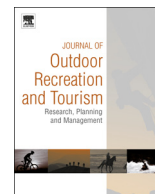




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## A travel cost evaluation of the benefits of two destination salmon rivers in Ireland

Gianluca Grilli<sup>a,b,\*</sup>, Gavin Landgraf<sup>a,c</sup>, John Curtis<sup>a,b</sup>, Stephen Hynes<sup>d</sup>

<sup>a</sup> Economic and Social Research Institute, Sir John Rogerson's Quay, Dublin, Ireland, UK

<sup>b</sup> Trinity College Dublin, Dublin, Ireland, UK

<sup>c</sup> National University of Ireland Galway, University Road, Galway, Ireland, UK

<sup>d</sup> Socio-Economic Marine Research Unit, J.E. Cairnes School of Business and Economics, National University of Ireland, Galway, Ireland, UK

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## ABSTRACT

Fishing for Atlantic salmon (*Salmo salar*) is a popular recreational activity in several northern hemisphere countries. This paper extends the empirical literature using the travel cost method to estimate the demand function for two of Ireland's premier salmon fisheries: the rivers Moy and Corrib. Data were collected by an on-site questionnaire and demand was estimated using count data models. Several findings have relevance to other premier destination Atlantic salmon fisheries. While international visiting anglers are often prized over domestic anglers, this research indicates no difference between domestic and overseas anglers in terms of their angling demand. Second, an estimated price elasticity of demand of  $-1.04$  indicates that anglers at these premier fisheries are quite cost sensitive, which is counter to previous estimates. Whether this result is more generally applicable at other premier salmon angling sites requires further research but it highlights the difficult balance fishery managers face when increasing permit prices. Finally, beyond the impact of higher travel costs on demand, domestic but not overseas anglers' demand declines as distance to the fishing sites increases.

*Management implications:* Results from this study are useful to improve fishery management in many salmon destinations. Managers may use results to tailor marketing actions across markets and assess the expected changes of fishing activities when manipulating the variables affecting the demand. In particular, most important findings include:

- The daily spending of tourists is high and assures a source of income to local communities;
- A large consumer surplus, suggesting that salmon fishing experience is valuable;
- Local and international anglers are not statistically different, which suggests that these markets are equally attractive;
- An elastic demand that implies that larger prices might reduce the number of trips made by anglers; in this regard a policy acting on price to increase revenues should be evaluated carefully.

### 1. Introduction

The west of Ireland has historically possessed some of the most prolific Atlantic salmon (*Salmo salar*) rivers in Europe, providing a livelihood for local fishermen, who exploited the salmon resource for many years. However, this level of fishing was unsustainable. To allow recovering the fish stock the Irish government curtailed commercial salmon fishing in the early 2000s (Gosch, Hernandez-Milian, Rogan, Jessopp, & Cronin, 2014). With the introduction of a river-by-river management scheme and with a mixed-stock drift net ban in 2007, large-scale commercial salmon fishing in Ireland effectively ended, marking a dramatic shift in Ireland's relationship with one of its most

culturally significant natural resources. In the years since the ban on drift netting, salmon angling catches have increased substantially (IFI, 2014), boosting Ireland's reputation as a premier recreational salmon angling destination. Recreational fishing, and particularly angling tourism, holds huge economic potential for the development of the west coast of Ireland.

River and lake resources are important components of a countryside's capital and, even if undervalued, contribute to the development of small rural areas (Garrod, Wornell, & Youell, 2006). In particular the potential of water resources could be used with the expansion of recreational angling, which contributes to local income through tourists' expenditures. There are several examples of successful

\* Corresponding author.

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sustainable fishing that bring notable contribution to local incomes (Lynch et al., 2016). Smart angling regulation may accomplish the objectives of eco-tourism activities: minimise environmental impacts and enhance local economies (Honey, 2008; Zwirn, Pinsky, & Rahr, 2005). The economic contribution of recreational angling to the Irish economy is quite large, generating some €755 million in economic activity from €555 million of direct angling-related expenditures (TDI, 2013). Salmon and trout anglers are estimated to spend €154 million per year (O'Reilly, 2015). These expenditures bring substantial revenue to rural communities, which often have limited economic activity. Although these figures provide a picture of the general economic impact of angling at national level, a rigorous benefit assessment of recreational angling at fishery level is worthwhile to understand the market and identify possible interventions to increase efficiency (Edwards, 1990).

Although recreational benefits of angling have been widely studied (e.g. Lawrence, 2005; Lew & Larson, 2012), relatively few papers focus on Atlantic salmon. Atlantic salmon angling is valuable not only for Ireland but for several northern hemisphere countries, including United States, Canada, Iceland, Norway and UK. There is an extensive literature on the biology, conservation, and management of Atlantic salmon fisheries Verspoor, e.g. et al. (2008) but surprisingly, there are relatively few studies examining recreational angling demand and anglers' preferences. An early study by Morey, Rowe, and Watson (1993) investigates participation and site choice decisions for salmon anglers fishing in New England. Breffle and Morey (2000) extend the analysis to allow heterogeneous preferences both by modelling utility as a function of individual characteristics and also allowing parameters to be described by known distributions. Both of these papers examine anglers' preferences and decisions in the context of changes in the attributes of the fishery (e.g. catch). Alternative approaches examine salmon anglers' willingness to pay or preferences as a function of socio-demographic attributes, identifying factors that drive salmon angling demand, which is information that can be used to increase the attractiveness of specific fisheries to tourist anglers Curtis (2002). This paper extends that literature and considers preferences of anglers visiting premier or destination salmon angling sites.

