

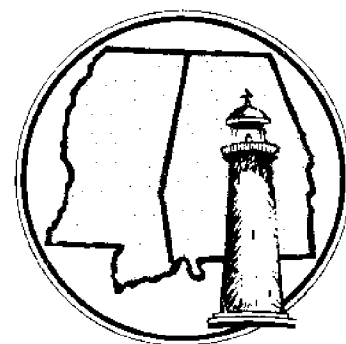
LINKAGES BETWEEN THE ECONOMY AND THE ENVIRONMENT OF THE COASTAL ZONE OF MISSISSIPPI

PART I: INPUT—OUTPUT MODEL

INTERIM TECHNICAL REPORT
March 1978

Bureau of Business Research
University of Southern Mississippi
Hattiesburg, Mississippi 39401

MISSISSIPPI—ALABAMA
SEA GRANT PROGRAM



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ENVIRONMENT OF THE COASTAL ZONE OF MISSISSIPPI

PART I: INPUT-OUTPUT MODEL

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PREFACE

The work upon which this report was based was financed in part by funds provided by Mississippi-Alabama Sea Grant Consortium. Many individuals, businesses, and government agencies provided help and assistance throughout the project. The time and effort of Charles L. Golladay and Charles Remus proved most valuable in gathering data and in computations. Dr. Wayne C. Curtis and Dr. William H. Smith of Troy State University, Alabama, were of immense help in providing technical and analytical assistance in the construction of the model.

Any errors of fact, logic, or judgment remaining in the report are, of course, the responsibility of the authors.

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I. INTRODUCTION

The growing awareness of the limitations of our natural resources, particularly those in coastal areas, and the pressures generated by the forces of economic growth have led to an awareness that the environment and the economy are intertwined. We cannot have economic growth and expect to maintain an unchanged environment at the same time. This realization has led to conflicts concerning the use of natural resources, and the trend is not expected to change. All of the coastal counties of Mississippi are experiencing rapid economic growth. Indications are that this growth will continue. As growth occurs, there will be increasing pressures on the coastal ecosystem.

Effective decision making regarding coastal resources requires knowledge of the costs and benefits associated with particular resource uses. In many cases, a knowledge of the trade-off between the environment and certain economic activities is a necessary condition for rational coastal zone management decisions.

The relationships between the environment and the economy are extremely complex. This complexity is reinforced by the interdependencies that exist among the economic activities themselves. In short, a complete picture of the economic-ecologic linkage requires knowledge of both direct

and indirect relationships, and these relationships must be quantified in a meaningful manner.

A theoretical and operational framework for linking economic activities with their respective environmental impacts has been developed and applied to resource decisions in other areas of the country. Feld [12] & Roberts [34], for example, have conducted such regional studies. The procedure typically follows three phases built upon an input-output model which delineates the economy of the study area into common economic sectors.

The first phase of the research requires the development of an input-output model of the region. Such a model -- aside from being a link in the three phase study -- is useful in its own right as a means to describe the overall economic activities of the region. The results and the by products of the study can be of immense value in economic interpretation as well as providing a basis for future research. This report discusses the findings of the first phase.

The second phase of the study attempts to identify and quantify in physical units the individual waste residuals from various producing sectors of the regional economy. It will describe the trade-off between the environment and specific economic activities. The result of the study is a two dimensional matrix consisting of the industrial sectors and the inevitable waste residuals contributed by them as part of their productive activities. This provides a complete picture of economic-ecologic interdependencies.

The third phase relates the economic activities and the environment in a manner by which the feedback and impact of each sector upon the other can be observed. That is, the waste residuals generated by the producing

sectors will in their turn affect the productivity of these sectors as well as the effect on the environment and its ability to generate inputs required for other economic and human activities. The physical impacts upon the environment are ultimately translated into monetary costs.

II. MISSISSIPPI COASTAL REGION INPUT-OUTPUT MODEL

The study area consists of the three counties in the coastal region of Mississippi: Hancock, Harrison, and Jackson Counties. In 1975 these counties had a total population of 270,000. As a coastal unit the three counties comprise 1,803 square miles, the fastest growing area of the state. The overall increase in population was almost 51,000 from 1960 to 1970 compared with 39,000 for the rest of Mississippi. A detailed description of the current and projected economic activity of the region may be found in Daniel & Cartee [10].

The input-output model is arranged with 29 endogeneous sectors. A theoretical exposition of such a model is given in Appendix A. From the basic theoretical model, a regional model is constructed using regionalization techniques explained in detail in Appendix B. Both appendices should provide an adequate compendium of pertinent theoretical and applied aspects of input-output analysis.

