differences may reveal the value of the associated fishing trip characteristics (such as duration of the trip or harvested fish species types) (Pitts et al., 2012; Farr, 2013; Carter et al., 2008).

The literature is replete with studies that have estimated the economic value of recreational fishing activities (Johnston et al., 2006; Hunt et al., 2019). Studies that assess recreational fishing values often focus on estimating anglers' willingness to pay (WTP), utilizing contingent valuation (CV) method (Wegge et al., 1986; Berrens et al., 1993; Hamel et al., 2000; Williams et al., 2003; Rolfe and Prayaga, 2007), travel cost (TC) method (Bockstael et al., 1989; Bell and Leeworthy, 1990; Shrestha et al., 2002; Bhat, 2003; Prayaga et al., 2010; Pascoe et al., 2014; Hunt et al., 2017), and choice experiment (CE) method (Paulrud & Laitila, 2013, Melstrom et al., 2020, Carter et al., 2022). In these methods, the WTP is quantified not by using real market data, but rather using a hypothetical market price (for CV and CE methods) or a substitute/proxy price (for TC method). For example, the TC approach considers availability and harvest values based on the substitution of distance and time required to reach fishing sites (Carter et al., 2008). These estimated values are accurate as long as substituted prices are correct (Carter et al., 2008; Melstrom et al., 2020). Often these methods estimate the economic value of lump sum improvement of associated non-market goods and services. On the other hand, the

Hedonic Price (HP) analysis can provide a more realistic understanding of anglers' preferences by analyzing the actual price differences of heterogeneous fishing trips and marginal implicit prices of corresponding characteristics (Pitts et al., 2012).

The goal of this study is to quantify the effect of a variety of attributes related to recreational fishing trips on their prices. In the first step, we have collected extensive data from recreational fishing websites maintained by guides and outfitters in Florida. After cleaning and processing the data, we explore the empirical relationships between trip prices and associated characteristics (e.g., type of fishing trips, fish species, guide characteristics, food, lodging, etc.). Then, a HP model is applied to estimate the implicit prices of these fishing trip characteristics. The remainder of this paper is organized as follows. Section 2 gives a background on the recreational fishing trips offered by guides and outfitters in Florida. Section 3 explains the research method, and the scope of our study. In section 4, we describe the data and in section 5, we discuss the results. Section 6 elaborates the conclusions of our study.

## 2. RECREATIONAL FISHING TRIPS LED BY OUTFITTERS/GUIDES IN FLORIDA

The guides and outfitters in Florida offer recreational fishing trips with diverse attributes. These attributes include trip *duration* (half/full day, etc.), accommodation (*food* and *lodging*), destination choices (e.g., inshore/offshore), fishing boat characteristics (e.g., *boat size*, *dockage*, etc.) and harvested fish types (e.g., *peacock bass*, *large-mouth bass*, *seatrouts*, *snapper*, *tarpons*, *sharks*, *tuna*, etc.), and the area of operation (e.g. South Florida, North Florida, etc.). Any angler who chooses a fishing package offered by guides/outfitters, implicitly puts value on these characteristics included in that fishing trip package (Pitts et al., 2012; Carter & Liese, 2010). Consequently, they would be willing to pay more for a trip to receive the preferred attributes and associated services (Carter & Liese, 2010).

The anglers, guides and outfitters jointly create a market where guides and outfitters supply goods and services for recreational fishing and anglers demand for these services. Gaining access to various fishing guides and outfitters has become easier with the Internet, especially for non-resident anglers. They can choose their guides and outfitters based on their preferences and the destination/site specific fishing opportunities. Internet-based advertising has also enabled fishing guides and outfitters to easily connect with their customers (Mozumder et al., 2007). Outfitters and guides use websites to advertise different fishing trips, highlighting various features and corresponding prices. The varieties in fishing trip characteristics provide more options for anglers to choose the one they like most. For example, in Florida, some guides and outfitters include food and lodging in longer trip packages. These additional services generate variations in the prices of different

fishing trip packages and create a competitive market for recreational fishing (Pitts et al., 2012).

## 3. HEDONIC PRICE MODEL

We apply a Hedonic Price (HP) model as a revealed-preferences approach to analyze the role of diverse trip characteristics in explaining the variations in price of fishing trip packages in this market (Pitts et al., 2012; Rosen, 1974). The Hedonic Price analysis is often utilized in a market where a good or service with different characteristics generates different prices in the market (Garrod & Willis, 1992). Thus, by conducting the HP analysis in a market offering goods and services with diverse attributes, we can find the marginal effects of these attributes on the market price (Taylor, 2003). Our theoretical model is based on the Rosen's (1974) Hedonic Price model. In this analytical framework, the recreational fishing market led by guides/outfitters is assumed to be a perfectly competitive market where the buyers (i.e., anglers) and sellers (i.e., guides/outfitters) compete for the purchase or sale of the fishing trips with diverse characteristics. The equilibrium price is determined by the interactions of sellers (outfitters/guides) and buyers (anglers) in this market and can be illustrated by the following HP function:

$$P = h(z; \gamma) \tag{1}$$

Where $p$ represent the price of a fishing trip, $z$ is the vector of the fishing trip attributes, and $\gamma$ is the vector of parameters describing the HP function. As the equation (1) depicts, the attributes in $z$ entirely determine the trip price. A buyer (an angler) of the services/attributes of a trip is not able to affect the equilibrium trip price, though the price she pays would be determined by the attributes of the chosen fishing trip. Also, a seller (a guide/outfitter) of a fishing trip is not able to impact the equilibrium price, but she can change the price of the trip if the trip-related attributes can be varied (Palmquist, 1989).

