Replacing IMPLAN sectors

The procedure for replacing a sector in IMPLAN is described in the IMPLAN manual and on the IMPLAN website, but essentially involves accessing the IMPLAN model, changing the sector name, editing the study area data to reflect the characteristics of the new sector, and then replacing the production function for the original sector with a new production function based on the new sector.[4]

Calculating production functions for the new OC sectors involved two steps. First, convert the OC expenditure data generated by the survey research described in Part 1 of this report ($ spending by expense category) into input purchase data ($ purchases from specific IMPLAN industrial and value added sectors). Second, for each OC, divide the estimated dollar purchases from each IMPLAN sector by the total value of output (landings value) for that OC.

One adjustment to survey results was necessary to develop the production functions for the OC sectors. Initially, the survey data related to output (landings), costs, and earnings for each fisherman in each OC were combined in the following basic equation:

> Net earnings (profits) = total value of landings (output) - input purchases from all industrial sectors within CA - all purchases outside CA - wages, salaries and other payments to labor - taxes.

However, some fishing operations had such negative profits that the total net earnings for some OCs were negative during 2006. Because I/O models are linear models, leaving negative net earnings for an OC would result in impact estimates showing that an increase in landings by that OC would result in a decrease in net earnings and in related economic impacts. Eliminating those fishermen with negative net revenues on the assumption that they are not representative of long-term operators would have solved the problem, but would have prevented the utilization of a great deal of otherwise useful cost data provided by those fishermen. After considering and testing that option and others, and consulting with other researchers who have experienced similar survey results that reflect temporary economic losses in fisheries, the decision was made to substitute $1 in net earnings for each survey respondent with negative net earnings in a given OC.[5] This resulted in positive net earnings for all OCs and preserved useful cost data obtained from fishermen with negative net revenues without significantly biasing analytical results. However, it did result in fleet-wide output for some OCs in the models being somewhat higher than reported output for those OCs based on CDFG data.

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[4] Within the context of input-output models a set of gross absorption coefficients that show the input purchases from various row sectors per dollar of output by a column sector represents a cost function. Because COFHE models are regional, however, "regional absorption coefficients" are used which show purchases within the region from various row sectors per dollar of output by a column sector; and purchases from outside the region from any sector are lumped together in a separate row sector called "imports." The technical coefficients in these regional models, therefore, reflect only regional purchases of inputs per $1 of sector output and do not represent "cost functions."

[5] The other option considered here involved discarding survey results from fishermen reporting negative income. NOAA economists constructing similar models encountered similar problems. The authors agreed with their conclusion that the survey data regarding the distribution of input costs from these fishermen are valid and important and should not be discarded. The approach used, which makes use of these cost data, was preferable to ignoring these survey results. Trial model runs comparing multiplier and impact estimates using survey results that include and exclude responses from fishermen reporting negative earnings showed minimal differences in estimated economic impacts.

Replacing negative earnings with $1 in positive earnings resulted in somewhat higher overall earnings for some OCs, and required that the control totals (landings values) for those OCs be increased by a comparable amount so that the technical coefficients used to describe the allocation of input purchases summed to one. However, in order to keep the total output statistics in the COFHE model consistent with the CDFG statistics, King and Associates used the production functions developed using the adjusted survey results with the CDFG control totals for each OC to develop a revised transactions table.[6]

Generating Study Area Data

Study area data consist of output, value added and employment.[7] The output and employment data for each OC in each study area were derived directly from CDFG landings data. Statewide value added was calculated by multiplying the coefficient of each value added component by the statewide landings value (output) for each OC.[8]

Output for each OC in each region and county had already been derived during Part 1 (Table 6) from CDFG landings data. Value added information for each county was calculated by multiplying the statewide value added coefficients by county-specific OC output. Jobs/output was calculated on a statewide basis for each OC and then multiplied by the county-specific OC output to estimate the number of jobs per OC in each county. To generate study area data for the regional versions of the COFHE model, output, employment, and value added information were summed for each county within the region.