Briefly, the model shows in what amounts the commodities or services a sector produces are actually absorbed by all other sectors in the region. It can also show the types of goods and services and their amounts which a particular sector received from all others. The year 1972 was chosen as the base year due to the fact that secondary data on the county level were more practically available than for any other recent year.

As stated in Appendix A, an input-output model consists of three basic parts. These include the transactions matrix, the technical coefficients matrix and the interdependence matrix. These three elements as well as their application in analyzing economic characteristics of the coastal region will now be discussed.

(1) The Transactions Matrix

The essential principles which describe dollar transactions are given by the transactions matrix presented in Table 1. Transactions are grouped into 29 sectors of business activity and three final sectors (civilian and military both comprise Federal Government). The horizontal rows show the distribution of the output of each sector to the other sectors. The vertical columns show the input needs of each sector from the other sectors. Each entry in the table is therefore an output of one sector and simultaneously an input of another sector.

For example, in the Transactions Matrix, Table 1, the input-output activities of Food Processing (Sector 8) may be examined as follows: The entries in Column (8) show the input of each of the 29 producing sectors that are required for the production of Food Processing output. The sum total of the column is the total contribution of the region to the annual dollar production of Food Processing. The total shows that the activity of this sector for the year 1972 amounts to \$99,838,000. Of this amount, \$30,400,000 were input contributions made by the 29 producing sectors, called the endogenous total. The difference between \$99,838,000 and \$30,400,000 of \$69,438,000 is the contribution of the primary input sector,

"the value added" to the Food Processing industry (See Appendix A). Value added may alternately be viewed as final purchases. For this study, the "value added" is disaggregated into three sectors: Households, Federal Government and Imports as shown in Rows (30) through (32). A full description of the method and rationale used in the process of disaggregation is given in Appendix D. Value added describes the contribution by the exogenous non-producing sectors to the production of commodities and services. An amount of \$26,854,000 was paid to individuals as wages and salaries; an amount of \$2,176,000 was paid to Federal Government as taxes; the remainder of \$40,408,000 represents purchases of this sector from outside the region, that is imports of the processing industry during the year. Imports, in this study, also depict depreciation and profits.

The output of the Food Processing industry is distributed among the other sectors as shown in Row (8). The Food Processing firms distributed output among the other 29 endogenous sectors in the amount of \$11,533,000. The remaining output, i. e., the difference between total output of \$99,838,000 and total purchases by endogenous producing sectors, of \$11,533,000 constitutes sales by the Food Processing industry to final, or non-producing users (see Appendix A). For this study, final demand is disaggregated into four sectors: Households, Federal Government-Civilian, Federal Government - Military, and Exports. These values appear in Columns (30) through (33), respectively, in Table 2. As explained in Appendix A, these columns describe the sales of producers to each sector of the economy which consumes their commodities. For instance, Food Processing (Sector 8) sold \$13,524,000

TABLE I
TRANSACTIONS MATRIX
MISSISSIPPI COASTAL REGION, 1972
(Thousands of Dollars)