On the demand side, anglers are assumed to have a well-defined utility function which can be written as:

$$U(x, z; \alpha^j) \tag{2}$$

where $x$ is a composite good with a unit price, and $\alpha^j$ is the vector of demographic characteristics of the angler $j$. The angler $j$ seeks to maximize utility by choosing different levels of fishing trip attributes $z$, and composite good $x$, subject to her budget constraint, $y^j = x + h(z; \gamma)$, where y denotes angler $j$'s income. It is assumed that angler $j$ purchases only one single fishing trip with attributes $z$. The optimal choice of each fishing attribute, $z_i$ can be written as:

$$\frac{\partial P}{\partial z_i} = \frac{\partial U/\partial z_i}{\partial U/\partial x} \tag{3}$$

The equation (3) specifies that at equilibrium the marginal rate of substitution between the fishing trip attribute, $z_i$, and the composite good, $x$, equals the ratio of the marginal price of the ith fishing trip attribute, and the marginal price of the composite good, $x$. In other words, the optimal choice of the attribute, $z_i$, occurs at the point where the implicit price of the fishing trip attribute, $z_i$, equals the angler's marginal willingness to pay (MWTP) for that specific attribute (McConnell and Phipps, 1987).

In order to quantify how anglers value different characteristics of charter fishing trips, we employ the HP model, which can be represented using a linear, semi-log, or double-log model. Here, the price for a fishing trip is estimated as a weighted summation of trip attributes, including the trip *duration* (half/full day, etc.), accommodation (*food* and *lodging*), distance of the trip destination from the shoreline (e.g., inshore/offshore), boat/vessel characteristics (e.g., *boat size*, *dockage*, etc.) and types of harvested fish species (e.g., *peacock bass*, *large-mouth bass*, *seatrouts*, *snapper*, *tarpons*, *sharks*, *tuna*, etc.).

Formally, the empirical model used to estimate the market price of fishing trips (hedonic function of trip characteristics) is as follows:

$$P = p_0 + \sum_i \tau_i T_i + \sum_k \beta_k B_k + \sum_l \phi_l F_l + \varepsilon_P \tag{4}$$

Where $T_i$, $B_k$, and $F_l$ respectively denote the $i^{th}$ trip attribute, $k^{\text{th}}$ boat attribute, and $l^{th}$ harvested fish species. The values $\tau_i, \beta_k,$ and $\phi_i$ represent the coefficients of each of the features. The $P$ is the market price of the fishing trip (the dependent variable) and the parameters $p_0$ and $\varepsilon_P$ specify the constant coefficient and the error term of the HP function respectively (Taylor, 2003).

Hedonic price models necessitate the careful selection of a functional form. The linear Ordinary Least Squares (OLS) model's assumption that the price of a fishing trip is the sum of its marginal implicit characteristic prices may not hold true. Taylor (2003) suggests that non-constant marginal implicit pricing offers a more intuitive approach. The dependent variable, market price, displayed positive skewness, with a mean of $683 exceeding the median of $475, suggesting the presence of heteroskedasticity. Consequently, a nonlinear functional form appeared to be more appropriate for the analysis (Pitts et al., 2012). Taylor (2003) suggests that forms like the semi-log or double-log models offer greater accuracy when dealing with unobservable influential variables or measurement errors. Consequently, in this study, a general semi-log model was employed:

$$\ln P = p_0 + \sum_i \tau_i T_i + \sum_k \beta_k B_k + \sum_l \phi_l F_l + \varepsilon_P, \tag{5}$$

The effect of each independent variable (included in the HP) on the value of the dependent variable (trip price) constitutes the implicit price of the fishing trip attribute

corresponding to that independent variable. The implicit price, or equivalently marginal price of an independent variable like $z$ is defined as the partial derivative of the dependent variable with respect to $z$ ($\partial P/\partial z$). Given that the proposed HP model is semi-log, the implicit price of a continuous variable is obtained by multiplying its corresponding coefficient by the median of the dependent variable (i.e., the median price of fishing trip). Accordingly, the implicit price of a continuous variable like $v_3$ (*duration*) can be estimated as follows.

$$\frac{\partial P}{\partial v_3} = P \times c_3 \tag{6}$$

where $P$ represents the median trip price and $c_3$ represents the coefficient of the corresponding variable.

Furthermore, the implicit price of a dummy variable like $v_4$ (*lodging*) is obtained by a different approach. The marginal effect of the independent dummy variable $v_4$ on the dependent variable, trip price can be calculated as:

$$\frac{\partial P}{\partial v_4} = (e^{c_4} - 1)P \tag{7}$$

where $P$ refers to the median trip price and $c_4$ represents the coefficient of the corresponding variable. (Halvorsen and Palmquist, 1980).

## 4. DATA COLLECTION

First, we have collected the list of more than 200 guides' and outfitters' websites from the Florida Fish and Wildlife Conservation Commission's website. For this research, an outfitter or guide is an entity that has access to different freshwater and saltwater fishing opportunities and offers recreational fishing trip packages. Following Pitts et al. (2012), we consider three issues when using the online price information specified by outfitters and guides. First, the price on the website indicates the on-site retail price (Pitts et al., 2012; Brynjolfsson & Smith, 2000; Little & Berrens, 2008). To make sure that the online prices of fishing trip packages are the same as the in-store prices, we called more than 10% of guides and outfitters and they confirmed that there is no major difference between online and in-store prices for recreational charter fishing. Second, it is assumed that each trip advertised online, implies at least one sale transaction (Pitts et al., 2012; Little & Berrens, 2008). This assumption was also confirmed by the guides/outfitters via a short phone interview. The third factor is that we consider each trip package as an unweighted observation in terms of trip duration, meaning that a fishing trip package is considered as one observation regardless of the duration of the fishing trip, e.g., a day-long trip and a multi-day trip are both considered as single observations (Pitts et al., 2012).

