The Economic Impact of Commercial Fishing on the State of Rhode Island 1975

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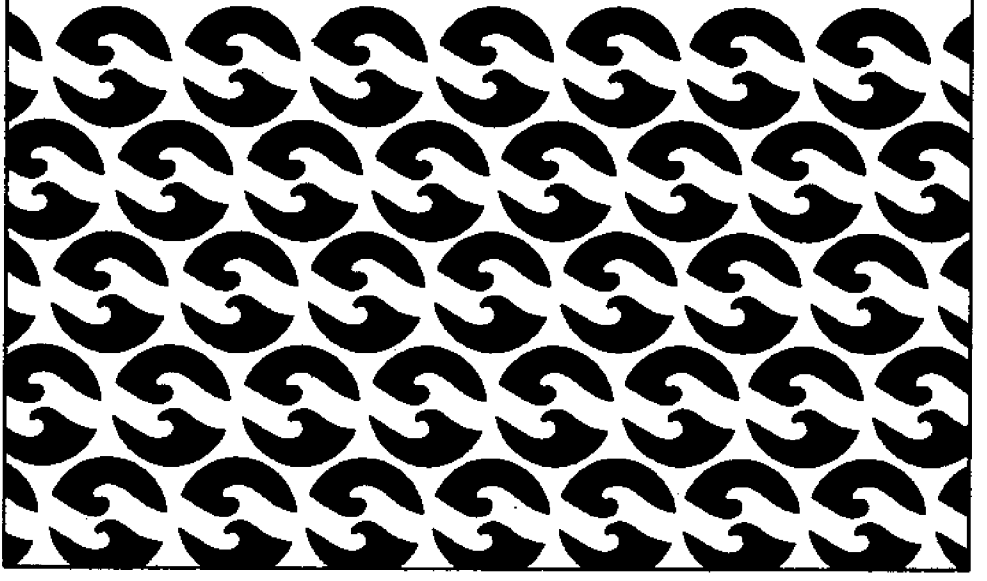

University of Rhode Island Marine Technical Report 65

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THE ECONOMIC IMPACT OF COMMERCIAL FISHING ON THE STATE OF RHODE ISLAND 1975

Submitted to
The Rhode Island Governor's Task Force on Fisheries
October, 1976

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ABSTRACT

Seventy-two responses from firms engaged in Rhode Island's commercial fishing activity (exempting fish retailers) were analyzed in an input-output framework to determine their impact on the state's economy. Results of the three-month study will be summarized, first, by describing the overall multiplier; second, by explaining the set of general multipliers; and third, by presenting major interdependency coefficients of direct and indirect effects.

The overall multiplier for Rhode Island's fishing industry is 424. This means that for every $100 of fish landed in the State, $424 worth of economic activity is stimulated. Were such multipliers available for other industries, the relative economic contribution of the fishing industry could be determined.

General multipliers for fin fishermen (FIN), lobstermen (LOB), shellfishermen (MOL), processors and handlers and packers (HP&P), and non-Rhode Island vessels (NRIV) are 252, 253, 276, 267, and 109, respectively. These figures represent the total dollar flows which ripple through the state's economy as a result of each sector selling $100 of additional product to final consumption. For example, for every $100 of additional product sold by HP&P to buyers located outside the state and to household consumers, $267 in total economic activity is generated in Rhode Island. To evaluate the relative magnitude of these multipliers, we can compare them with their equivalents for the "average" non-fishing industry in the state, represented in the study by the category entitled "Other Economic Activity" (OEA). The general multiplier for OEA is only $163. So we can conclude that for every $100 delivered to final demand, FIN contributes 55 percent more economic activity than the "average" non-fishing industry, LOB also contributes 55 percent more, MOL contributes 69 percent more, and HP&P, 64 percent. These figures must be coupled with total output measures, however; industries cannot be compared solely on the basis of interdependency coefficients. Total output of OEA in Rhode Island, of course, was much greater than total output of the fishing industry.

The total contributions to the state's economy by NRIV is only $109.31 for every $100 worth of sales to final demand. However, these vessels' sales of fish to HP&P amount to almost half as much as sales by Rhode Island fishermen. In other words, non-Rhode Island vessels are providing nearly one-third of all the fish to Rhode Island handlers, packers, and processors. This means that if the fish presently delivered to HP&P by NRIV could be provided instead by Rhode Island fishermen, then an increase of approximately $150 in total economic benefits per $100 of output would be realized by the state.

A more detailed analysis of the interrelationships among the various sectors studied can be undertaken by examining interdependency coefficients (Table 3). For every $100 increase in fish bought by all purchasers who buy fish from Rhode Island handlers, packers, and processors, FIN would have to produce an additional $21.22 work of fish; LOB would have to supply an additional $13.12 worth of lobsters; and MOL would have to make available an additional $5.29 worth of mollusks. Other businesses in Rhode Island collectively would have to produce an additional $46.20 worth of their products and state and local governments would receive $8.22 in revenues. Fianlly, $52.26 in additional personal income would be generated throughout the state's economy and NRIV would have to deliver an additional $18.10 worth of fish to Rhode Island.

