The Value of Shoreline Recreational Fishing Across Time and Space: An Internal Meta-Regression Approach

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Extended Abstract:

In 2016, President Barack Obama signed into law the Outdoor Recreation Jobs and Economic Impact Act of 2016 (Outdoor REC Act). The legislation mandates that the contributions of the outdoor recreation industry, which includes recreational fishing, be measured separately from overall gross domestic product (GDP). In accordance with this new policy, the Bureau of Economic Analysis (BEA) estimated that the outdoor recreation economy accounted for 2.3 percent ($639.5 billion) of GDP in 2023[2] and grew faster than the overall U.S. economy. For recreational fishing specifically, the gross output was found to have been consistently increasing every year since 2002. Although these government estimates suggest the growing importance of the outdoor economy, there is a lack of information on trends in outdoor recreation's *value* from an economic welfare perspective. This research aims to fill this gap in the literature using coastal fishing as a case study.

Generally, there is conflicting evidence on trends in outdoor recreation in the literature. Siikamäki (2009) conducted a comprehensive study in time use and found that per capita time use in outdoor recreation has remained constant since 2003. On the other hand, Pergams and Zaradic (2008) evaluated various forms of nature recreation (e.g., fishing, camping, backpacking) in relation to national and state park visitation in the United States, Japan, and Spain and found a decline in the majority of categories, and thus concluded a "fundamental and pervasive shift away from nature- based recreation." In their study, per capita fishing, which was measured in the form of fishing licenses, was found to decline at about 1% per year after a 1981 peak until 2005, the final year of their sample period.

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2 In producing this estimate, the BEA takes into account the value of goods and services directly related to outdoor recreation, referred to as "core goods and services", plus the value of goods and services that support access to outdoor recreation. Core goods and services include gear, equipment, fuel, concessions, maintenance, repair, and fees related to outdoor recreation activities whereas supporting goods and services include travel and tourism, as well as local trips, construction, and government expenditures.

In this article, and in contrast to past studies that examine recreation expenditures or time use, we examine the dynamics of the economic value of shoreline fishing, a significant type of outdoor recreation, using a travel cost framework. To do so, we take advantage of the 15 years of fishing intercept data collected through the Marine Recreation Information Program (MRIP) of the National Oceanic and Atmospheric Administration (NOAA).

The MRIP data is collected with the primary purpose of measuring fishing activity across coastal sites on the East and Gulf Coasts, but the data provides information that is conducive to employing a multi-site, zonal travel cost model (Dundas and von Haefen 2020). Specifically, the angler origins (zip code), sampling weights, and the site locations are the essential ingredients for the model. We apply a repeated discrete choice model of participation and site choice from 2004 to 2018. We estimate separate models by year, wave (a two-month period) and five geographic regions (Gulf, Florida, Southeast, Mid-Atlantic, Northeast – see Table 1). In the process, we produce 450 per-trip values of coastal fishing. These estimates serve as a useful platform for assessing spatial, socioeconomic, and temporal patterns in coastal fishing value.

Our analysis resembles meta regression methods often used in the benefit transfer literature in which estimates are combined, synthesized, and analyzed from multiple, related studies to identify systematic variation in willingness to pay (WTP) of nonmarket goods and services[3] (Van Houtven et al., 2007). In the context of environmental commodities, past researchers have identified several methodological factors (study type, survey implementation method, response rate, question format, treatment of outliers/protests, and econometric methods) in addition to environmental and economic factors that drive variation in values across time and space (Johnston et al., 2006). By employing a consistent set of methodological assumptions, we are able to estimate spatial, temporal, and socioeconomic effects that are unconfounded by methodological factors. Our approach is thus similar to internal meta-analyses (Klemick et al., 2018).

Our results suggest that while there is significant heterogeneity across seasons within a year, the value of recreational fishing remains relatively stable across years. We find heterogenous value estimates across regions, although our results suggest that our five regions could be collapsed into three. Although we do not find year dummies to be jointly significant in my analysis, an alternative specification that substitutes logged GDP (real) as an explanatory variable finds that logged trip values are positively correlated with real GDP per capita. We estimate the income elasticity for coastal fishing to be about 0.36, which aligns with several studies that find that the value of an environmental good increases with income (Barbier et al. (2017); Czajkowski and Šč asnỳ (2010); Jacobsen and Hanley (2009)). we also find evidence that average distance traveled in a given period and temperature fluctuations drive values. These findings provide guidance for how benefit transfers can be conducted across time and space.

To our knowledge, this study of recreational fishing is the most comprehensive in its spatial and temporal scale. Dundas and von Haefen (2020) use six years of MRIP data to estimate how weather affects recreational fishing participation. Unlike this analysis which uses a national sample of anglers, the authors restrict their sample to anglers residing in coastal counties, which corresponds roughly to a 300-mile maximum one-way driving distance.

Similarly, the MRIP data was also used to conduct a detailed travel cost analysis of off-road vehicle restriction policy effects on recreation at Cape Hatteras National Seashore (Dundas et al., 2018). Alvarez et al. (2014) used the MRIP data and random utility model framework to evaluate recreational fishing losses due to the Deepwater Horizon Oil Spill on the Gulf and Southeast coasts. Kuwayama et al. (2020) use MRIP data in a travel cost framework to estimate changes in expected nonmarket valuation from nutrient pollution reductions, which serve as inputs in a second stage hedonic analysis. Haab et al. (2012) examined the ability of MRIP (formerly Marine Recreational Fisheries Statistics Survey (MRFSS)) to support single-species models and their analysis found that the data does present substantial preference heterogeneity across different targeted species.

