Short-term Impacts on Coastal Sub-Regions

Description of Input-Output Model
Overview

• Explanation of short-term impacts
• Brief description of input-output models
• Legal mandates?
• IMPLAN software and data
• Steps used to construct input-output model
  – Region of influence area designations
  – IMPLAN modifications
  – Data requirements
• Impact estimation issues
  – Capturing forward linkages
  – Avoiding double-counting impacts
• Comparison to other input-output modeling approaches
Economic Impacts

What is meant by short-term impacts?

• The immediate regional impacts (sales, income, employment) that would occur in 2004 following implementation of a proposed regulation rather than a discounted stream of impacts in future years.

• No temporal effects

• Assumes the economic structure in each sub-region in New England will remain unchanged

• No price effects
Input-output Models

• I/O models capture inter-industry transactions between businesses and between businesses and final consumers in an economy
  — Industries use the products of other industries to produce their own products
  — Outputs from one industry become inputs to another
Basic Input-Output Logic

- Fuel
- Ice
- Food
- Nets
- Insurance
- Labor

Commercial Harvester

Producer Sector

Intermediate Demand Sectors

Seafood Dealers
Seafood Processors

Final Demand Sectors

Grocery Stores
Restaurants
Exports

Labor
Input-output Models

- I/O models track the linkages between businesses and final consumers (market and non-market financial flows)
- I/O models also provide estimates of the direct, indirect, and induced changes that will occur in a particular geographic region from fishery management actions

**Direct** - sales, income and employment generated from ex-vessel purchases of seafood

**Indirect** - sales, income and employment of businesses that supply seafood harvesters (e.g., commercial fishers must purchase fuel, oil, bait, insurance, etc.)

**Induced** - sales, income and employment resulting from expenditures by employees of the direct and indirect sectors (e.g., crew purchase groceries and incur auto loans)
Limitations / Assumptions

Limitations

• I/O analysis is not a substitute for benefit cost analysis
  — I/O describes the effects of expenditures
• I/O models are generally static and simply provide a snapshot of changes in impacts rather than a discounted sum of future impacts

Assumptions

• Constant returns to scale
• No supply constraints
• Fixed commodity input structure
Legal Mandates

Are there legal requirements that mandate NMFS to conduct I/O assessments?

NO!

Why construct I/O models?

- I/O analyses can be used to help fulfill the requirements of NEPA, EO12866, and maybe even National Standard 8 of the Sustainable Fisheries Act
  - References made to examining “direct and indirect effects” in NEPA and National Standard 8
  - NEPA requires broad consideration of the distributive effects
- “NMFS Guidelines for Economic Analysis of Fishery Management Actions” specifically mentions that I/O models could be used to estimate the regional income and employment effects
- “Considering Cumulative Effects under the NEPA” by the Council on Environmental Quality I/O models are referenced as a cumulative effects analysis method
Components of IMPLAN

Software
• Simply provides a user-friendly platform from which I/O models of regional economies can be developed

Data
• National-level technology matrices
• Estimates of sectoral activity for industry output, employment, value-added, and final demand for each county in the U.S. for 528 industrial sectors (4-digit SIC)
## IMPLAN’s Fishing-Related Sectors

<table>
<thead>
<tr>
<th>IMPLAN Sector Name</th>
<th>IMPLAN Sector</th>
<th>SIC Sector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercial Fishing</td>
<td>25</td>
<td>0910</td>
</tr>
<tr>
<td>Wholesale Trade</td>
<td>447</td>
<td>5000, 5100</td>
</tr>
<tr>
<td>Prepared Fresh or Frozen Seafood</td>
<td>98</td>
<td>2092</td>
</tr>
<tr>
<td>Canned &amp; Cured Seafoods</td>
<td>97</td>
<td>2091</td>
</tr>
</tbody>
</table>
Default IMPLAN data and sector breakouts are generally not capable of being used to describe the economic activity associated with fishery management actions.
Steps Used to Construct I/O Model