The objective of the paper is to estimate the demand for Atlantic salmon angling using the travel cost method (TCM) as a function of angler characteristics and with a particular focus on the importance of travel distance. The TCM is a non-market technique, implemented to estimate the use value of tourist destinations, by investigating the actual behaviour of tourists (Haab & McConnell, 2002). The method enables the estimation of consumer surplus of anglers, which is considered a good approximation of a welfare measure for recreational fisheries' use value (Hanley & Barbier, 2009; Provencher & Bishop, 1997). The present analysis is conducted for two premier salmon angling destinations: the River Corrib, which flows through Galway City, and the River Moy. Well-known internationally, these two rivers accounted for more than a quarter of all salmon caught recreationally in Ireland in 2014 (IFI, 2014). Estimating the value that different types of anglers place on these two destination salmon fisheries will inform policymakers' cost-benefit calculations while also providing a preview of anglers' value of other Atlantic salmon fisheries if their salmon populations improved.

## 2. Methods

### 2.1. Study areas

The study concentrates on the rivers Corrib and Moy, because they are two of the most important and famous angling destinations in Ireland. Indeed, more than half of the 4600 overseas anglers who purchased salmon licenses in Ireland in 2014 bought their licenses in the Moy or Corrib river basins. The river Corrib, although being short and running just six kilometres from Lough Corrib to Galway Bay, is the second largest Irish river by flow. The River Moy runs for 110

kilometres, from the heights of the Ox Mountains to the Atlantic Ocean at Killala Bay. The premier stretch of the river for angling is located in Ballina, in County Mayo, just before the river meets the sea. Because of the high recreational demand, angling on these rivers is well regulated and anglers must possess both a licence and a date-specific permit to fish. At the same time, salmon stock levels are carefully monitored so that catch rates do not exceed conservation limits. Anglers can retain up to ten salmon per angling season, while daily limits vary during the season. From the 1st January to 11th May one fish per day can be retained; three fish can be retained from the 12th May until the 31st August and then one fish until the end of the season (30th September). Every salmon caught must be registered in a personal logbook and communicated to Inland Fisheries Ireland (IFI), so that harvesting can be effectively monitored. After harvesting the bag limit, anglers can still fish 'catch and release'.

### 2.2. Data collection

Data were collected by means of a self-administered, paper-based questionnaire, completed on-site during the fishing seasons of 2015 and 2016. It was intended to survey the entire population of anglers with the help of local fishery managers who delivered the questionnaire when anglers registered at the fishery. If anglers were members of a group, all components of the group were invited to take part of the survey. Only a minority of anglers completed the survey. A question arises whether the completed survey responses are representative of the population of anglers? This is unlikely to be the case for our respondents, because completing the questionnaire is potentially subject to selection bias. So although the intention was to survey the population of anglers at the two fisheries, the outcome could be described as convenience sampling (Etikan, Musa, & Alkassim, 2016).

The questionnaire was organised in two main thematic sections. The first section, contained questions aiming to capture the necessary data for the TCM, i.e. total number of days spent fishing in the current trip in Ireland, the total amount of expenditures (for tackle, travel, subsistence and accommodation), type of accommodation, country and municipality of residence. The second section contained socio-demographic questions related to age, gender, personal income and occupation. The questionnaire was designed specifically with a TCM model in mind but confined to be as short as possible, as anglers would be unreceptive to a long questionnaire at the beginning of their fishing session. In addition to these data, travel distance variables were derived from the home town question and added to the dataset: round-trip distance between hometown and fishery.

There were 139 responses to the survey though some were incomplete, with only 134 usable for the TCM. The size of our sample is small but it is comparable to other studies available in the literature on recreational angling, for example Englin, Lambert, and Shaw (1997) collected a sample of 120 respondents while du Preez and Hosking (2011) used an even smaller sample of 96 respondents.

The dependent variable in the TCM model is the number of days per trip. The variables included as independent variables, in order to explain the number of fishing days an angler undertakes, are summarised and described in Table 1. The *Tcost* variable represents the average daily cost sustained by anglers. The variable labelled *Moy* is a dummy included to test whether there are significant differences between locations in terms of number of days spent fishing. We have no *a priori* knowledge about the sign of this coefficient, indicating if trip lengths differ between the two locations. On the other hand, we suspect a positive effect of *Age66+* on the number of days spent fishing. This variable is a proxy for retired people, which have, on average, more free time to spend in leisure activities compared to younger people, *ceteris paribus*. *Prof/Manager* is another dummy, used as proxy for high-income anglers. We presume that people with higher income have more money for recreational activities, therefore they can afford to spend a larger number of days fishing. *Groupsize*, indicating the number of

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