Geographic Concentration in the Northeast U.S. Sea Scallop Fishery

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Outline

1. Research Question and Motivation
2. Some Background
3. Indices of Geographic Concentration
4. Spatial Analysis
Research Questions

• Is geographic concentration in the scallop industry going up or down?\(^1\) **Probably down.**

• Is there spatial association of “specialization” in the scallop industry\(^2\)? **As a whole, no. But there seem to be pockets.**

**Motivation:** Lots of spatial and non-spatial management. How does management (and other things) affect ports and communities?

\(^1\)Bickenbach and Bode (2008); Guillain and Le Gallo (2010); De Dominicis, Arbia, and De Groot (2013).

\(^2\)Anselin (1995).
Scallop Fishery

- In 1938, New Bedford, MA had a 48% share of scallop (Bearse, 1941).
- Two fleets:
  - “Big” Limited Access Fleet: Days-at-Sea, rotational closures, permanent closures, crew size.
  - “Small” (General Category) Fleet: Possession limits, some IFQs, rotational closures, permanent closures.

![Graph showing total scallop landings, 1996-2013.]

Total scallop landings, 1996-2013.
Moving Poleward?

- Catch locations moving north.
- Landing locations?
Methods 1a:  
A General Theil Index of Concentration

\[ T = \sum_{r=1}^{R} w_r \frac{X_r}{\Pi_r} \ln\left( \frac{X_r}{\Pi_r} \right) \]

- \( \Pi \) is the benchmark for “regularity” in the distribution of \( X \).
- \( w_r \) is a weight that reflects the “importance” of each port.
- Theil \( \uparrow \Leftrightarrow \) increasing geographic concentration.

By varying the weights \((w_r)\) and “regularity benchmark” \((\Pi_r)\), we can construct different indices that measure very different things\(^3\).

\(^3\)Bickenbach and Bode (2008)
Methods 1b:
A General Theil Index of Concentration

- Absolute index, $\Pi = 1 \equiv$ Scallop landings equal in ports
- Relative index, $\Pi = \text{"all fishing"} \equiv$ Scallop proportional to "all" fishing
- Change index, $\Pi = X_{1996} \equiv$ Scallop landings proportional to 1996 Landings.

$$T = \sum_{r=1}^{R} w_r \frac{X_r}{\Pi_r} \ln\left( \frac{X_r}{\Pi_r} \sum_r w_r \frac{X_r}{\Pi_r} \right)$$
Some results

"Absolute": $\Pi = 1$

Geographic concentration went down from 1996-2011 before increasing in 2012.
A few more results?

“Relative 1”: Π = “all fishing”

- Not sure if I “believe” the “all revenue” graph is meaningful.
“Change Index”: $\Pi = X_{1996}$
Methods 2: Indicators of Spatial Association

Are “Specialized” scallop ports located close to:
- ...specialized scallop ports?
- ...non-specialized scallop ports?
Global Spatial Association

Quantity

Revenue

LQq

LQr
Local Spatial Association
Local Spatial Association
Findings and Future Work

Findings:
- Geographic concentration going down in “absolute” terms.
- Probably also going down “relative” terms.
- Spatial association of port-specialization seems to be present, and may be affected by spatial management.

Future work:
- Indices with regularity defined as “accessible resources”
- “Causal” models – What is the effect of closing off a section of the ocean on a port (all ports)?
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References


Catch and Landings, by species
“Relative 2”: Scallop proportional to “other” fishing