As we did with general multipliers, we can compare interdependency coefficients for fishing sectors with other industries in the state. For a $100 increase in deliveries to final demand, FIN, LOB, and MOL would contribute between $72.51 and $99.54 to households as direct and indirect personal income payments. Other industries would contribute only $32.80. Similarly, FIN, LOB, and MOL would contribute between $10.82 and $12.26 to Rhode Island governments, whereas the average Rhode Island industry would contribute only $5.86.

All of the various coefficients presented in this report (Tables 2 through 5) present information on the economics of the state's fishing industry. Each one provides insight into an aspect of the industry. They are too numerous, however, to be discussed individually. Within the report, directions are provided as to how to read and interpret the various tables.

Generalizations from the elements of the results described in this abstract are as follows:

1. The overall multiplier for Rhode Island's fishing industry is 424. This means that as fish flow from fishermen to consumer (both inside and outside the state), $424 in economic activity is generated for every $100 in fish landed.

2. On a per-dollar-of-output basis, Rhode Island's fishing industry (excluding fish retailing) contributes approximately 60 percent more to the state's economy than the "average" industry. Consequently, a policy-induced increase in output of the fishing industry would generate significantly greater economic returns to the state than it would if directed at the "average" industry. This statement assumes that the fish would be available for such an increase and that they could be sold.

3. If the fish presently supplied to Rhode Island's HP&P by NRIV were provided by in-state vessels, then an increase of approximately $150 in total economic benefits per $100 of landed fish would be realized in the state.

4. In terms of contributions to personal income of Rhode Island residents per $100 of output, the sectors of the fishing industry provide more than twice as much as the average non-fishing industry, and as much as 30 times more than non-Rhode Island vessels.

INTRODUCTION

This study was commissioned by the Rhode Island Governor's Task Force on Fisheries to determine the impact of the state's commercial fishing activities on the state's economy.[1] Such information is intended to assist in decisions where the economic contributions of the fishing industry are an issue.

The Task Force requested a short-duration study to be conducted between June and September 1976.[2] Although it was initially felt that this short time frame would place severe qualitative restrictions on the data gathering process, subsequent surveys far exceeded anticipated coverage and response.

As requested by the Task Force, the report does not contain technical details of the analytical tool employed--regional input-output analysis. However, they will be provided upon request by the researchers. Further, it contains no profile of the fishing industry. That is, various demographic characteristics of fishing sectors are not enumerated. For this information the reader is referred to Stephen B. Olsen and David K. Stevenson, Commercial Marine Fish and Fisheries of Rhode Island, Marine Technical Report #34, The Coastal Resources Center, University of Rhode Island, 1975.

There are ways in which the commercial fishing industry is important to the state in addition to its contributions to the economy. For example, the fishing fleet is a tourist attraction (which by itself provides economic benefit) and it is deeply rooted in the state's history and culture. The purpose of the study, however, was to address only the major transactions within the industry and with aggregated economic units outside the industry.

The remainder of this report will describe the study in three parts. First, the Methodology section will explain the technique employed, its assumptions, and several key concepts of input-output analysis. In the Results section, detailed explanations of how to read the tables of coefficients and multipliers are presented along with the tables and examples. The third section gives an explanation of guidelines for the application of results to policy analysis, and the fourth section gives highlights of the findings.

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[1] An earlier study by Rorholm, et al. (1967), provided an initial basis for such evaluation. The present study was commissioned in part to update the information and to confine the analysis to the Rhode Island economy given concern that the state's general industry structure and specifically the target industry differ from the aggregated Southern New England region.

[2] A replication of the study by Rorholm, et al. (1967) is presently under way by Grigalunas, et al. Its expected completion time is Summer 1978.

METHODOLOGY

Although it necessitates somewhat more complex data gathering procedures than economic base analysis, input-output analysis was selected as the analytical tool because it enables examination of both the direct and the indirect effects of changes in the economy.[3] Direct effects (wages, taxes, and other expenditures) generated by the operation of the commercial fishing industry is important information for policy makers. Alone, however, this information would represent an incomplete assessment of the industry's economic contributions. Indirect effects (such as employment in supporting and dependent industries, and induced effects from consumer spending) are also important for decision making.

The validity of input-output analysis rests on four conditions. These are the assumptions under which this study was undertaken. First: Fixed proportions of factor "inputs" is assumed. This means that when the level of output of a sector of the economy changes, the amounts of all inputs are required to change proportionately. Second: The physical and price structures of the industries are assumed to remain the same. Third: Technologies are assumed constant. For example, the results of this study would not help in explaining the economic impact of a new fishing technique that would affect the amount of catch per unit effort. Fourth: Product mix is assumed to remain unchanged. This means that a major shift in the proportions of species caught and marketed annually could not be validly analyzed with the results of this study.