We have collected data regarding the details of fishing trip packages that guides and outfitters offer to their customers. The total number of compiled fishing trip packages

offered by guides/outfitters in Florida is more than 3150 trips. Among them, 650 packages are offered by outfitters, while the remaining trips are offered by guides. About 39.7% of the packages offer freshwater fishing trips and the remaining 60.3% of packages offer saltwater fishing trips (71% of saltwater trips offer inshore fishing trips, while 29% of them provide offshore/nearshore fishing trips).

Table 1 describes the dependent and independent variables used in the HP analysis. The dependent variable is the *price* (total trip cost) for the freshwater or saltwater fishing trips. The *extra trips per package* is an independent variable that represents the number of extra trips in a fishing package offered by guides/outfitters. Obviously, this variable is zero if the package offers just one fishing trip. The concept of multi-trip fishing packages is similar to bulk purchasing when the guides/outfitters will accept a slightly lower price for each trip, if the angler will agree to purchase multiple trips.

Table 1: Definitions and statistical summary of the variables used in the Hedonic Price Model

| Variables | | Definition | Mean | STD | Median | Min | Max |
|---|---|---|---|---|---|---|---|
| **Price (USD)** | | Price of a fishing trip offered by guides and outfitters | 683.5 | 1054.3 | 475.0 | 75.0 | 12,000 |
| **Price/Person** | | Price/person of a fishing trip offered by guides and outfitters | 182.1 | 104.1 | 162.5 | 20.8 | 1,500 |
| **Price/Hour** | | Price/hour of a fishing trip offered by guides and outfitters | 101.3 | 102.8 | 81.3 | 16.0 | 1,500 |
| **Extra trips/Package** | | Number of additional trips in a multi-trip package | 0.091 | 0.391 | 0 | 0 | 2 |
| **Duration (Hour)** | | Duration of a fishing trip | 6.7 | 4.5 | 6.0 | 2.0 | 72 |
| **Number of Anglers** | | Number of anglers allowed in a fishing trip package | 3.7 | 3.8 | 3.0 | 1.0 | 24 |
| **Boat size** | | If the boat size is greater than the median size; yes=1, no=0 | 50% | 50% | 21 | 0 | 1 |
| **Lodging** | | Accommodation and food provided in the trip; yes=1, no=0 | 6.24% | 24.19% | 0 | 0 | 1 |
| **Freshwater** | | If the type of fishing trip is freshwater; yes=1, no=0 | 39.80% | 48.96% | 0 | 0 | 1 |
| **Saltwater Inshore** | | If the fishing destination is Saltwater inshore, yes =1, no=1 | 42.80% | 49.48% | 0 | 0 | 1 |
| **Saltwater Offshore** | | If the fishing destination is Saltwater offshore, yes =1, no=1 | 17.39% | 37.91% | 0 | 0 | 1 |
| **Guides-Led Trip** | | If the fishing trip is led and sold by a guide; yes=1, no=0 | 79.69% | 40.23% | 0 | 0 | 1 |
| **Freshwater Species** | Largemouth | Fish species is largemouth bass; yes= 1, no=0 | 26.23% | 44.00% | 0 | 0 | 1 |
| | Peacock | Freshwater fish species is peacock bass; yes= 1, no=0 | 8.56% | 27.97% | 0 | 0 | 1 |
| | Crappie | Freshwater fish species is crappie; yes= 1, no=0 | 8.05% | 27.22% | 0 | 0 | 1 |
| | Bluegill | Freshwater fish species is bluegill; yes= 1, no=0 | 2.82% | 16.56% | 0 | 0 | 1 |
| | Gar | Freshwater fish species is gar; yes= 1, no=0 | 2.63% | 16.01% | 0 | 0 | 1 |
| **Saltwater Species** | Redfish | Saltwater fish species is redfish; yes= 1, no=0 | 34.79% | 47.64% | 0 | 0 | 1 |
| | Tarpons | Saltwater fish species is tarpons; yes= 1, no=0 | 30.77% | 46.16% | 0 | 0 | 1 |
| | Seatrouts | Saltwater fish species is seatrouts; yes= 1, no=0 | 30.49% | 46.04% | 0 | 0 | 1 |
| | Snappers | Saltwater fish species is a snapper; yes= 1, no=0 | 15.10% | 35.82% | 0 | 0 | 1 |
| | Sharks | Saltwater fish species is a sharks; yes= 1, no=0 | 19.02% | 39.25% | 0 | 0 | 1 |
| | Dolphin | Saltwater fish species is dolphin; yes= 1, no=0 | 7.18% | 25.81% | 0 | 0 | 1 |
| | Tuna | Saltwater fish species is tuna; yes= 1, no=0 | 6.05% | 23.84% | 0 | 0 | 1 |
| | Sailfish | Saltwater fish species is sailfish; yes= 1, no=0 | 5.11% | 22.02% | 0 | 0 | 1 |
| | Mackerel | Saltwater fish species is Mackerel; yes= 1, no=0 | 15.85% | 36.53% | 0 | 0 | 1 |

The independent variable *duration* takes the value of 4, 6, or 8 hours, for a half day, ¾ day, or full day fishing trip respectively. The *number of anglers* is another independent variable which can affect the trip price. There is data for the allowed maximum number of anglers on the websites indicating that the fishing trip price is fixed for the allowed number of anglers. Usually, if the customers want to bring more than the maximum number of anglers, they should pay an extra fee, which depends on the duration of the trip and ranges from $50 to $100. The *boat size*, as a fishing trip attribute, can also impact the fishing trip *price*. The larger the boat, the more anglers can be accommodated and thus the *price* will change accordingly.