COFHE Model Construction

Once the background study area data calculations were complete, King and Associates created new IMPLAN models for the state and each county and region that included the 20 new sectors representing the 20 OCs. The assumption was made that each OC in each county and region in the state has the same production and cost functions (input-output relationships) but may have very different regional spending patterns. Prior to any model construction, the production functions for all OCs were saved to the "production function library" within IMPLAN. Then, models for each of the 27 study areas (22 California counties, four California regions, and the state) were constructed using the following steps:

1. A new model was created for each study area.
2. The Access version of the model was opened, and the “Industry/Commodity Codes” and “Type Codes” tables were replaced with tables that contained the names of the new sectors substituted for the original IMPLAN sectors.
3. The study area data (value added, employment and output) for each new sector/OC was manually entered, overwriting existing data for the sector being replaced. When an OC did not exist in a given study area, existing values in the sector being replaced were zeroed out.
4. Social accounts were created.

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[6] The coefficients and multiplier impacts per dollar change in OC output are the same regardless of the OC control total. This adjustment was made only to make the numbers in various tables match and avoid confusion.

[7] In IMPLAN, employment refers to the total number of jobs (full and part-time), not full-time equivalents. Many California fishermen work part-time in multiple fisheries. Therefore, the sum of employment (full and part time jobs) across fisheries in California is greater than the number of fishermen participating in California fisheries.

[8] The four components of value added are employee compensation, proprietor’s income, other property income, and indirect business tax.

5. Using the "edit production function" tool, the production functions were retrieved for each OC from the library, and the "Balance Value Added" option was selected.
6. Social accounts were then rerun.
7. Using the "edit byproducts" tool, byproducts were edited because a number of the sectors that were replaced produce multiple commodities.[9] Byproducts were manually edited so that each of the new fishing sectors only produced one commodity (i.e., the target of the OC).
8. Social accounts were rerun a final time, and the final model was constructed with Type II multipliers.

IV.3 Results from the COFHE Model

Statewide COFHE Multipliers

This section contains tables of economic impact coefficients and multipliers generated for the state of California using the COFHE model. Table 31 through Table 37 show the statewide direct, indirect, induced and total economic impacts of a $1 change in output (landings) in each OC on the following: Output (Table 31), Value Added (Table 32), Labor Income (Table 33), Employee Compensation (Table 34), Proprietor's Income (Table 35), Other Property Income (Table 36), and Indirect Business Taxes (Table 37). Table 38 shows Employment impacts of a $1 million dollar change in output for each OC. Table 39 defines the terms that are used to describe various types of economic impacts in these tables. As discussed elsewhere, these multiplier impacts are estimated per dollar of direct output for each OC, and not per dollar of new final demand for the output of each OC. Further explanations are provided in the following sections.

Regional and County COFHE Multipliers

Sets of multipliers with the same definitions and characteristics as the statewide multipliers shown in Tables 31 through 38 are available for each of the four regions and 22 counties that are included in the COFHE model. These are available electronically at the CDFG website (http://www.dfg.ca.gov/marine/) and can be used as described above to determine the impacts of federal, state, regional, and county fishery management policies on regional or county economies. Economic impacts estimated at various scales are "nested" in the sense that statewide impacts are distributed among regions, and regional impacts are distributed among counties within each region. Differences between impacts in the state and in any particular region accrue to other regions as reflected in the tables for those regions. Those impacts that do not accrue to any of the four coastal regions, but are shown to accrue in the state, impact "the rest of the state".

Use of COFHE Multipliers

In general, using these multipliers to estimate statewide economic impacts of changes in fishery management policies involves three steps. First, estimate how the policy change is expected to affect the landings of each OC. Second, multiply those direct changes in the value of OC landings by the appropriate multipliers from these tables to estimate the economic impacts of policy changes related to each OC. Third, add the economic impacts associated with all OCs in the study area of interest (e.g., the

[9] For example, the industry Soybean Processing (sector 52) was replaced with Tuna Seiners (OC 20). Soybean Processing produces commodities in soybean processing (88.5%), flour milling (1.2%), and fats and oils refining and blending (10.3%). Editing the byproducts meant deleting the latter two byproducts described above so that everything produced by the "new" industry is in sector 52.