An important but somewhat abstract concept in input-output analysis is "final demand." We can think of the purchasing activity of our economy as divided into two categories: (1) that in which the purchased product is subsequently reprocessed by another production sector and (2) that in which the product is directly consumed and not reprocessed. For example, fish to make catfood is in the first category. Fish bought by the housewife is in the second; it is the final product. The final product category, called "final demand," consists of products which are not put back in the production process to make some other product. In the present study, the sectors which constitute final demand include households, the federal government, and exports. These sectors are actually the economic end-of-the-line for all products in the economy and are thus the driving force behind the economic system. All fish caught in Rhode Island are, in one way or another, intended ultimately for consumption by the final demand sectors.

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[3] For detailed descriptions of the technique see Miernyk (1957 and 1965), Yan (1969), Leontief (1965), Isard (1975).

We have defined final demand broadly because of time constraints. Similarly, we did not include fish retailers (fish markets and restaurants) in the study. Thus, we have assumed they constitute part of an aggregate category labeled "Other Economic Activity." Exclusion of retailers from the direct analysis merely has the effect of slightly understating the overall impact of the commercial fishing industry. This is true because fish retailers generate direct and indirect rounds of spending in addition to those studied "up through" handlers, packers, and processors.

In effect, then, this study concentrates on fish catching and fish wholesaling activities. When we discuss the "indirect impact" of a sector, we shall be referring to all economic activity up to that sector (and not to any activity "after" it) as fish "flow" from fishermen to final demand. This is an important distinction to bear in mind in the evaluation of direct and indirect multipliers later on.

The sectors of Rhode Island's fishing industry (and their definitions) included in the study are as follows (henceforth these sectors will be referred to by abbreviation):

1. Fin-fish catching (FIN)--Rhode Island fishermen for whom a majority of their annual catch consists of fin-fish.

2. Lobster catching (LOB)--Rhode Island fishermen for whom a majority of their annual catch is lobsters.

3. Mollusk catching (MOL)--Rhode Island fishermen primarily engaged in harvesting quahogs, sea clams, scallops, and conchs.

4. Fish handling, packing, and processing (HP&P)--Businesses in Rhode Island whose primary function is some combination of boxing, whole product handling, or cutting for wholesale.

5. Non-Rhode Island vessels (NRIV)--Boats and vessels hailing from ports outside of Rhode Island but landing catch at ports within the state. (This sector consists mainly of New Bedford and North Shore (Fairhaven, Gloucester) boats landing at Newport, Rhode Island.)

Other businesses in the state (and sale of ice and fuel to fishermen by HP&P) were grouped in one category entitled "Other Economic Activity." State and local government was also included as a producing sector. The category "Households," as a categorical supplier of labor and purchaser of goods and services, was treated as both a producing and consuming sector.

Data gathering consisted of determining, by mail, telephone, interview survey, and by analysis of aggregate economic data, the flow of goods and services within these eight industrial sectors of the state. Because we anticipated a certain resistance to divulging specific dollar quantities for revenues and expenditures, we asked the firms involved to estimate variables as percentages of total sales (see questionnaires in Appendices I and II). These percentages were then applied to industry totals and aggregate data obtained from the following sources:

1. National Marine Fisheries Service (NMFS), Department of Commerce

2. Rhode Island Department of Natural Resources

3. Rhode Island Seafood Council

4. Rhode Island Department of Employment Security

5. Rhode Island Department of Economic Development

6. University of Rhode Island Marine Advisory Service

7. University of Rhode Island Department of Resource Economics

8. Rhode Island Division of Taxation

Questionnaires were mailed to a total of 350 firms in the fishing industry. The questionnaire presented in Appendix I was administered to all Rhode Island respondents, while that in Appendix II was administered to the NRIV sector. This process took place between June 1, 1976 and August 12, 1976 and generated 72 usable responses.

RESULTS

Interindustry Transactions

The first stage in the analysis of data was preparation of an input-output table (Table 1). It shows the flow of goods and services (in dollars) between economic sectors of interest. The sources of data contained in the table are given in Appendix III.

There are two ways of interpreting the numbers in the table--in terms of purchases by one sector from another, or in terms of sales by one sector to another. These are equivalent, because the sales of one sector become the purchases of others.

TABLE 1

TRANSACTIONS TABLE

Intersectoral Flow of Goods, Services, & Labor

(in dollars)