- Developed geographical region of influence (ROI) area designations (distinctive fishing subregions - communities)
- We used a functional economic area concept to develop ROI’s
  - A semi self-sufficient economic area centering on the needs of the impacted industries
  - Considered ports of landings, location of harvesters, dealers, and processors, and source of seafood dealer purchases
- Used this approach so we’d be able to predict how the impacts of the management actions would vary across semi self-sufficient fishing areas (geographic areas where similar fishing communities exist)
Fishing Regions and Port Cities of New England

1: Downeast Maine
2: Upper Mid-Coast
3: Lower Mid-Coast
4: Southern Maine
5: New Hampshire
6: Gloucester, North Shore
7: Boston Area
8: Cape and Islands
9: New Bedford Coast
10: Rhode Island
11: Connecticut Coast
12: Near Coastal New England
13: Other US Regions
IMPLAN Improvements

Decide how to disaggregate IMPLAN’s single commercial fishing sector

Disaggregated by gear type & size class
  — Regulations often target specific gear sectors
  • Grouped harvesting activities in New England into 17 distinct gear sectors (5 land groundfish)
  • Created 187 new harvesting sectors (11 subregions * 17 gear sectors)
  • Separated the wholesale seafood dealer component from the default IMPLAN wholesale trade sector and created 11 new wholesale seafood dealer sectors (one for each subregion)
  • Model consists of 725 industry sectors (527+198)
New Harvesting Sectors

1) Inshore lobster
2) Offshore lobster
3) Large bottom trawl*
4) Medium bottom trawl*
5) Small bottom trawl*
6) Large scallop dredge
7) Medium scallop dredge
8) Small scallop dredge
9) Surfclam, ocean quahog
10) Sink gillnet*
11) Diving gear
12) Midwater trawl
13) Pots and traps
14) Bottom longline*
15) Other mobile gear
16) Other fixed gear
17) Hand gear
Data Requirements

Primary and secondary data
- Output
- Employment
- Production functions

Further modifications to IMPLAN default data
- Institutional demand/sales
- Byproducts
- Foreign exports
Impact Estimation

- IMPLAN uses a final demand approach to generate impacts
  - How a change in retail seafood demand affects the retail support sectors and the backward linked industries associated with the processing, wholesaling, distribution, and production of seafood in a local economy
- Commercial harvesters (producing sectors) are regulated and not retailers (final demand sectors)
  - How a change in local seafood production affects the backward linkages associated with harvesting and the forward linked impacts associated with distribution, wholesaling, processing, and retailing
- A production-oriented approach (supply-side approach) is more appropriate for assessing the impacts of regulations
Supply-side Approach

• First step was to define estimated output (revenue) changes for the directly regulated sectors

• From there adjustments were made to account for output changes to the forward linked sectors without double-counting

• Harvester, dealer, and processor output changes were then applied to the IMPLAN-generated multipliers (captures backward linkages) to arrive at the economy-wide impacts of the proposed regulation

• The assessment does not capture the forward linked impacts associated with the final demand sectors (retail, hospitals, hotels, etc.)
Impacts

• An additional step is required to estimate subregional impacts associated with the seafood processing sector and the remaining 527 default IMPLAN sectors in the model.

• Assumed impacts would be distributed according to default IMPLAN output, employment, and income shares in each subregion.

• In this manner, we can apportion the estimated New England impacts for these 527 sectors to each subregion without actually having constructed a full multiregional model.

• Method suggested by Doug Olson from IMPLAN who also reviewed our modeling approach.
Model Comparisons

- **NEFSC input-output model**
  - Internalizes the new fishery-related sectors and therefore explicitly details the inter-industry transactions between the fishery-related sectors and between the fishery-related sectors and all the other sectors in the model

- **FEAM model and U.S. Minerals Management Service model**
  - Changes in ex-vessel revenues are allocated to IMPLAN sectors according to proportions contained in a production function and then these output values are multiplied by the IMPLAN-generated multipliers to estimate impacts
  - This approach is unable to delineate impacts to sectors other than those contained in the production functions