OUTPUT [SALES]	PURCHASES									
	1	2	3	4	5	6	7	8	9	
	FISHERIES	FORESTRY	LIVESTOCK PRODUCTS	CROPS & AGRI-CULTURAL	AG-FORESTRY, FISH SVC	MINING	CONSTRUCTION	FOOD PROCESSING	APPAREL & LUMBER	LUMBER & WOOD
1 FISHERIES	150.	0.	0.	0.	0.	0.	0.	7235.	0.	0.
2 FORESTRY	0.	250.	0.	0.	0.	0.	0.	0.	108.	409.
3 LIVESTOCK PRODUCTS	0.	0.	411.	24.	0.	0.	0.	2235.	0.	0.
4 CROPS & AGRICULTURAL	0.	0.	204.	0.	0.	0.	0.	1135.	0.	0.
5 AG FORESTRY, FISH SVC	219.	145.	157.	119.	0.	0.	352.	0.	0.	0.
6 MINING	0.	0.	0.	0.	0.	0.	1249.	0.	1.	0.
7 CONSTRUCTION	0.	0.	42.	20.	0.	271.	48.	461.	25.	35.
8 FOOD PROCESSING	0.	0.	715.	0.	27.	0.	0.	8335.	0.	0.
9 APPAREL & FINISHED	0.	0.	0.	0.	0.	0.	0.	0.	262.	0.
10 LUMBER & WOOD	0.	0.	0.	0.	0.	11.	0.	0.	4.	1261.
11 PAPER & ALLIED	0.	0.	0.	0.	0.	0.	111.	83.	49.	13.
12 PRINTING/PUBLISHING	0.	0.	0.	0.	0.	0.	41.	163.	2.	16.
13 CHEMICAL/PETRO/OTHER	11.	7.	4.	11.	1.	42.	111.	73.	14.	3.
14 STONE, CLAY & GLASS	1.	1.	1.	1.	0.	31.	4296.	512.	0.	17.
15 PRIMARY/FER METALS	54.	4.	2.	0.	1.	33.	3858.	172.	6.	21.
16 TRANSPORTATION EQUIP	3024.	0.	0.	0.	0.	1.	2.	2.	0.	2.
17 MISCELLANEOUS MFG	36.	24.	2.	4.	4.	45.	917.	140.	506.	12.
18 WATER TRANSPORTATION	161.	107.	19.	24.	0.	121.	0.	882.	0.	174.
19 OTHER TRANSP/WHSE	212.	141.	155.	31.	20.	149.	414.	645.	117.	228.
20 COMMUNICATION/PU UTIL	2.	1.	42.	21.	2.	212.	599.	1368.	156.	20.
21 EATING & DRINKING	19.	13.	23.	8.	2.	14.	1004.	410.	0.	21.
22 SERVICE STATIONS	6.	4.	0.	3.	0.	4.	324.	0.	0.	7.
23 WHOLESALE/RETAIL	146.	97.	181.	53.	14.	106.	7729.	3156.	382.	165.
24 FINANCE/INS/REAL EST	100.	66.	112.	108.	39.	526.	1202.	996.	150.	62.
25 HOTEL/MOTEL/LDGING	0.	0.	0.	0.	0.	0.	0.	129.	5.	0.
26 MEDICAL SERVICES	0.	0.	0.	0.	0.	1.	19.	9.	1.	0.
27 EDUCATIONAL SERVICES	0.	0.	7.	0.	0.	1.	21.	10.	2.	1.
28 OTHER SERVICE	23.	15.	46.	94.	0.	246.	7230.	1645.	272.	121.
29 STATE/LOCAL GOV'T	3.	1.	2.	0.	0.	8.	139.	175.	48.	7.
ENDGENOUS TOTALS	4167.	876.	2125.	531.	114.	282.	34470.	30400.	2150.	6350.
30 HOUSEHOLDS	2795.	1855.	977.	372.	291.	1084.	51352.	24854.	2667.	4208.
31 FEDERAL GOV'T	336.	223.	117.	45.	139.	446.	4017.	2176.	524.	532.
32 IMPORTS	4602.	4946.	941.	634.	1023.	4726.	29361.	40408.	4574.	4572.
TOTAL PURCHASES	11900.	7900.	4160.	1582.	1667.	4458.	119400.	99838.	9915.	15659.

Table 1

TRANSACTIONS SUMMARY
Mississippi Hospital Facility, Inc.
(Thousands of Dollars)