FROM: \ TO:	FIN	LOB	MOL	HP&P	NRIV	Other Econ Activity	S & L Gov't	HSHLDS	Fed Gov't	Exports	Total Output
FIN	-0-	115,317	-0-	6,304,013	-0-	69,591	-0-	17,549	-0-	272,314	6,778,650
LOB	-0-	-0-	-0-	3,978,290	-0-	216,690	-0-	-0-	-0-	-0-	4,194,950
MOL	-0-	-0-	-0-	1,599,942	-0-	159,418	-0-	161,339	-0-	430,218	2,350,916
HP&P	-0-	26,152	-0-	1,000,454	-0-	6,074,900	106,923	1,701,866	218,843	22,135,054	31,264,200
NRIV	-0-	33,624	-0-	5,438,122	-0-	-0-	-0-	-0-	-0-	-0-	5,471,746
OTHER Econ Activity	2,169,177	994,210	424,105	2,688,721	247,957	1,424,159,052	196,696,874	2,112,391,129	*	*	16,054,495,478
S & L Gov't	117,949	62,925	16,456	343,906	-0-	289,062,942	118,669,457	504,186,834	*	*	1,138,727,300
HSHLDS	3,385,272	2,219,144	1,778,703	4,220,667	54,717	3,680,341,497	755,000,000	64,000,000	354,000,000	119,000,000	5,484,000,000
Fed Gov't	90,834	-0-	-0-	375,170	*	*	*	*	*	*	*
Imports	477,219	373,353	-0-	4,908,479	*	*	*	*	*	*	*
Deprec.	538,227	369,158	131,651	406,435	*	*	*	*	*	*	*

*Not Necessary for Impact Analysis

In Table 1, the selling sectors are given at the left side and the purchasing sectors at the top. Thus we note, for example, that the FIN sector (left side) sells $115,817 of its output directly to the LOB sector (top), primarily as bait. Or equivalently, the LOB sector purchases $115,817 of its input from the FIN sector.

Similarly, the LOB sector sells $3,978,290 of its output to the HP&P sector, $216,690 elsewhere in the state, and does not directly export anything out of the state. The far right column indicates total output by each of the sectors--essentially the total revenues generated by each. Thus the sum of the total input for FIN, LOB, MOL, and NRIV exactly equals the ex-vessel value of landings in Rhode Island for 1975, or $18,796,322. Total revenues for HP&P in the state are nearly $31.3 million.

By tracing through the cells in each row, we can determine the distribution of total output by a given sector to each of the buying sectors (column). By tracing through the cells in each column, we note the distribution of total input to a given sector (which again, by definition, equals total output by that sector) from each of the selling sectors.

Technical Coefficients

With the data in Table 1, we can take a first look at the economic impact or contribution of the sectors investigated. Table 2 is a matrix of "technical coefficients" that represent the inputs from each of the selling sectors that are required to support $100 worth of output from a given sector. Again, the selling sectors are given at the left side of the table and provide inputs to the sectors at the top. Thus, each $100 in output of the FIN sector (top) requires $32.00 worth of output from other economic activity, $1.74 in the form of state and local government services, $49.94 worth of household labor, and so on.

Therefore, if we wish to examine the direct impact of increased fin fishing landings on those sectors that provide inputs to FIN (without respect to species and assuming existing price structure and industry structure), we need only apply the technical coefficients as follows:

$$\frac{\$\text{ increase in landings}}{\$100} \times \text{appropriate technical coefficient}$$

If FIN landings increase by $2.5 million, then

$$\frac{\$2,500,000}{\$100} \times \$49.94 = \$1,248,500$$

TABLE 2

TECHNICAL COEFFICIENTS

Value of Inputs from Each Sector (row) per $100 Output of Each Sector (column) (in dollars)

FROM: \ TO:	FIN	LOB	MOL	HP&P	NRIV	Other Econ Activity†	S & L Gov't†	HSHLDS†
FIN	-0-	2.76	-0-	20.16	-0-	-0-	-0-	-0-
LOB	-0-	-0-	-0-	12.73	-0-	-0-	-0-	-0-
MOL	-0-	-0-	-0-	5.12	-0-	-0-	-0-	-0-
HP&P	-0-	.62	-0-	3.20	-0-	.04	.01	.03
NRIV	-0-	.80	-0-	17.39	-0-	-0-	-0-	-0-
Other Econ Activity	32.00	23.71	18.04	8.60	4.53	8.87	16.98	38.52
S & L Gov't	1.74	1.50	.70	1.10	-0-	1.80	10.24	9.19
HSHLDS	49.94	52.91	75.66	13.50	1.00	22.91	65.16	1.17
Fed Gov't	1.34	-0-	-0-	1.20	*	*	*	*
Imports	7.04	8.90	-0-	15.70	*	*	*	*
Deprec.	7.94	8.80	5.60	1.30	*	*	*	*
Total Input	100.00	100.00	100.00	100.00				

*Not necessary for impact analysis.
†Zeros in these columns from insignificant digits.

will go to households in the form of income to captains, crews, and boat owners as compensation for their labor output and return on invested capital.

Notice that these technical coefficients account for only the direct effects of increased output in one sector on those other sectors that provide input to it. No attention has been given to the effects that increased output in one sector will have on other sectors that transform that output further. For example, we have not yet considered the increase in HP&P activity that would result from the availability of more fin fish. Nor have we considered what happens to the purchasing activity of sellers when they step up output to meet the demands of Rhode Island purchasers. We have not yet accounted for increased expenditures for labor (payments to the household sector) that would be required by state and local government to support a $100 increase in fin fishing landings. Similarly, we have not yet accounted for increased spending by households, spending that would reflect their increased income from increased landings. The following section addresses this problem.