Furthermore, we include certain additional trip characteristics that may be desirable to anglers. The variable *lodging* is added to represent the services commonly offered in multi-day fishing trips or offshore/nearshore trips. Also, the type of fishing trips (i.e., *saltwater* or *freshwater* fishing trips) can affect the price as the equipment, size of boat, duration, and the targeted fish species are different. Saltwater and freshwater fish species can also influence the price since some of the fish species are popular for catch and release or some fish species are difficult to catch (like sharks or sailfish). Also, the equipment that is required to catch a specific fish species may influence the price of the fishing trip.

After cleaning and processing the collected data, we classify the trips into three different categories*: freshwater* (FW) fishing, saltwater inshore (SWI) and saltwater offshore (SWO) fishing trips. For each of the categories, we also take corresponding fish types into consideration. For example, we use the dummy variable *largemouth* as an independent variable to see how anglers value this particular species in their fishing experiences. The potential variation in trip prices due to other fish types are also considered in the same way.

After estimating the empirical model, we analyze the impact of different fishing trip characteristics on the price of the trip. The multivariate regression analysis allow us to estimate implicit price for the variables included in the HP model.

## 5. MODEL ESTIMATIONS AND RESULTS

### 5.1 Descriptive Statistics

Table 1 reports the descriptive statistics of our collected data. As mentioned earlier, we categorize the total number of 3191 packages into three classes: freshwater (FW), saltwater inshore (SWI), and saltwater offshore (SWO) fishing trips. Almost 80% of the fishing trips are provided by guides and the rest of the trips are provided by outfitters. Moreover, the majority of the freshwater, saltwater inshore and saltwater offshore fishing trips are offered by guides (87%, 74% and 78% respectively). The primary difference between an outfitter

and guide is that an outfitter is sort of a one-stop-shop in the sense that they usually take care of all aspects of a trip (including lodging, meals, trips, etc.); however, a guide tends to focus on specific tasks and fish species (i.e., bonefish expert, marlin fishing, etc.). In Florida most of the outfitter-type businesses are involved in hunting or in fishing.

Additionally, the packages can be classified into three categories based on the distance of the fishing spot from the shoreline: inshore (if distance is less than 1 miles), offshore (if distance is greater than 10 miles), and near-shore (if distance ranges from 1 mile to 10 miles) fishing trips. Eighty two percent of total fishing trips are offered by both guides and outfitters for inshore fishing trips (including freshwater and saltwater inshore), and the rest of the fishing trips provide nearshore and offshore trips (6% and 12% respectively).

As Table 1 depicts, the average fishing trip price, price/person and price/hour are $683.5, $182.1, and $101.3, respectively. Only 6.24% of guides and outfitters provide lodging and food. 39.8%, 42.80%, and 17.39% of fishing trips are freshwater, Saltwater inshore, and saltwater offshore fishing trips respectively. In terms of fish species, as indicated by Table 1, for instance, 26.23% of total fishing trips offer largemouth bass as a freshwater fish species and 34.8% of the saltwater inshore fishing trips offer redfish.

To gain a better understanding of the dependent variable (trip price) of our proposed model, we depict the distribution of trip price per person per hour in Figure 1 and Figure 2. As these plots illustrate, the price of trips sold by outfitters show a slightly wider range than the price of those offered by guides. Based on Figure 1, the distribution of the recreational fishing trip price is right skewed and the trip price per person per hour is less than $25 for more than half of the packages offered by guides. However, less than 40% of the packages offered by outfitters are less than $25 per person per hour. Figure 2 compares the price distribution based on the type of fishing trips (freshwater, saltwater inshore and saltwater offshore). As shown in Figure 2, the price per person per hour for more than half of the freshwater fishing trips cost less than $27.5, while less than 30% of the saltwater inshore and offshore fishing trips cost less than $27.5/person/hour.

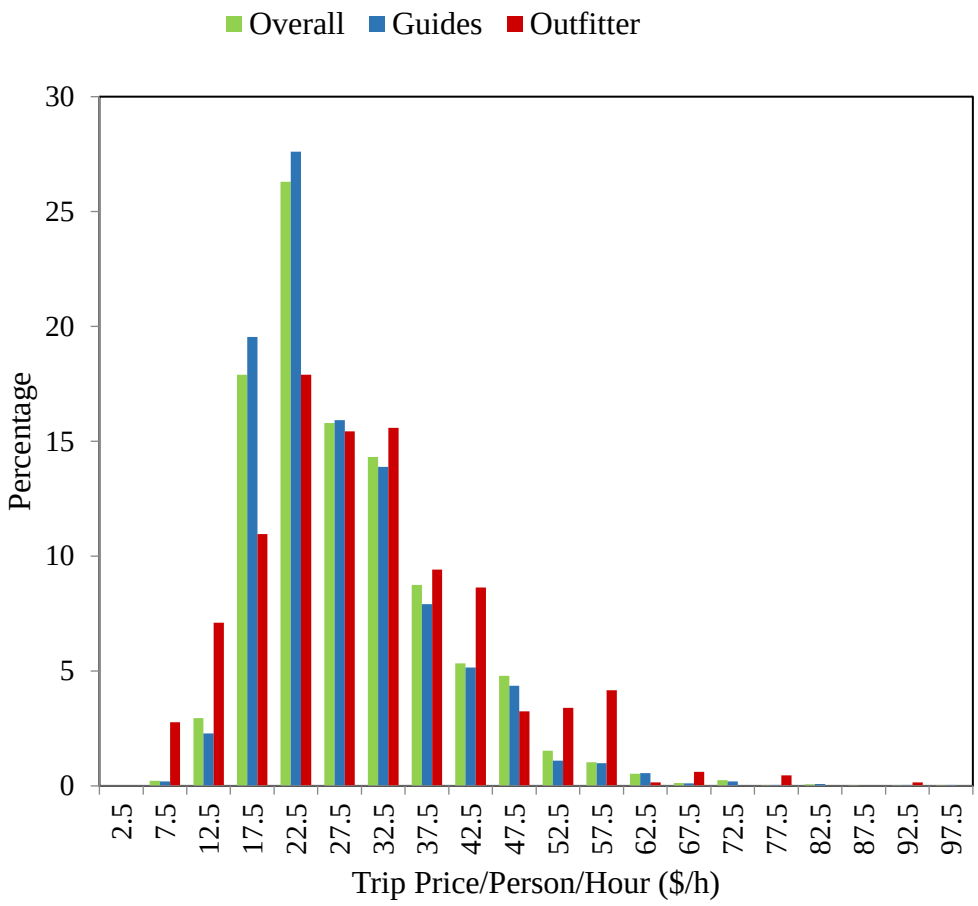


Figure 1: Distribution of Trip Price/Person/Hour by Service Providers (Guides and Outfitters)