	11	12	13	14	15	16	17	18	19	20	21	22	23
	FARE & ALLOC	ENTERTAINMENT	THEATRICAL/RETRO	BAR & LOBBY	BAR & LOBBY	TRANSPORTATION	MISCELLANEOUS	WATER TRANS-PORTATION	OTHER TRANS-PORTATION	AMPHITHEATRE	WATER & SEWER	WATER	WATER
1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	800.	0.	0.
2	2500.	0.	281.	0.	0.	0.	4.	25.	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	0.	0.	9.	1.	0.	0.	0.	0.	0.
4	0.	0.	23.	0.	0.	0.	24.	3.	0.	7.	2.	0.	59.
5	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	26.	0.	155.
6	0.	0.	301.	163.	0.	0.	5.	3.	5.	321.	0.	0.	51.
7	615.	28.	3056.	510.	451.	715.	139.	644.	869.	765.	110.	36.	850.
8	0.	0.	172.	0.	0.	0.	58.	25.	98.	0.	136.	44.	1049.
9	0.	0.	0.	0.	0.	864.	42.	0.	24.	0.	0.	0.	1128.
10	3043.	1.	156.	61.	167.	1215.	189.	0.	1.	900.	18.	6.	142.
11	0.	284.	894.	179.	105.	139.	126.	12.	15.	0.	0.	0.	10.
12	124.	160.	34.	1.	34.	75.	13.	5.	6.	54.	45.	5.	118.
13	217.	8.	1528.	35.	62.	138.	94.	52.	69.	12.	18.	6.	50.
14	34.	0.	447.	107.	88.	597.	92.	7.	0.	0.	16.	5.	121.
15	150.	12.	151.	62.	2221.	5943.	509.	31.	41.	45.	14.	4.	106.
16	0.	0.	0.	0.	15.	5052.	165.	106.	139.	1.	17.	6.	132.
17	264.	13.	586.	81.	356.	2764.	948.	35.	45.	20.	41.	14.	319.
18	2095.	57.	2572.	744.	3478.	2565.	318.	0.	4022.	93.	0.	0.	266.
19	2745.	74.	6917.	876.	1937.	362.	417.	0.	531.	253.	216.	69.	659.
20	1675.	114.	6132.	745.	1483.	1915.	472.	406.	531.	3093.	753.	243.	5795.
21	209.	14.	509.	46.	187.	493.	107.	41.	40.	16.	0.	61.	1478.
22	67.	4.	164.	15.	60.	159.	34.	20.	26.	5.	62.	0.	476.
23	1405.	107.	3915.	357.	1436.	3797.	821.	472.	618.	120.	1480.	472.	0.
24	921.	203.	5727.	328.	603.	1535.	472.	605.	792.	273.	1218.	392.	9372.
25	87.	4.	280.	8.	36.	138.	19.	14.	21.	43.	44.	14.	338.
26	6.	0.	32.	2.	6.	16.	3.	4.	3.	2.	6.	2.	45.
27	6.	4.	35.	3.	6.	18.	5.	4.	3.	7.	7.	2.	48.
28	1733.	275.	3718.	544.	1491.	2175.	1013.	734.	962.	789.	1725.	555.	4722.
29	112.	107.	500.	40.	79.	342.	65.	902.	1121.	2604.	555.	179.	4268.
TOT.	18212.	1472.	39702.	4907.	14301.	31026.	6067.	9445.	9560.	9459.	7309.	2115.	31913.
30	21797.	1614.	56807.	4478.	14865.	140840.	7699.	10959.	14361.	9442.	10096.	3238.	77705.
31	1564.	332.	7170.	493.	960.	37227.	1234.	378.	1111.	4520.	1151.	371.	8863.
32	39455.	2585.	107549.	7414.	25158.	314529.	13622.	4268.	7818.	98446.	7943.	2818.	85484.
TOT.	81038.	6003.	211228.	17492.	55284.	523622.	28622.	25070.	32850.	121867.	26499.	8542.	203965.

Table 1

TRANSACTIONS MATRIX

Millions of dollars
Thousands of barrels

SECTOR	SECTOR									FEDERAL DEMAND				TOTAL OUTPUT
	24	25	26	27	28	29	30	31	32	33	34			
	PRIVATE INVENTORY	HOUSEHOLDS	GOVERNMENT	STATE/LOCAL GOVT	FEDERAL GOVT	EXPORTS	HOUSEHOLDS	FED. GOVT	FEDERAL GOVT	MILITARY	EXPORT			
1	0	0	0	0	0	0	8217	0	0	73	2500	11900		
2	34	0	0	0	0	0	7896	0	0	0	0	7900		
3	0	0	4	0	16	0	2700	15	73	0	71	4160		
4	0	1	0	0	16	45	1552	24	3	3	2	1582		
5	0	0	0	0	23	16	1252	15	148	148	3	1667		
6	0	0	0	0	0	373	2669	0	1453	0	5204	9458		
7	6473	382	683	231	639	1833	36685	41304	12003	12003	20298	119400		
8	13	3	389	414	0	53	11533	13524	1000	1000	73780	98838		
9	0	122	15	20	9	67	2557	524	889	5395	3046	15659		
10	23	10	0	0	0	53	12307	246	0	45	78523	81038		
11	0	0	0	0	38	47	2505	10	0	0	720	6003		
12	98	5	5	217	893	95	2212	2404	287	380	208256	211228		
13	24	61	66	59	45	127	2957	10	2	3	9473	17392		
14	16	34	5	5	124	17	6588	861	105	345	41463	55284		
15	25	48	1	2	34	25	13581	180	10	50	992	523622		
16	63	8	0	1	491	42	9269	1744	0	25	17468	28622		
17	116	248	69	74	429	91	8103	3014	10	25	5241	25070		
18	0	0	0	0	206	511	19417	367	0	25	2905	32850		
19	363	227	155	169	663	3795	27395	1550	250	753	2010	121867		
20	1601	896	1498	1811	3901	5773	41525	4753	16013	16013	2010	121867		
21	144	87	63	67	303	102	5541	7423	43	242	13250	26499		
22	46	28	20	22	98	33	1687	4100	46	274	2485	8542		
23	1105	665	484	516	2335	782	33126	145982	425	2075	18357	203965		
24	9072	1853	1500	1400	3165	3270	46702	57098	170	830	6100	110900		
25	158	534	114	122	225	39	2366	1143	43	297	25288	29047		
26	74	16	0	156	28	15	448	72644	258	810	1500	35660		
27	78	18	166	0	30	31714	32192	619	0	0	0	38016		
28	1877	1434	1194	1272	2414	1753	40074	39986	425	2075	10939	93499		
29	1947	154	419	446	1507	314	16106	43637	75	362	61237	141417		
30	23350	6836	7050	7704	17636	67488	399157							
31	23246	12707	15626	16456	40869	54354		0	127800	187146	89765	1034842		
32	58743	1353	1664	1774	4351	43	149741	1495199	15	42	641107	879660		
33	110900	29067	35660	38016	93499	141417			84	0	0	1149360		
34														
35														