Direct and Indirect Effects

Table 3 contains the table of interdependency coefficients (although our term is technically incorrect, we shall refer to them as "multipliers"). It was derived by mathematical manipulation of the technical coefficients presented in Table 2. In the economy, an increase in final demand (that is, purchases of products which do not re-enter the state's economic system) for the products of the fishing industry from outside of the industry (demand for exports, for example) would lead to both direct and indirect increases in the output of all affected sectors within the industry.

If, for example, there were an increase in demand for the output of packers, handlers, and processors, then there would be direct increases in their purchases from fish, mollusk, and lobster catches. But additionally, when fishermen sell more to processors, the processors' demands for the products of other businesses likewise increase. These effects spread throughout the economy.

Multipliers in Table 3 show the total expansion of output in all industries which results from the delivery of one hundred dollars worth of output, outside the state, by each industry in it. The table may be read as the total dollar increase in production directly and indirectly required by the sectors listed on the left-hand side which would result from a $100 increase in deliveries to final demand by the industries at the top.

TABLE 3

INTERDEPENDENCY COEFFICIENTS
("Multipliers")

Direct, Indirect and Induced Impact on Each Sector (row) per $100 Output to Final Demand by Each Sector (column)
(in dollars)

	FIN	LOB	MOL	HP&P	NRIV	Other Econ Activity	S & L Gov't	HSHLDS
FIN	100.01	2.90	.01	31.22	-0-	.01	.01	.01
LOB	.01	100.09	.01	13.16	-0-	.01	.01	.01
MOL	.01	.04	100.01	5.29	-0-	.01	.01	.01
HP&P	.05	.69	.06	103.43	-0-	.06	.07	.06
NRIV	.01	.92	.01	18.10	100.00	.01	.01	.01
Other Econ Activity	68.22	61.56	64.17	46.20	6.20	124.70	63.14	54.49
S & L Gov't	10.84	10.82	12.26	8.22	.40	5.86	122.45	13.68
HSHLDS	73.51	76.58	99.54	52.26	2.71	32.80	95.39	122.86
General Multiplier	252.66	253.60	276.07	267.84	109.31	163.46	281.09	191.13

For example, in the LOB column it can be seen that a $100 increase in the sale of lobsters to final demand would generate a $2.90 increase in lobstermen's bait requirements from fin fishermen. Similarly, a $100 increase in demand for the products of HP&P would result in a $21.22 increase in their requirements for fin fish, a $13.16 increase in lobsters, a $5.29 increase in mollusks, and so on down the column. The HP&P to HP&P multiplier of $103.43 may be read as the total increase in output requirements of HP&P (including the direct $100 increase in sales) that would result from the postulated increase in demand. That is, in addition to the $100 increase in sales to final demand, there would also be a $3.43 direct and indirect increase in their requirements from other processors, handlers, and packers.

The numbers along the bottom of the table (general multipliers) represent total direct and indirect increases in output of all sectors of the economy that would be precipitated by a $100 increase in deliveries to final demand of the products of the industries at the top. For example, a $100 increase in deliveries of MOL to final demand would ultimately generate $276 in increased total output requirements of the industries listed at the left of the table.

DATA AS A PLANNING TOOL

There are many economic planning applications of input-output analysis, but several precautions must be borne in mind. In this section, we will first discuss some guidelines for the use of the results of the study. Then several findings will be explained which may have importance in fisheries planning and coastal zone management.

Guidelines for Application of Results

When input-output analysis is used as a planning tool, a certain amount of caution should be employed. First, one can postulate an increase in final demand for the products of the sectors analyzed, but this does not contribute any information on how that increase may be obtained. Instead, it says that if the increase occurred, and if the technical coefficients remained constant, then the effects represented by the various multipliers would be felt.

Second, caution must be exercised in comparing the effects of the various sectors because of intra-sector differences in ability to sustain increases. For example, in Table 3, note that MOL contributes $99.54, directly and indirectly, to households for every $100 increase in demand. The HP&P sector contributes $52.26 to households under the same conditions. But total sales for MOL in

1975 were only $2,350,915, whereas for HP&P they were $31,264,200. It would be erroneous to conclude, based on the multipliers, that MOL contributed more to households than HP&P. Similarly, the probability of generating an increase in demand for shellfish is lower than for the same increase in demand for the output of HP&P.

Third, the assumptions stated earlier for input-output analysis must be met in order for it to produce accurate forecasts. These assumptions (namely, that (1) the structure of industries does not change, (2) price structure remains the same, (3) technology employed by industries remains the same, and (4) product mix does not change) may be viewed as conditions which must be met in order for the results to be employed as an accurate forecasting tool. For example, one could not attempt to assess the effects of an increase in HP&P output which would result from a new fish-catching method. This would reflect a change in technology which would mean that the increase in output was made possible by circumstances which were not operating when data for the model were collected.

