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Wagner, A F; Bennear, L; Stavins, R

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Using revealed preferences to infer environmental benefits, evidence from recreational fishing licenses

Abstract

We develop and apply a new method for estimating the economic benefits of an environmental amenity. The method is based upon the notion of estimating the derived demand for a privately traded option to utilize an open access good. In particular, the demand for state fishing licenses is used to infer the benefits of recreational fishing. Using panel data on state fishing license sales and prices for the continental United States over a 15-year period, combined with data on substitute prices and demographic variables, a license demand function is estimated with instrumental variable procedures to allow for the potential endogeneity of administered prices. The econometric results lead to estimates of the benefits of a fishing license, and subsequently to the expected benefits of a recreational fishing day. In contrast with previous studies, which have utilized travel cost or hypothetical market methods, our approach provides estimates that are directly comparable across geographic areas. Our findings show substantial variation in the value of a recreational fishing day across geographic areas in the United States. This suggests that current practice of using benefits estimates from one part of the country in national or regional analyses may lead to substantial bias in benefits estimates.

**USING REVEALED PREFERENCES
TO INFER ENVIRONMENTAL BENEFITS:
EVIDENCE FROM RECREATIONAL FISHING LICENSES**

Lori S. Benneer

Duke University

Robert N. Stavins

*Harvard University
and Resources for the Future*

Alexander F. Wagner

Harvard University

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Contact: Professor Robert N. Stavins
John F. Kennedy School of Government
Harvard University
79 John F. Kennedy Street
Cambridge, Massachusetts 02138
Phone: 617-495-1820
Fax: 617-496-3783
E-Mail: robert_stavins@harvard.edu

USING REVEALED PREFERENCES TO INFER ENVIRONMENTAL BENEFITS: EVIDENCE FROM RECREATIONAL FISHING LICENSES*

Lori S. Benneer, Robert N. Stavins, and Alexander F. Wagner

We develop and apply a new method for estimating the economic benefits of an environmental amenity. The method is based upon the notion of estimating the derived demand for a privately traded option to utilize an open access good. In particular, the demand for state fishing licenses is used to infer the benefits of recreational fishing. Using panel data on state fishing license sales and prices for the continental United States over a fifteen-year period, combined with data on substitute prices and demographic variables, a license demand function is estimated with instrumental variable procedures to allow for the potential endogeneity of administered prices. The econometric results lead to estimates of the benefits of a fishing license, and subsequently to the expected benefits of a recreational fishing day. In contrast with previous studies, which have utilized travel cost or hypothetical market methods, our approach provides estimates that are directly comparable across geographic areas. Our findings show substantial variation in the value of a recreational fishing day across geographic areas in the United States. This suggests that current practice of using benefits estimates from one part of the country in national or regional analyses may lead to substantial bias in benefits estimates.

1. INTRODUCTION

When considering regulatory actions for a number of disparate environmental and natural resource problems, policy makers may wish to have estimates of the economic value of a day of recreational fishing. Such values can be used to measure the recreational benefits of proposed regulatory or other policy actions. In the past, such estimates have been used in economic impact analyses of: new dams and reservoirs, improvements in water quality, cleanups of abandoned hazardous waste sites, and reductions in the magnitude of global climate change. Virtually all of these estimates have drawn on one of two methods: contingent valuation, a direct survey approach employing hypothetical constructed markets; or travel-cost, an indirect market-based method. The

*Benneer is an Assistant Professor of Environmental Economics and Policy at the Nicholas School of the Environment and Earth Sciences, Duke University; Stavins is the Albert Pratt Professor of Business and Government at the John F. Kennedy School of Government, Harvard University, and a University Fellow of Resources for the Future; and Wagner is a Ph.D. student in Political Economy and Government at Harvard University. Financial support was provided by Resources for the Future, the U.S. Environmental Protection Agency, and the Dean's Research Fund, John F. Kennedy School of Government. The analysis benefitted from discussions with Andrew Metrick, Richard Newell, and Kerry Smith, comments from participants at seminars at the National Bureau of Economic Research and Harvard University, and very helpful comments from two anonymous referees. The data set, which builds upon previous work by Scott Wolf (1988), was assembled with the help of a series of research assistants, including: Rod Bender, Nancy Bilica, Alisha Bloom, Diane Cherry, Peter Condon, Andrew Hoffman, and Michael Susanto. The authors alone are responsible for any errors.