to Households, \$1,000,000 to military installations of the Federal Government, and \$73,780,000 worth of their products to buyers outside the region. The disaggregation procedure followed in estimating the final demand columns is given in Appendix D.

The final column in Table 1 represents the estimated total sales corresponding to each producing sector. These are control totals and are key factors in the composition of any regional input-output model using secondary data and the national model (see Appendix B). An extensive description of how these totals were obtained is given in Appendix C.

(2) The Technical Coefficients Matrix

A brief look into the transactions matrix will make it obvious that there is a fundamental relationship between the volume of the output of a sector and the volume of inputs entering to generate its activities. Thus, every entry in the table is dependent upon every other entry. These relationships show the nature of technology within the region. These relationships are expressed as ratios or coefficients of each input to the total output. A table displaying these coefficients is called the technical coefficients matrix or the direct requirements matrix. Table 2 shows the technical coefficients as obtained from the transactions table shown in Table 1.

To site Food Processing again, Column (8) shows that approximately 31¢ of every dollar spent consists of purchases from the other endogenous sectors and that approximately 27¢ is paid to Households as wages and salaries. About 2¢ is paid to the Federal Government as taxes and 40¢ to

sectors outside the Gulf Coast region as **Imports**. If it can be assumed that such expenditures are determined by inflexible technical considerations, these coefficients can be used to estimate the demand by Food Processing for materials and service inputs produced by the other sectors.

Given such a table, and assuming that the technical requirements in each sector remain invariant, it is possible to compute transactions tables for succeeding years by knowing the total output of the particular industry for the particular year.

(3) Interdependence Coefficient Matrix

The interdependence coefficients matrix is given in Table 3. The matrix shows the effect on the total output of the j^{th} sector from an increase of one dollar in the i^{th} sector's final demand. The figures in the table indicate the necessary changes in total endogenous output to meet the added new requirements from the increase in final demand. The reason for this can be explained as follows. In excess of the direct requirements for the sector's output, the increase in final demand will necessitate additional transactions within the other endogenous sectors. For instance, a one dollar increase in final demand for Food Processing will alter its requirements of purchases from the other sectors as shown in Column (8), Table 3. A comparison of Column (8), Table 2, with Column (8) of Table 3 shows the nature of alterations in the input requirements of this sector to meet the new increase of \$1 in final demand. These new additions to the requirements of the Food Processing sector from other sectors will result, in turn, in increased purchase requirements by all other sectors. Entries in