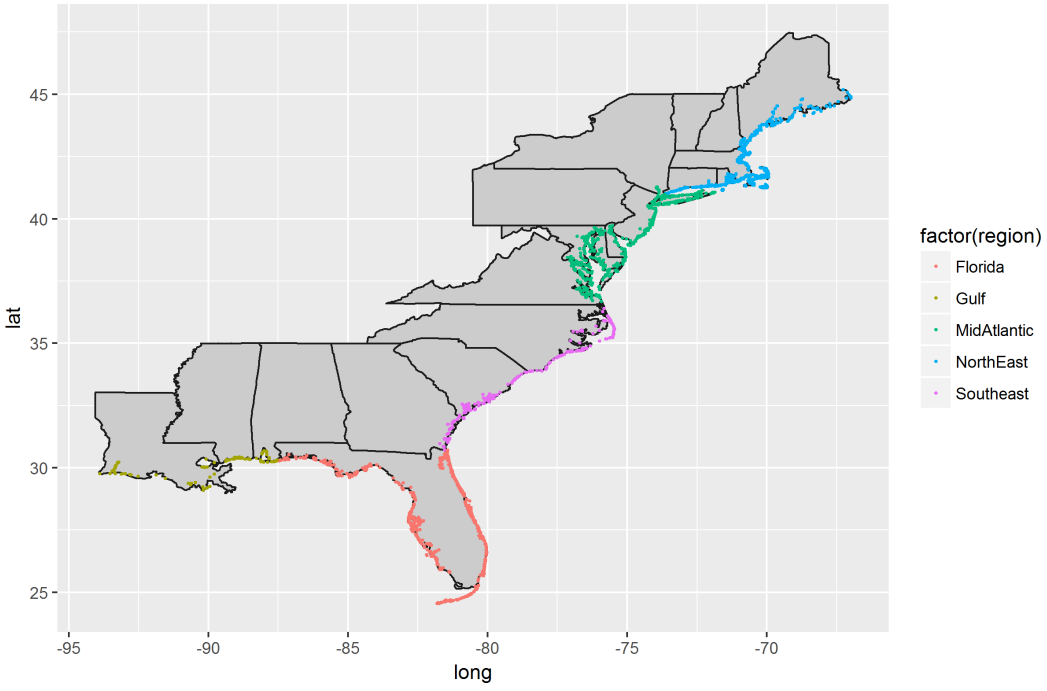

Figure 1: The 2,475 sites in the choice set, disaggregated by region.

REFERENCES

Alvarez, S., Larkin, S. L., Whitehead, J. C., and Haab, T. (2014). A Revealed Preference Approach to Valuing Non-Market Recreational Fishing Losses from the Deepwater Horizon Oil Spill. *Journal of Environmental Management*, 145:199-209.

Barbier, E. B., Czajkowski, M., and Hanley, N. (2017). Is the Income Elasticity of the Willingness to Pay for Pollution Control Constant? *Environmental and Resource Economics*, 68(3):663-682.

Czajkowski, M. and Ščasnỳ, M. (2010). Study on Benefit Transfer in an International Setting. How to Improve Welfare Estimates in the Case of the Countries' Income Heterogeneity? *Ecological Economics*, 69(12):2409-2416.

Dundas, S. J. and von Haefen, R. H. (2020). The Effects of Weather on Recreational Fishing Demand and Adaptation: Implications for a Changing Climate. *Journal of the Association of Environmental and Resource Economists* 7(2):209-242.

Dundas, S. J., von Haefen, R. H., and Mansfield, C. (2018). Recreation Costs of Endangered Species Protection: Evidence from Cape Hatteras National Seashore. *Marine Resource Economics*, 33(1):1-25.

Haab, T., Hicks, R., Schnier, K., and Whitehead, J. C. (2012). Angler Heterogeneity and the Species-specific Demand for Marine Recreational Fishing. *Marine Resource Economics*, 27(3):229–251.

Jacobsen, J. B. and Hanley, N. (2009). Are There Income Effects on Global Willingness to Pay for Biodiversity Conservation? *Environmental and Resource Economics*, 43(2):137-160.

Johnston, R. J., Besedin, E. Y., and Ranson, M. H. (2006). Characterizing the Effects of Valuation Methodology in Function-based Benefits Transfer. *Ecological Economics*, 60(2):407-419.

Klemick, H., Griffiths, C., Guignet, D., and Walsh, P. (2018). Improving Water Quality in an Iconic Estuary: an Internal Meta-analysis of Property Value Impacts Around the Chesapeake Bay. *Environmental and Resource Economics*, 69(2):265-292.

Kuwayama, Y., Olmstead, S., and Zheng, J. (2022). A More Comprehensive Estimate of the Value of Water Quality. *Journal of Public Economics,* 207:104600.

Pergams, O. R. and Zaradic, P. A. (2008). Evidence for a Fundamental and Pervasive Shift Away from Nature-based Recreation. *Proceedings of the National Academy of Sciences*, 105(7):2295-2300.

Van Houtven, G., Powers, J., and Pattanayak, S. K. (2007). Valuing Water Quality Improvements in the United States Using Meta-analysis: Is the Glass Half-full or Half-empty for National Policy Analysis? *Resource and Energy Economics*, 29(3):206-228.