

## *Are Fishers Loss Averse? Evidence from the Gulf of Mexico Shrimp Fishery*

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## Introduction

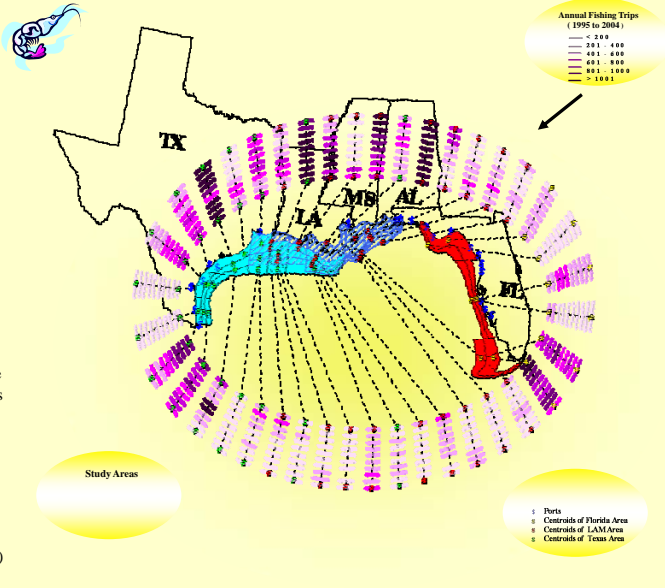
The U.S. shrimp industry has changed significantly since 2000 due to the increase in input costs and decrease in output price. One observation of the changes is that the fleet size has shrunk drastically, while the total effort, measured by fishing time, has fallen by a less amount. A brief overview of the summary statistics for trips taken between 1990 and 2004 indicates that effort exerted per trip has been increasing during the period of analysis. Based on prospect theory and other empirical studies on reference-dependent preferences, this paper attempts to provide another explanation for shrimpers' short-run labor supply and effort decision in individual trips in the Gulf of Mexico. According to prospect theory, people care about loss more than gains. The price fall after 2000 made it harder for the shrimpers to reach their revenue goal for each trip. This might contribute to the increase in per trip fishing effort observed by the researchers.

## Econometric Model

To incorporate the reference-dependent preferences into the econometric model, we construct a utility function (similar to Farber 2008) with the marginal utility of income significantly changed after reaching the reference level of income. Specifically, if fishers are loss averse, the marginal utility is higher before reaching the reference level of income than it is after the reference income is achieved. A simplified form of the utility function is:

$$U(r, h) = (1 + \rho d[r > T]) (r - T) - H(h)$$

Where  $r$  is the revenue for a trip,  $h$  is labor hours,  $\rho$  is the "kink" parameter for the utility function, and  $d[\cdot]$  is an indicator function of whether the actual income reaches the target. Furthermore,  $T$  represents the income target for certain fishing time in a trip (which can be allowed to vary by trip) and  $H(h)$  is the function for labor (say, hours at sea), which is negatively related to utility. In this study, income is interchangeably used with gross revenue of a trip.



This elliptical ring map displays annual fishing trips made by vessels in excess of 60 feet in length during ten year period (from 1995 to 2004). The innermost ring is for year 1995. The rings spread out in ascending order in years. Each bar for a particular ring indicates annual trips to some small areas defined by subarea and fathom zone.

## Data Description

The primary data used to test loss aversion by Gulf shrimpers is the Shrimp Landings File (SLF), which provides trip-by-trip information for all vessels in the Gulf of Mexico shrimp fishery. A subset of the SLF is merged with the Coast Guard Vessel Operating Unit File as well as Shrimp Permit File, which provides detailed characteristics associated with individual vessels in the fishery.

## Results

The results for all four models indicate that if the revenue goal is not reached, shrimpers will exert more effort, with the hazard of finishing fishing decreased by 10%. Further, the decrease in large vessels (those that are no smaller than 80 feet) are higher. Details of the results are in table 1.

Table 1 Estimates for fishing time model

Variables	Model 1	Model 2	Model 3	Model 4
constant	1.304*** (0.0968)	1.495*** (0.109)	1.280*** (0.0851)	3.285*** (0.148)
multiple site	-0.366*** (0.0153)	-0.385*** (0.0165)	-0.329*** (0.0136)	-0.428*** (0.0239)
ln(distance)	-0.552*** (0.00692)	-0.585*** (0.00779)	-0.530*** (0.00652)	-0.699*** (0.0137)
age	0.0127*** (0.000742)	0.0125*** (0.000806)	0.0107*** (0.000668)	0.00265*** (0.00105)
vessel length	-0.0259*** (0.00113)	-0.0278*** (0.00127)	-0.0268*** (0.000970)	-0.0424*** (0.00162)
freezer	-0.591*** (0.0127)	-0.591*** (0.0140)	-0.591*** (0.0118)	-0.511*** (0.0175)
TX closure	-0.141*** (0.0199)	-0.190*** (0.0220)	-0.0735*** (0.0188)	-0.407*** (0.0369)
BRD	-0.0455 (0.0410)	-0.0771 (0.0440)	-0.0683* (0.0385)	-0.0869 (0.0619)
target dummy ( $\alpha$ )	0.0440*** (0.0123)	0.0673*** (0.0122)	0.134*** (0.0118)	0.0354*** (0.0169)
difference ( $\gamma$ )	-0.00128*** (0.000547)	-0.000943*** (0.000550)	-0.0325*** (0.00124)	0.00261*** (0.000595)
difference/target ( $\delta$ )	0.0110*** (0.000567)	0.0104*** (0.000575)	0.0427*** (0.00125)	0.0175*** (0.000948)
ln( $\rho$ ) for weibull	0.446*** (0.00376)	0.449*** (0.00407)	0.450*** (0.00351)	0.503*** (0.00790)
ln( $\theta$ ) for gamma				-1.939*** (0.0814)
observations	42892	36884	48969	26440
Standard errors in parentheses	*** p<0.01, ** p<0.05		* p<0.1	



## Conclusion

The results provide some evidence that shrimpers are loss averse. However, the methodology used in this analysis might need further consideration. Duration model provides a convenient way to analyze the trip decision without having detailed information on the daily revenue for each trip. On the other hand, it uses hazard instead of probability, which might not be easy to interpret. Plus, the construction of the income target variable might be somewhat arbitrary, even though four different methods are tried. In addition, shrimpers' loss averse attitude might not be the only explanation for the less obvious decrease in fishing effort after 2000. Other factors such as structural change in the industry should also be considered.

## References

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