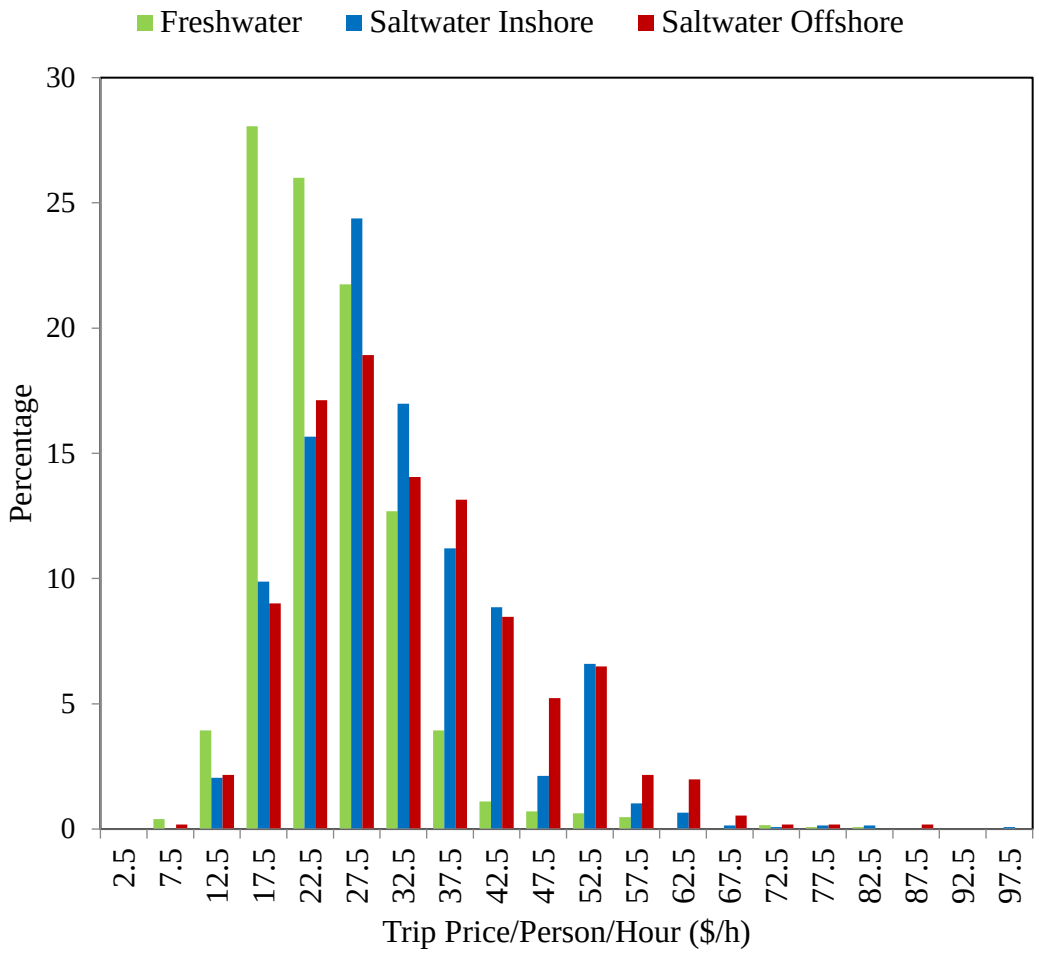


Figure 2: Distribution of Trip Price/Person/Hour for Freshwater, Saltwater Inshore and Saltwater Offshore Trips for Recreational Fishing in Florida.

## 5.2 Hedonic Price Model Estimation

In Table 2, we presented the results of four Hedonic Price models. Model 1 demonstrates the impact of all types of recreational fishing trip attributes (both freshwater and saltwater) on the trip price. Model 2, 3, and 4, respectively, display the results for recreational fishing trip packages of freshwater, saltwater inshore, and saltwater offshore fishing trips. To account for spatial (location) fixed effects, we integrated the zip code level of the fishing trip locations.

Table 2: Estimation of Semi-Log Hedonic Price Models for Freshwater, Saltwater Inshore, and Saltwater Offshore Fishing Trips Price

