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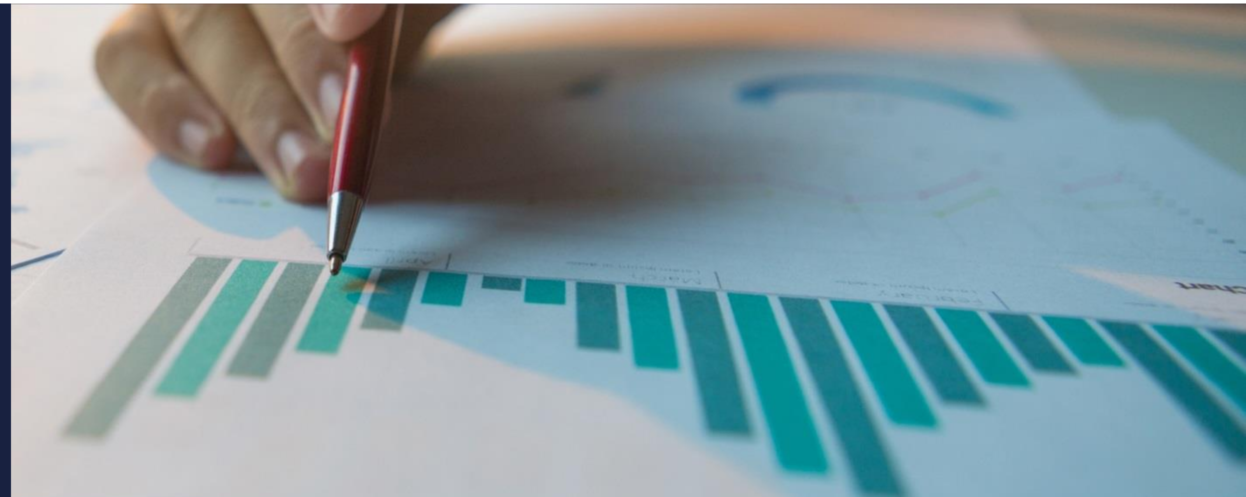
Sea Bass Angling in Ireland: a Structural Equation Model of Catch and Effort



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VENUE
Royal Society, London

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Iascach Intíre Éireann
Inland Fisheries Ireland

Outline

<u>Analysis of recreational fishing data</u>

- Background: <u>feedback loops</u> between catch and effort
- Methods
- Results
- Discussions/Implications

Background

Self-reported catch – Demand Relationship:

Issues:

- Recall bias – measurement errors
- Bi-directional relationship

Catch affects the number of trips

The frequency of trips affects catch

Background

Approach:

Structural Equation Model (SEM) to jointly estimate Catch and Demand

- Approach similar to Englin et al. (JEEM, 1997)
- We show bi-directional causality

Survey and Data collection

- Recreational angling of Sea Bass in Ireland
- Web survey via email, IFI website and socials
- Data collection
  - Annual trips TCM model
  - Annual number of fish caught (CFM model)

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Descriptive statistics of the sample

266 responses - 230 fully completed questionaires

Variable	Statistics
Place of origin	• 69% Ireland • 10% UK • 5% Northern Ireland • 16% Other countries
Annual fishing days	30 (st.dev. 28)
Annual catch (n. of fish)	31 (st.dev. 49)
Average daily cost	€47 (st.dev. 97)
Median age class	35 - 44
University degree holder	32%
Median Income	30-45K per year

Methods

Structural model 1 (SEM 1)

CFM
Av. length
Tackle inv.
Bass angler
All_around angler
Boat fishing
Wexford
Waterford
Cork
Kerry

TCM
E[CFM]
Travel cost
Irish
Employed
Uni. degree
Age55+

Structural model 2 (SEM 2)

TCM
Travel cost
Irish
Employed
Uni. degree
Age55+

CFM
E[CFM]
Av. length
Tackle inv.
Bass angler
All_around angler
Boat fishing
Wexford
Waterford
Cork
Kerry

Methods

Negative Binomial regression:

$$LL = \frac{\Gamma(\alpha^{-1} + y)}{\Gamma(\alpha^{-1})\Gamma(y+1)} \left(\frac{\alpha^{-1}}{\alpha^{-1} + \mu}\right)^{\alpha^{-1}} \left(\frac{\mu}{\alpha^{-1} + \mu}\right)^{y}$$

SEM equations:

$$LL_{SEM1} = LL_{CFM}[Z_i\beta] + LL_{TCM}[(X_i; E[CFM_i]\beta)]$$

$$LL_{SEM2} = LL_{TCM}[X_i\beta] + LL_{CFM}[(Z_i; E[TCM_i]\beta)]$$

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Results

Predicted number of annual fishing days:

Sample av.	Baseline TCM	SEM 1	SEM 2
30.8	33 (1.65)	31.02 (.42)	30.61 (.02)
-	+ 7.14%	+ 0.71%	- 0.61%

Predicted number of fish caught annually:

Sample av.	Baseline CFM	SEM 1	SEM 2
31.5	17.5 (1.48)	30.27 (2.82)	33.82 (7.48)
-	- 44%	- 3.9%	+ 7.35%

Results

Cost coefficients (€1000):

Baseline TCM	SEM 1	SEM 2
-2.685*** (0.797)	-3.143*** (0.971)	-3.552*** (0.751)

Consumer Surplus per day (CS):

Baseline TCM	SEM 1	SEM 2
€383 (118)	€318 (98)	€282 (59)

WTP (CS + av. Daily cost)

Baseline TCM	SEM 1	SEM 2
€431 (123)	€366 (100)	€330 (66)

Results

Marginal effects:

E[Catch] on fishing days

Baseline TCM	SEM 1
.26 (.04)	.53 (.15)

E[Days] on expected catch

Baseline CFM	SEM 2
.53 (.08)	3.77 (.99)

Price Elasticity:

Baseline TCM	SEM 1	SEM 2
-.13 (.04)	-.15 (.05)	-.17 (.04)

(Inelastic demand)

Concluding Remarks

- Catch and fishing days have a bi-directional relationship;
- We used SEM models to account for feedbacks SEM models had better predictions
- SEM models had a more conservative CS
- SEM provided larger marginal effects
- SEM 1 vs SEM 2?

Thank you for your attention!

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