TABLE 3
INTERDEPENDENCE COEFFICIENTS MATRIX

SECTOR	1	2	3	4	5	6	7	8	9	10
1 FISHERIES	1.01288	.00010	.01573	.00357	.00136	.00009	.00035	.08066	.00007	.00010
2 FORESTRY	.00030	1.03277	.00044	.00348	.00077	.00097	.01261	.00056	.01219	.00007
3 LIVESTOCK PRODUCTS	.00002	.00002	1.11582	.01699	.00045	.00002	.00003	.02748	.00004	.00001
4 CROPS & AGRICULTURAL	.01868	.01898	.05714	1.00393	.00023	.00002	.00007	.01384	.00008	.00001
5 AG FORESTRY, FISH SVC	.00007	.00005	.04694	.07639	1.00009	.00003	.00030	.00365	.00003	.00003
6 MINING	.00287	.00222	.00035	.00337	.00005	.00060	.01133	.00030	.00029	.00002
7 CONSTRUCTION	.00054	.00054	.01910	.02082	.00237	.00083	.00504	.00883	.00672	.00004
8 FIBER PROCESSING	.00054	.00054	.21071	.00500	.01788	.00062	.00062	1.09666	.00047	.00004
9 APPAREL & FINISHED	.00094	.00011	.00041	.00031	.00007	.00044	.00044	.00029	.00029	1.02750
10 LUMBER & WOOD	.00014	.00022	.00139	.00144	.00079	.00012	.04645	.00130	.00160	.00160
11 PAPER & ALLIED	.00015	.00005	.00117	.00020	.00012	.00012	.00157	.00554	.00540	.00003
12 PRINTING/PUBLISHING	.00114	.00008	.00077	.00084	.00010	.00010	.00122	.00217	.00067	.00004
13 CHEMICAL/PETRO/OTHER	.00054	.00026	.00192	.00730	.00068	.00068	.00127	.00118	.00067	.00004
14 STONE, CLAY & GLASS	.00814	.00077	.00194	.00161	.00021	.00021	.03672	.00612	.00052	.00004
15 PRIMARY/FAB METALS	.26014	.00026	.00054	.00081	.00046	.00046	.00069	.02103	.00064	.00006
16 TRANSPORTATION EQUIP	.00487	.00344	.00181	.00362	.00262	.00262	.00906	.00245	.00049	.00006
17 MISCELLANEOUS MFG	.01849	.01692	.01460	.01921	.00194	.00194	.00632	.01379	.00314	.00006
18 WATER TRANSPORTATION	.02304	.02257	.04927	.02598	.01293	.01293	.01056	.01420	.01497	.00006
19 OTHER TRANSP/WHSE	.00344	.00195	.02122	.02139	.00277	.00277	.01486	.02012	.02178	.00002
20 COMMUNICATION/PU UTL	.00224	.00200	.00838	.00530	.00147	.00147	.00235	.00549	.00004	.00006
21 EATING & DRINKING	.00070	.00062	.00045	.00224	.00007	.00007	.00313	.00028	.00027	.00006
22 SERVICE STATIONS	.01634	.01430	.06255	.04708	.01003	.01003	.07095	.04039	.04364	.00006
23 WHOLESALE/RETAIL	.00018	.00009	.04772	.08437	.02497	.02497	.02156	.01948	.02724	.00006
24 FINANCE/INS/REAL EST	.00003	.00002	.00061	.00045	.00010	.00010	.00042	.00167	.00001	.00006
25 HOTEL, MOTEL, LODGING	.00064	.00053	.00010	.00011	.00003	.00003	.00023	.00014	.00017	.00003
26 MEDICAL SERVICES	.00594	.00053	.00344	.00148	.00034	.00034	.00151	.00137	.00212	.00001
27 EDUCATIONAL SERVICES	.00274	.00226	.02647	.06798	.00196	.00196	.06945	.02401	.03415	.00006
28 OTHER SERVICES			.00654	.00398	.00140	.00140	.00560	.00529	.00827	.00006
29 STATE/LOCAL GOV'T										
TOTALS	1.39927	1.13869	1.72369	1.42182	1.09411	1.30110	1.37940	1.42130	1.27216	1.50334

TABLE 3
INTERDEPENDENCE COEFFICIENTS MATRIX

	24	25	26	27	28	29
1	.0010	.0015	.0008	.0097	.0015	.0034
2	.0013	.0057	.0045	.0050	.0036	.0025
3	.0002	.0003	.0004	.0032	.0021	.0010
4	.0003	.0008	.0018	.0018	.0022	.0038
5	.0025	.0013	.0016	.0016	.0036	.0053
6	.0087	.0040	.0044	.0044	.0037	.0040
7	.06736	.02045	.02541	.02549	.01318	.13992
8	.0037	.0042	.01225	.04220	.00036	.00343
9	.0013	.00459	.0069	.0068	.0031	.0077
10	.00355	.00177	.00167	.00169	.00114	.00737
11	.0020	.0020	.0018	.0045	.0099	.0073
12	.00134	.00089	.00071	.00641	.01026	.00251
13	.0039	.00233	.00173	.00172	.00265	.00158
14	.00267	.00210	.00123	.00122	.00197	.00535
15	.00264	.00274	.00106	.00110	.00111	.00515
16	.00085	.00080	.00056	.00059	.00565	.00091
17	.00198	.00085	.00263	.00266	.00525	.00271
18	.00123	.00194	.00123	.00140	.00400	.00054
19	.00538	.01014	.00633	.00641	.00961	.03190
20	.01985	.03118	.05373	.04387	.04771	.05836
21	.00228	.00383	.00245	.00246	.00386	.00283
22	.00073	.00124	.00077	.00079	.00125	.00091
23	.01674	.02816	.01802	.01813	.02840	.02078
24	1.09322	.07608	.05036	.05060	.04191	.04214
25	.00173	1.01908	.00355	.00357	.00272	.00129
26	.00078	.00066	1.00010	.00418	.00037	.00111
27	.00549	.00293	.00817	1.00356	.00485	.22652
28	.02505	.05683	.03922	.01947	1.03124	.03339
29	.02092	.00983	.01557	.01547	.01991	1.00967
	1.27747	1.29642	1.25024	1.25672	1.23836	1.61571