Similarly, unless the assumptions are met, an alternative industry structure could not be tested. We could not, for example, test the impact of a larger processor moving into the state, a processor who would process in large quantities species which are not currently caught in large quantities.

Finally, it must be remembered that the numbers in the transactions table (Table 1), upon which subsequent analyses rest, represent either simple or weighted averages of responses. They are industry statistics, and are not necessarily appropriate for a given firm. For individual firms there was often wide variance around the averages derived for the table. Therefore, firm-by-firm comparison with the table could be erroneous or misleading.

HIGHLIGHTS OF RESULTS

Of great importance for planning purposes is the ability of input-output data to help explain the effects of the industries studied on a region's economy. It would be possible to rank industries by their relative contributions to any sector.

Impact of Non-Rhode Island Vessels

In Table 1, for example, among the four sellers of fish to HP&P, FIN constitutes the largest dollar volume, NRIV is the second largest, LOB is the third, and MOL the fourth. In fact, NRIV accounts for

nearly one-third of the fish sold to Rhode Island HP&P. Certainly, then, these vessels are extremely important to the firms they are supplying and to the economy as a whole, in that without them (assuming all these would remain the same) the volume of fish landed in the state would be only approximately two-thirds what it was in 1975.

A more fundamental question is, "What are the direct and indirect dollar contributions of these various sectors to the state's economic system?" This question can be answered by examining Table 3. For every $100 in output, FIN, LOB, and MOL generate between $61.56 and $68.22 in the rest of the state's economy; between $10.82 and $12.26 in payments to state and local government; and between $73.51 and $99.54 in payments to households. Non-Rhode Island vessels precipitate a total of only $6.20 in other economic activity in Rhode Island, $0.40 to Rhode Island state and local government, and $2.71 to Rhode Island households for every $100 in sales.

This may be summarized by noting that NRIV contributes greatly to the inputs of Rhode Island HP&P, but little to households, state and local governments, and other economic activity in the state, up until the time their product is sold to HP&P. But the economic contributions of HP&P depend heavily on NRIV.

Overall Industry Impact

Another important finding of the study is that for every $100 increase in the value of the Rhode Island catch, $424 in economic activity is stimulated (assuming the same technology, product mix and price, and industry structure). This figure would be somewhat higher if the retail sector had been included in the analysis. It was derived in two steps. First, the weighted average of the ratio of HP&P output to input with and without imports was computed (1.582). Then this figure was multiplied by the general multiplier for HP&P ($267.84, bottom row, Table 3): $424.

This multiplier would be applicable for predicted increases in the state's catch which are expected to occur as a result of extended jurisdiction. It may be interpreted as the overall multiplier for the Rhode Island commercial fishing industry (without specific consideration for retail fish sales). Therefore, it is the one with which this industry could be compared with other industries competing for coastal zone areas in order to estimate which occupant would generate more economic return (in purely dollar terms) to the state.

Household Income

The third major finding is the impact of the fish industry on the state's household income. Since the income that Rhode Island residents receive from economic activity in the state is often a crucial policy determinant, a detailed breakdown of income effects in each of the sectors studied is appropriate (Table 4).

TABLE 4

IMPACT ON HOUSEHOLD INCOME

Forms of Change in Household Income as a Result of $100 Worth of Output to Final Demand by Each Sector
(columns 1, 2, 3, 5 & 6 in dollars)

	Direct Income Change	Indirect Income Change	Direct & Indirect Income Change	Type I Ratio	Induced Income Change	Direct, Indirect & Induced Income Change	Type II Ratio
FIN	49.94	9.91	59.85	1.20	13.66	73.51	1.47
LOB	52.91	10.05	62.49	1.19	13.62	76.53	1.45
MOL	75.66	5.36	81.02	1.07	18.52	99.54	1.32
HP&P	13.50	29.04	42.54	3.15	9.72	52.26	3.87
NRIV	1.00	1.21	2.21	2.21	.50	2.71	2.71
Other Econ Activity	22.91	3.78	26.69	1.16	6.11	32.80	1.43
S & L Gov't	65.16	12.49	77.65	1.19	17.74	95.39	1.46

Column 1 of Table 4 is taken from the household row of Table 2. These numbers reflect the income received by households as a direct result of $100 worth of output by each of the sectors at the left side. For example, for each $100 worth of output by HP&P, employees and owners of HP&P firms receive $13.50 (column 1, row 4).

Column 2 of the table contains the income that households indirectly derive from each sector's sale of $100 worth of output to final demand (exports, sales to the federal government, and household consumption). Here we examine all household income except that earned by employees and owners of each of the sectors. For example, when the output of HP&P to final demand increases by $100, we note that in addition to the income received by employees and owners of HP&P firms, households realize $29.04 from the many rounds of other transactions set off in support of HP&P activity.

Column 3 is merely the sum of column 1 and column 2 for each sector. These figures represent the total household income received from $100 worth of each sector's output, exclusive of that household income derived indirectly from consumer spending.