| **Variable Name** | | Model 1 | Model 2 Freshwater | Model 3 Saltwater Inshore | Model 4 Saltwater Offshore |
|---|---|---|---|---|---|
| **Extra Trips / Package** | | -0.0082 (0.0213) | -0.0379*** (0.0108) | 0.0639 (0.0548) | |
| **Number of Anglers** | | 0.0287*** (0.0014) | 0.1511*** (0.0035) | 0.0734*** (0.0028) | 0.0176*** (0.0021) |
| **Duration** | | 0.0390*** (0.0009) | 0.0817*** (0.0012) | 0.0961*** (0.0020) | 0.0191*** (0.0013) |
| **Lodging** | | 0.2295*** (0.0348) | 0.2952*** (0.0195) | 0.0344 (0.0662) | 0.5755 *** (0.2019) |
| **Guides** | | 0.0471* (0.0269) | 0.0584* (0.0324) | 0.0933*** (0.0237) | 2.0256*** (0.2979) |
| **Boat Size** | | 0.0127*** (0.0018) | -0.0256*** (0.0034) | 0.0189*** (0.0024) | 0.0074 (0.0054) |
| **Freshwater fishing (**saltwater inshore fishing is the reference) | | -0.2052*** (0.0198) | | | |
| **Saltwater offshore fishing (**saltwater inshore fishing is the reference**)** | | 0.2474*** (0.0154) | | | |
| **Freshwater Species** | Largemouth | | 0.0229* (0.0128) | | |
| | Peacock | | 0.0600** (0.0276) | | |
| | Crappie | | 0.0094 (0.0115) | | |
| | Gar | | 0.0080 (0.0148) | | |
| **Saltwater Inshore Species** | Redfish | | | -0.0820*** (0.0137) | |
| | Tarpons | | | 0.0395*** (0.0126) | |
| | Snapper | | | 0.0101 (0.0189) | |
| **Saltwater Offshore Species** | Sharks | | | | -0.0493 (0.0723) |
| | Tuna | | | | 0.1899** (0.0804) |
| | Dolphin | | | | 0.3099*** (0.0758) |
| | Mackerel | | | | -0.0841 (0.0638) |
| **Constant** | | 5.5778*** (0 .0520) | 5.4820*** (0.0777) | 5.1608*** (0.0619) | 5.2681*** (0.2650) |
| **Spatial fixed effects** | | Yes | Yes | Yes | Yes |
| **Number of Observations** | | 3,174 | 1,270 | 1,349 | 555 |
| **R-squared** | | 0.8633 | 0.8946 | 0.9042 | 0.9313 |

Note: Standard errors are reported in parentheses. *p < 0.1, **p < 0.05, ***p < 0.01.

In general, the estimated coefficients exhibited consistent stability in terms of both sign and significance across all four models. In model 1, The estimated coefficients on the *number of anglers* and *trip duration* are statistically significant, showing the expected positive sign. This indicates that as the number of anglers and the duration of the fishing trip increase, the prices also rise. Outfitters allocate more time and provide additional goods and services for longer trips and larger groups. Similarly, the estimated coefficient on the variable *lodgings* is positive and statistically significant, suggesting that fishing trips that include lodging come with higher prices. The estimated coefficient of *boat size* was found to be statistically significant with positive sign, suggesting that the size of the boat used during the trip influences the price. Lastly, the estimated coefficient of *freshwater fishing* indicate that these trips have a negative effect on the price when compared to saltwater inshore fishing trips. This suggests that anglers may perceive saltwater inshore fishing trips as more desirable or valuable, which leads to higher prices for such trips. On the other hand, the coefficient estimate for *saltwater offshore* fishing trips is positive, indicating that these trips have a positive impact on the price. This implies that anglers value the experience of saltwater offshore fishing trips due to factors like the potential for catching larger or more diverse fish species, a deeper sea fishing experience, or the opportunity to explore offshore locations.

Model 2 reports the results of the HP model for freshwater fishing trips. Like Model 1, most of the independent variables are statistically significant with expected signs. For instance, the estimated coefficient on *extra trips/package* is found to be statistically significant, and its expected negative effect on the price provides an important insight. This implies that when a fishing trip package offers an add-on trip option, guides or outfitters are willing to accept a slightly lower price for the overall trip. It could be seen as an incentive to encourage anglers to book multiple trips, leading to increased business volume for the outfitters and guides.

The statistically significant negative coefficient on *boat size* suggests that the size of the boat used during the fishing trip has an influence on the trip's price, but in an unexpected way. One possible explanation for this result is related to the fact that freshwater fishing trips might have limited options for boat sizes compared to saltwater fishing trips. In many freshwater fishing locations, smaller and more maneuverable boats are commonly used due to the nature of the water bodies (e.g., rivers, lakes, ponds) where larger boats may not be practical or allowed. Consequently, the limited availability of larger boats for freshwater fishing trips could lead to lower pricing for such trips compared to saltwater trips, where larger boats are more commonly used.

Moreover, the estimated coefficients for fish species, particularly *largemouth* and *peacock*, were found to be statistically significant with a positive sign. The positive sign indicates that these specific fish species have a positive impact on the trip price, which

aligns with findings from previous studies (Pitts et al., 2012). This result suggests that, in comparison to bluegill, anglers tend to prefer largemouth and peacock fishing trips. These two species likely offer more desirable fishing experiences, attracting higher demand from anglers, which, in turn, influences the pricing of these trips. In other words, the positive impact of largemouth and peacock on the trip price highlights their popularity among anglers and their potential to command higher prices in the market.

Model 3 reports the results of the HP analysis for saltwater inshore fishing trips. The estimated coefficients on *duration*, *number of anglers* and *boat size* are statistically significant with the expected positive sign. The estimated coefficients for the saltwater inshore fish species, particularly *redfish* and *tarpon*, were found to be statistically significant with a negative and positive sign, respectively. These signs indicate that redfish and tarpon have a negative and positive effect on the price of the fishing trip. This suggests that anglers have differing preferences for these two species compared to trout. The positive coefficient for tarpon indicates that anglers tend to prefer tarpon fishing trips, which may be due to the nature of catching this challenging and sought-after game fish. The demand for tarpon fishing trips could lead outfitters to price these trips at a premium. On the other hand, the negative coefficient for redfish suggests that anglers do not show the same level of preference for redfish fishing trips compared to trout. This could be attributed to factors such as availability, popularity, or the perceived experience associated with catching redfish. As a result, outfitters/guides may price redfish fishing trips at a lower level than those targeting trout or other preferred species.