Table 3, in essence, show the direct requirements of Table 2 plus the indirect requirements resulting from the effect of increased final demand. In order to find the indirect requirements, it is necessary to subtract each entry in Table 2 from a corresponding entry in Table 3. For example, the indirect effect of a one dollar increase in final demand for the output of Food Processing can be computed as shown in Table 4. Similar tables can be constructed for all 29 sectors.

TABLE 4

INDIRECT EFFECT COEFFICIENTS:
RESPONSE TO ONE DOLLAR INCREASE IN FINAL
DEMAND IN THE FOOD PROCESSING SECTOR
MISSISSIPPI COASTAL REGION, 1972

Sector	Total Effect*	Direct Effect**	Indirect Effect
1	.08066	.07247	.00819
2	.00056	.00000	.00056
3	.02748	.02239	.00509
4	.01384	.01137	.00247
5	.00365	.00000	.00365
6	.00030	.00000	.00030
7	.00883	.00462	.00421
8	1.09666	.08349	1.01317
9	.00029	.00000	.00029
10	.00130	.00029	.00101
11	.00554	.00484	.00070
12	.00217	.00163	.00054
13	.00118	.00073	.00045
14	.00612	.00513	.00099
15	.00309	.00172	.00137
16	.02103	.00002	.02101
17	.00245	.00140	.00105
18	.01379	.00883	.00496
19	.01420	.00646	.00774
20	.02012	.01370	.00642
21	.00549	.00411	.00138
22	.00028	.00000	.00028
23	.04039	.03161	.00878
24	.01948	.00998	.00950
25	.00167	.00129	.00038
26	.00014	.00009	.00005
27	.00137	.00010	.00127
28	.02401	.01648	.00753
29	.00523	.00175	.00348

*Column (8), Table 3

**Column (8), Table 2

III. MULTIPLIER ANALYSIS

The interrelationships among the regional economic sectors can be analyzed further using the concept of the multiplier. In essence, multipliers measure the spread of impulses that originate in any particular sector to all the others due to exogenous changes outside the producing sectors such as changes in final demand, income or employment. The impulses lead to a series of effects from one sector to another which include, of course, the original sector. The multipliers can clearly show how a growth or decline in the activity of one sector can induce growth or decline in the other sectors. This knowledge can be utilized to forecast future economic development as well as to aid in economic planning. A basic feature of an input-output model is its ability to provide information necessary to compute multipliers.

In this study output, income and employment multipliers were investigated and their values are given in Table 5. In practice, two types of multipliers are computed and are given the names Type I and Type II. The former is calculated by considering the Household sector as being exogenous to the processing sectors, while the latter is obtained by making the Household sector endogenous within the processing sectors. A brief description and analysis of the two multipliers follows.

(1) Type I Multipliers

a. Output Multipliers

Output multipliers are measures of the indirect effects of changes in the final demand for output of each sector and the impulse it generates throughout the economy. In Table 5, Column (1), output multipliers for the 29 sectors of the coastal region are given. An increase of one dollar in final demand for the Fisheries sector, for instance, will cause a change in total output in the region of approximately \$1.40. Similarly, a multiplier value of \$1.35 for the Eating and Drinking sector means that a one dollar increase in final demand for the products of this sector will generate about \$1.35 of output in the whole economy. Livestock Products has the highest multiplier value, implying that there is a high degree of interplay between this sector and the other sectors. The smallest multiplier appears in the Transportation Equipment sector. At first glance, this seems surprising since one of the most important segments of the Mississippi coastal economy is this particular industry. The reason can be explained by the fact that in the model sales of the Transportation Equipment sector were mainly to the Federal Government Military sector. The activity of this sector primarily consists of the manufacture of large naval ships, a very specialized process. Thus, the Transportation Equipment sector makes only incidental purchases from the other local sectors with the majority of purchases made from areas outside the region (Imports). **Other low output multipliers are for Agricultural, Forestry and Fishery Services, and Communications and Public Utilities.** This indicates

that interactions in these sectors occur mostly among themselves.