In column 4 are ratios of direct and indirect income change (column 3) to direct income change (column 1) for each sector. When compared, these ratios indicate the relative importance of behind the scenes household activity that takes place in support of each sector's output. Thus, for HP&P we notice that the total household income derived from HP&P output to final demand is actually 3.15 times that earned by HP&P employees and owners.

Consideration for household income that is derived from economic activity in support of increased consumer spending is given in column 5: "Induced Income Change." (Here we consider increased consumer spending that follows increased household income.) When added to direct and indirect income change, the grand total effect on household income of $100 worth of any sector's output is obtained (column 6). This is simply the household row of Table 3, "Interdependency Coefficients" or "Multipliers."

Column 7 (Type II ratio) is much like column 4 (Type I ratio). However, in the Type II ratios we are considering the relative importance of total "behind the scenes" household activity (including induced household income). The larger the ratio, the more important it is that we consider household income other than that directly earned in any sector if we are to properly assess that sector's economic contribution to Rhode Island residents.

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Appendix I

Questionnaire administered to Rhode Island Businesses

CONFIDENTIAL CONFIDENTIAL

Rhode Island Fishing Industry Economic Impact Study

Rhode Island Governor's
Task Force on Fisheries

Questionnaire Cover Sheet

DATE_____

Firm Name_____

Address_____

_____

_____

Name of person interviewed_____

Interviewer_____

County_____Town_____

S.I.C. Code_____

If Subsidiary, name of parent company_____

When completed, this form will be available only to Task Force Staff-members involved in this study. This sheet with its identifying information will be removed from the remainder of the questionnaire as soon as the field supervisors have audited it to be sure no call back is required.

Rough estimates are acceptable for all items.

Would you like to receive a copy of the reporr when completed (Winter 1976)

Yes___ No___

Appendix I (cont'd)

1. Please check the sector which most clearly describes your business:

   a. Fishing catching-based outside R.I.____
   b. R.I. based fish catching.....____
   c. Frozen processing .....____
   d. Fresh processing .....____
   e. Wholesaling & jobbing.....____
   f. Other (specify).....____

2. What products and services are provided by this firm's outlets which operate in R.I.?(Specify fin fish or shellfish where applicable)

Products and/or services	Percentage of Total Dollar Sales
	100%

3. Of your firm's total sales for the most recent complete year, please indicate how much is sold to customers located:

	Percentage of Total Dollar Sales
a. Inside Rhode Island.....	_____
b. Outside Rhode Island.....	_____
	100%

4. Of your firm's sales to customers located inside Rhode Island (3a above) how much is sold to:

	Percentage of Total Dollar Sales
a. Consumers directly; that is, does not go through wholesalers, processors, or retailers.....	_____
b. Fresh fish processors.....	_____
c. Frozen fish processors.....	_____
d. Wholesalers & jobbers.....	_____
e. Businesses in R.I. other than processors and wholesalers & jobbers.....	_____
f. State and local government agencies (include schools, hospitals, government utilities,etc.)	_____
	100%

Appendix I (cont'd)

5. What percentage, if any, of your sales are directly to the Federal Government?_____

6. Assume that your firm's total dollar outflows (expenditures, payments and return to owners) for the most recent complete year exactly equal total dollar inflows (sales). How would you allocate those outflows among the following categories? (Should sum to 100%)

   a. Gross wages, salaries, and return to owners (before tax withholdings).....____

   b. Purchases from fish catchers with boat(s) based outside R.I. landing fish at R.I. ports.....____

   c. Purchases from fish catchers with boat(s) based in R.I. landing fish at R.I. ports.....____

   d. Purchases from fish catchers with boat(s) based outside R.I. landing fish at points outside R.I.....____

   e. Purchases from fresh fish processors in R.I.....____

   f. Purchases from frozen fish processors in R.I.....____

   g. Purchases from fish wholesalers and jobbers in R.I...____

   h. Payments for purchases (supplies, equipment, repairs, etc.) and debt from R.I. firms other than fish catchers, processors, and wholesalers & jobbers.....____

   i. Payments to state and local governments (taxes, fees, etc.).....____

   j. Business taxes and fees to federal government.....____

   k. Payments for all other purchases (supplies, equipment, repairs, etc.) from firms located outside R.I.....____

   100%

Appendix II

Questionnaire Administered to NRIV Owners

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Please answer the following questions; estimates are all that are requested. Use percentages only.

When complete, please insert questionnaire in enclosed post-paid, addressed envelope and drop it in the mail.