Model 4 presents the results of the HP analysis developed for saltwater offshore fishing trips. As shown in column 4, most of the estimated coefficients are statistically significant and exhibit the expected signs. One notable finding is related to the estimated coefficient on the *lodging* variable. This coefficient was found to be statistically significant and displayed a positive impact on the price of a fishing trip. The positive impact of lodging variables on the trip price can be attributed to the added convenience and amenities that come with lodging arrangements. Anglers may prefer trips that include lodging facilities, as it provides them with a comfortable place to stay during their fishing excursion. Offering lodging options can also enhance the overall fishing experience, especially for anglers traveling from distant locations. Within the saltwater offshore fish species variables, the estimated coefficients on *tuna* and *dolphins* are found to be statistically significant, and both display a positive sign. This suggests that anglers have a preference for tuna and dolphins over sailfish species. The positive coefficients for *tuna* and *dolphins* indicate that these two fish species are more desirable to anglers, potentially due to factors such as their size, fighting abilities, or the unique experience they offer. Anglers may view tuna and

dolphins as prized game fish, sought after for their challenging characteristics, making trips targeting these species more valuable.

Using the results of the HP analysis, we estimate the implicit prices of different explanatory variables for all four models. As indicated in Table 3, the estimated marginal implicit price of the *extra Trips / package* variable is $-15.16 for freshwater fishing trips. This means that, on average, each additional trip or package included in a freshwater fishing trip is associated with a decrease of $15.16 in the overall price of the trip. This result may be attributed to the discounts offered by outfitters when bundling multiple trips together. It suggests that anglers who opt for additional trips within a package deal may benefit from cost savings compared to booking individual trips separately.

Table 3: Results from Implicit Price Estimation Model

| Variable Name | | Model 1 | Model 2 Freshwater | Model 3 Saltwater Inshore | Model 4 Saltwater Offshore |
|---|---|---|---|---|---|
| Extra Trips / Package | | | -15.16 | | |
| Number of Anglers | | 13.6325 | 60.44 | 36.7 | 12.32 |
| Duration | | 18.525 | 32.68 | 48.05 | 13.37 |
| Lodging | | 122.5361 | 137.358 | | 544.6135 |
| Guides | | 22.9077 | 23.36 | 48.8955 | 4576.8275 |
| Boat Size | | 6.0325 | -10.11 | 9.45 | |
| Freshwater fishing (saltwater inshore fishing is the reference) | | -88.1199 | | | |
| Saltwater offshore fishing (saltwater inshore fishing is the reference) | | 133.3283 | | | |
| Freshwater Species | Largemouth | | 9.2656 | | |
| | Peacock | | 24.7346 | | |
| | Crappie | | | | |
| | Gar | | | | |
| Saltwater Inshore Species | Redfish | | | -39.364 | |
| | Tarpons | | | 20.1452 | |
| | Snapper | | | | |
| Saltwater Offshore Species | Cobia | | | | |
| | Sharks | | | | |
| | Tuna | | | | 146.39 |
| | Dolphin | | | | 254.30214 |
| | Mackerel | | | | |

The variable *number of anglers* added value with estimated implicit prices of $13.63, $60.44, $36.7, and $12.32 for overall fishing trips, freshwater trips, saltwater inshore trips, and saltwater offshore trips, respectively. The highest estimated implicit price for the *number of anglers* was observed in freshwater fishing trips, indicating that adding an additional angler to a freshwater trip would increase the overall trip price by $60.44. This suggests that freshwater fishing trips often cater to smaller groups, offering more personalized attention and potentially commanding higher prices for each additional angler. On the other hand, saltwater offshore fishing trips are commonly conducted with larger groups, which might result in less substantial price increases for additional anglers. In this context, increasing the number of anglers in a saltwater offshore fishing trip would lead to a relatively smaller increase in the trip price, only raising it by approximately $12.32.

The variable *duration* had a significant impact on the pricing of different fishing trips, contributing varying amounts to the prices of each trip type. Specifically, it added $18.525 to the price of overall fishing trips, $32.68 to freshwater trips, $48.05 to saltwater inshore trips, and $13.37 to saltwater offshore fishing trips, respectively. The lowest implicit price for the variable *duration* was observed in saltwater offshore fishing trips. This could be attributed to the nature of saltwater offshore fishing experiences, which typically involve longer durations due to the need to travel further offshore in pursuit of larger game fish. As a result, the additional time spent on saltwater offshore trips might not lead to a significant increase in the overall trip price. Anglers and outfitters in this setting might be more willing to offer more competitive pricing for longer trips to attract customers.

The estimated marginal implicit price of the variable *lodging* is the highest for saltwater offshore fishing trips, amounting to $544.61. The higher implicit price of lodging for saltwater offshore fishing trips can be attributed to several factors. Saltwater offshore fishing trips typically involve traveling to more distant and offshore fishing grounds, which often require longer durations compared to freshwater fishing trips. As a result, anglers on these extended trips may prefer to have lodging options available, providing them with a convenient place to rest between fishing sessions. In addition, variable *guide* exhibits the most substantial marginal effect of $4576 on the price of saltwater offshore fishing trips compared to other types of fishing trips. The higher implicit price of the *guide* variable for saltwater offshore fishing trips can be related the to the fact that saltwater offshore fishing often involves targeting larger and more challenging game fish species in deep waters. Anglers on these trips may seek the skill that a professional guide can offer, increasing their chances of successful catches and enhancing their overall fishing experience.