use of the first of these approaches has generated considerable controversy within economics;¹ and both approaches require large quantities of geographically specific data. The majority of analyses by government agencies — including benefits estimation for Regulatory Impact Analyses — do not employ new site-specific or policy-specific studies of the value of a recreational fishing day. Rather, these analyses typically employ “benefit transfer methods,” whereby estimates from a previous study are applied — sometimes with modifications — to a new and different policy scenario (Desvousges, Johnson, and Banshaf 1998).

In this context, it may be of interest to have an additional set of estimates — based upon a conceptually distinct, revealed-preference approach — of the economic benefits of a recreational fishing-day (Stavins 1992). Our methodology differs from previous studies in two important respects. First, we estimate willingness-to-pay for a recreational fishing day from observed behavior regarding the purchase of fishing licenses, rather than observed behavior regarding travel to sites or stated preferences regarding those sites. Second, the two existing approaches² use detailed micro-data (of observations of opportunity costs of travel or respondents’ explicit estimates of willingness-to-pay) to develop benefit estimates specific to particular bodies of water and particular changes in water quality. This is both their advantage and disadvantage. In contrast, the approach developed in this paper uses aggregate data at the state level to derive estimates — in a national modeling framework — of state averages of recreational benefits.³ As a result, our state estimates are directly

¹For an overview of the controversy, see: Portney 1994; Hanemann 1994; and Diamond and Hausman 1994.

²Other direct, revealed-preference methods that have been used for examining environmental amenities and that require detailed micro-data — hedonic property and wage models — have not been applied to estimating the value of recreational fishing days (Freeman 2003). In principle, a sport fishing demand function could also be estimated in some cases by drawing on data from pay-for-use facilities, such as private, managed trout ponds, where users are charged for access or use (Vaughan and Russell 1982).

³Seneca and Davis (1976), in an analysis of the factors affecting participation in recreational activities, carried out a county-level, cross-sectional econometric analysis of the factors affecting fishing license sales in West Virginia in 1970. Because there was no variation in license prices in the cross section, price could not be included as an explanatory variable.

comparable among one another, allowing inferences to be made about relative recreational benefits across geographic areas with more confidence than is possible based on previously available methods.

In Part 2 of the paper, we outline the theoretical framework underlying our estimation strategy. In Part 3, we describe our data, and in Part 4, we describe the econometric analysis, including the results from generalized least squares (GLS) and instrumental variables (IV) regressions. In Part 5, we use the econometric results from the IV equations to derive estimates of average expected recreational fishing day values, and we compare these estimates with results from previous studies. In Part 6, we conclude.

2. OVERVIEW OF METHOD

Throughout the United States, a state fishing license is required for recreational fishing on any and all bodies of water, with the exception of privately own ponds. Thus, apart from the possibility of illegal fishing activity, to which we return below, a license is a necessary condition for deriving benefits from a day of recreational fishing. Likewise, apart from the relatively rare urbanite who may enjoy displaying to others an (unused) fishing license, experiencing some fishing days is a necessary prerequisite for deriving benefits from owning a fishing license.⁴

Building upon the household production approach to consumer behavior (Becker 1965), Bockstael and McConnell (1983) identified the conditions under which empirical knowledge of the demand function for a private, market good could be used to infer the benefits derived from a related

⁴We return later to the possibility that the license provides its owner with the *option* to go fishing, and thereby that simply *expecting* to go fishing is all that is required for a person to derive benefits from owning a license.