1. Approximately what percentage of the dollar value of your annual catch is landed in the State of Rhode Island.....____%

2. Assume that the total of all payments by your vessel (expenses, payments to captain and crew, and return to owners) exactly equals the totalvalue of your landings for 1975. What percentage of these total payments went to:

   a. Gross payments to any of your captain, crew and owners who are Rhode Island residents (before tax withholdings).....____%

   b. Purchases from Rhode Island fishermen.....____%

   c. Purchases from fish wholesalers, jobbers, or handlers located in Rhode Island.....____%

   d. Payments for purchases (supplies, equipment, repairs, etc.) from Rhode Island businesses other than fishermen, wholesalers, jobbers, and handlers.....____%

   Should not add to 100%

Appendix III
Sources of Data

Table 6

SOURCES OF DATA IN TRANSACTIONS TABLE

	FIN	LOB	MOL	HP&P	NRIV	Other Econ Activity	S & L GOV'T	HSHLDS	FED GOV'T	EXPORTS	OUTPUT
FIN	a	a	a	a	a	a	a	a	a	a	b
LOB	a	a	a	a	a	a	a	a	a	a	b
MOL	a	a	a	a	a	a	a	a	a	a	b
HP&P	a	a	a	a	a	a	a	a	a	a	c
NRIV	a	a	a	a	a	a	a	a	N/A	N/A	d
Other Econ Activity	a	a	a	a	a	e	f	g	N/A	N/A	h
S & L GOV'T	a	a	a	a	a	i	j	k	N/A	N/A	l
HSHLDS	a	a	a	a	a	m	n	o	p	q	r
FED GOV'T	a	a	a	a	N/A	N/A	N/A	N/A	N/A	N/A	N/A
IMPORTS	a	a	a	a	N/A	N/A	N/A	N/A	N/A	N/A	N/A
DEPREC	a	a	a	a	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Appendix III (cont'd)

Sources of Data in Transactions Table

a. Survey data obtained from questionnaires (Appendix II), then applied to total output for each sector obtained as in b, c, & d as appropriate.

b. Value of fin fish, lobster, and mollusk landings in R.I., 1975, from NMFS (February, 1976), p. 3. Adjusted for landings attributable to non-Rhode Island Vessels (NRIV) obtained as in d.

c. Base data from NMFS, Newport, adjusted upward to reconcile with survey responses.

d. The simple average of NMFS, Newport, estimate of NRIV landings and the value of HP&P purchases of landings from NRIV (Survey), plus the direct sales of NRIV landings to Rhode Island lobster boats (Survey). Adjustments to be based on distribution of fin fish and lobster landings in total NRIV landings given by NFMS, Newport.

e. Technical coefficient derived from Feld (1973) and applied to total output obtained in h, less specific internalized inputs addressed in the present model.

f. Ratio of business sectors' sales to S & L Gov't to total business output (Feld, 1973), times total output in h, less sales to S & L Gov't by specific sectors addressed in model.

g. As in f for sales to Households (Personal Consumption-Residential), Feld, 1973.

h. Ratio of total output of business sectors to Gross State Product for 1967 (Feld, 1973), times estimated Gross State Product for 1975, less total output attributable to specific production sectors in the present model.

i. Business taxes & fees to state & local government (State of Rhode Island & Providence Plantations State Budget, 1977, p. A3; Annual State Report on Local Government Finances & Tax Equalization, 1975, p. 3) plus employers' contributions to employment insurance (State of Rhode Island Annual Financial Report, 1975, exhibit 5-11), less payment to S & L Gov't by sectors specific to the present model.

j. State aid to cities and towns (State of Rhode Island Annual Financial Report, 1975, exhibit 5-11).

Appendix III (cont'd)

k. Personal taxes & fees to S & L Gov't (State Budget, 1977, p. A4; State of Rhode Island Annual Financial Report, 1975, table IV-3; Annual State Report on Local Gov't Finances & Tax Equalization, 1975, p. 3), plus employees' contributions to temporary disability insurance adjusted for 1975, State of Rhode Island Annual Financial Report, 1975, Table IV-3.

l. Total S & L Gov't Revenues (State of Rhode Island Annual Financial Report, 1975, table IV-3; Annual State Report on Local Gov't Finances & Tax Equalization, 1975, p. 3, adjusted for 1975). Implicit is the assumption that S & L Gov't debt structure does not materially affect output.

m. Total Labor and Proprietor's Income less Government Sources of Income (Sources of Current Business, April, 1972, table 10) less personal services and product household sources (see o) less allocation of personal contributions to social insurance (SOCB, April, 1976) plus adjusted allocation of property income (SOCB, April, 1976).

n. Total Wages & Salaries of S & L Gov't employees (SOCB, April, 1965; table 10), plus adjusted transfer payments (Governmental Finances in 1973-74; SOCB, April, 1976) plus employment insurance expenditures (State of Rhode Island Annual Financial Report, 1975, exhibit 5).

o. Personal service and private household income adjusted for 1975 (Rhode Island Basic Economic Statistics, 1975) plus allocation of property income (SOCB, April, 1976) minus allocation of personal contributions for social insurance (SOCB, April, 1976).

p. Wages & Salaries of Rhode Island federal employees (SOCB, April, 1976) plus transfer payments from federal government (SOCB, April, 1976; Governmental Finances in 1973-74) less allocation of personal contributions for social insurance.

q. "Residence Adjustment" (SOCB, April, 1976; table 10).

r. "Personal Income by Place of Residence--R.I." (SOCB, April, 1976; table 10).