Furthermore, we have estimated the marginal value of different fish species. As Model 2 shows, compared to *bluegill* species, *largemouth* and *peacock* added value with implicit

prices of $9.26, $24.73 respectively. The fish species implicit price estimations provide valuable insights into anglers' preferences for different fish species. Anglers are more likely to value the experience of catching largemouth bass and peacock bass more than catching bluegill during their fishing trips. Largemouth bass is a highly prized game fish known for its strong fighting abilities and popularity among anglers. Its positive implicit price suggests that anglers are willing to pay a premium to have the opportunity to catch largemouth bass during their fishing trips. Peacock bass is known for its vibrant colors. The relatively higher implicit price compared to *bluegill* indicates that anglers have a strong preference for targeting peacock bass. [1]

Compared to *trout* fish species, the *redfish* reduces the value of saltwater inshore fishing trips while *tarpons* add value to the saltwater inshore fishing trips. The negative implicit price of redfish could be attributed to the abundance of redfish in the coastal waters, making them a common catch and reducing the sense of uniqueness among anglers. (Camp et al., 2016; Pitts et al., 2012). On the other hand, the positive implicit price of *tarpons* could be due to their rarity. As highly prized game fish, tarpons have long been sought after by anglers for sport fishing purposes. However, the decline in tarpon populations due to overfishing and habitat loss has resulted in reduced availability in the fishing areas. As model 4 depicts, compared to *sailfish* the saltwater offshore fish species including *tuna* and *dolphins* added value with implicit prices of $146.39, $254.30. The positive implicit prices of tuna and dolphins highlight the value that anglers place on catching these species. Anglers may perceive these fishing experiences as unique, making them willing to pay more for the chance to catch these species during their fishing trips. [1]

The differential impacts of fish species on trip prices may provide some useful information for private boat operators on how to optimally package and market their fishing trips. Profit-seeking tour operators may focus on targeting anglers who are more interested in high-value species. The species implicit price information can also provide insights to the fishing and wildlife management agencies as they want to be vigilant for any unusual increase in fishing activities for high value fish species.

## 6. DISCUSSION AND CONCLUSION

We have estimated the marginal implicit prices for a number of characteristics of freshwater and saltwater fishing trips operated by guides and outfitters in Florida. The results suggest that freshwater and saltwater anglers significantly value the lodging feature in fishing trips (implicit prices range from $122.53 to $544.61). One of the key reasons for the higher implicit prices associated with lodging is the convenience it provides to anglers. Offering accommodations as part of the fishing trip package allows anglers to have a

[1] For more information see FWC Fish and Wildlife Research Institute (https://myfwc.com/research/)

comfortable and accessible base throughout their fishing experiences. The added convenience saves valuable time, allowing anglers to maximize their fishing experience without the need for extensive travel to and from the fishing spots. Furthermore, the substantial marginal price effect of the guides highlights the strong preference of anglers for guided fishing experiences, which can be seen as a premium to the willingness to pay for such services. The added value that guides bring to saltwater offshore fishing trips makes them a significant component of the overall package, leading to a higher price point compared to other types of fishing trips.

Moreover, the anglers had a higher willingness to pay to catch specific freshwater and saltwater fish species compared to some other species. Identifying the higher willingness to pay for specific freshwater and saltwater fish species by anglers is not only beneficial for guides/outfitters for targeting high value species, but also highlights the critical importance of conservation efforts to protect these specific species. By aligning angler preferences with sustainable practices, we can ensure a harmonious balance between sport fishing activities and the conservation of natural resources. The results also show that recreational fishing guides and outfitters in Florida have the potential to enhance the economic impacts at both local and regional levels by attracting a greater number of recreational anglers. Specifically, there is an opportunity to target the sport fishing market of non-resident anglers who seek multi-day fishing experiences and require accommodations and related services. Only a limited percentage, approximately 6.2% of guides/outfitters, currently provide lodging and food services for anglers. Similarly, 9.1% of guides/outfitters include additional fishing trips in their packages. The fish and wildlife management agency, local economic bureaus and tourism departments may consider paying more attention to supporting and improving related service sectors in these types of recreational fishing activities. These agencies may want to develop policies that can attract more non-resident anglers who are likely to bring more tourism revenues to the state and scale up the economic impacts.

It is important to highlight that our study did not examine the relationship between income levels and trip expenditures. However, we acknowledge that higher-income households are more likely to afford expensive fishing trips, raising concerns about equity and access. Future research should focus on incorporating income data to better understand the socio-economic dimensions of recreational fishing and address potential issues related to environmental and social justice. Equitable access to recreational fishing opportunities is crucial for promoting inclusive outdoor recreation and conservation efforts.

Additionally, our study primarily focused on guided fishing trips, and it did not encompass the behaviors and preferences of avid anglers who own their boats. While we acknowledge the importance of considering the preferences and behaviors of those anglers, we think that this group represents a relatively smaller segment in the overall recreational fishing market. Future research could benefit from incorporating data on these types of

smaller group of anglers to provide a more comprehensive analysis of the recreational fishing sector. This integration will offer a broader perspective on angler preferences and contribute to more informed policymaking and resource management decisions.

The findings of this paper have important policy implications. First, by understanding the marginal price of fish species, policymakers can develop conservation and management strategies that target the species that are highly valued by anglers. For example, as anglers place a higher value on dolphins, policymakers may prioritize policies that promote sustainable fishing practices to ensure that the dolphins' population is healthy and abundant. Second, the marginal effect of fishing trip characteristics can also guide infrastructure investments that can enhance the recreational value of fishing trips. For instance, if anglers highly value attributes such as lodging, policymakers can support and invest in the development of these facilities to improve the overall quality of the fishing experience. Third, the result of this study could help policymakers develop user fees and taxes that capture the value that anglers place on types of recreational fishing and specific species they target. For instance, we find that anglers place a high value on the quality of the saltwater fishing experience. Accordingly, policymakers may consider increasing user fees for popular saltwater fishing locations to help fund conservation and management efforts and promote sustainable fishing practices. Overall, the finding can provide valuable insights for policymakers and managers responsible for managing these unique natural resources and can help ensure that policies and priorities are compatible with anglers' preferences and the sustainability of these unique natural resources.

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