If final demand changes were assumed to have taken place simultaneously in all industries, then a total increase of \$29 in final demand will generate an additional \$38.41 in total output. On the average, the multiplier will have the value \$1.32, as shown in Table 5.

(b) Income Multipliers

Income multipliers for the 29 sectors of the coastal region are given in Column (2) of Table 5. They measure the total change throughout the regional economy from a change in income within a sector. For instance, a one dollar increase in income of the Fisheries sector will generate a \$1.49 income increase throughout the economy. Income multipliers for the other sectors can be analyzed in a similar manner.

As was explained earlier in the case of output multipliers, income multipliers result from the spreading effect of the force of an initial increase or decrease in income for a particular sector of the economy over the rest.

The construction of income multipliers of this study follows a method described by Bradley and Gander [3]. Such multipliers represent the ratio of direct plus indirect income effects to the direct income effect.

The direct income effect coefficients can be found in the Household row (row 30) of Table 2. Each entry in that row is an estimate of the original impact on household income per dollar change in output. Household income consists of wages and salaries, proprietor income, and rental income. For instance, an entry of 0.26898 in Row (30) and Column (8) of Table 2 is the

estimate for wages and salaries that the Food Processing sector pays. That is, approximately 29¢ of every dollar spent by this sector is paid as income to Households. Data in Row (30) can be of help in identifying the sectors that are labor intensive. It can be seen that sectors 7, 18, 19, 21, 22, 23, 25, 26, 27, 28, and 29 are fairly labor intensive, as they should be. On an average basis, these sectors spend approximately 42¢ of each dollar of expenditures in the form of wages and salaries. The least labor intensive industries appear to be sectors 6 and 20 with values of 11¢ and 8¢, respectively. This implies that the Mining and Communication and Public Utility sectors are capital intensive.

If all sectors simultaneously experience an increase in income of one dollar each, then total income in the region will increase to \$39.54 due to the income multiplier effect. On an average basis, the income multiplier effect has a value of \$1.36 as shown in Table 2.

(c) Employment Multipliers

Employment multipliers are defined as the total employment generated in the economy by a one-unit change in employment in a particular sector. The values of the multipliers are given in Column (2) of Table 5. It should be noted that the coefficients for sectors 1 through 5 are not included due to lack of data on employment. The values of the multipliers can be computed as the ratio of the direct and indirect effect to the direct effect. Each coefficient represents the magnitude of the increase in employment in a sector that is felt throughout the economy. For instance, a one unit change in employment in the Food Processing industry will

TABLE 5
TYPE I MULTIPLIERS

SECTOR	OUTPUT	MULTIPLIERS	
		INCOME	EMPL.
1 FISHERIES	1.40	1.49	1
2 FORESTRY	1.14	1.19	1
3 LIVESTOCK PRODUCTS	1.72	1.88	1
4 CROPS & AGRICULTURAL	1.42	1.56	1
5 AG FORESTRY, FISH SVC	1.09	1.12	1
6 MINING	1.30	1.79	1.67
7 CONSTRUCTION	1.38	1.28	1.45
8 FOOD PROCESSING	1.42	1.45	1.59
9 APPAREL & FINISHED	1.27	1.31	1.18
10 LUMBER & WOOD	1.50	1.51	1.23
11 PAPER & ALLIED	1.30	1.36	1.55
12 PRINTING/PUBLISHING	1.32	1.38	1.28
13 CHEMICAL/PETRO/OTHER	1.24	1.29	2.24
14 STONE/CLAY & GLASS	1.37	1.45	1.45
15 PRIMARY/METAL	1.35	1.45	1.61
16 TRANSPORTATION EQUIP	1.08	1.09	1.09
17 MISCELLANEOUS MFG	1.27	1.33	1.37
18 WATER TRANSPORTATION	1.52	1.46	1.51
19 OTHER TRANSP/WHSE	1.41	1.35	2.11
20 COMMUNICATION/PU UTIL	1.10	1.38	1.22
21 EATING & DRINKING	1.35	1.29	1.12
22 SERVICE STATIONS	1.31	1.27	1.16
23 WHOLESALE/RETAIL	1.20	1.15	1.18
24 FINANCE/INS/REAL EST	1.28	1.42	1.44
25 HOTEL, MOTEL, LODGING	1.30	1.21	1.19
26 MEDICAL SERVICES	1.25	1.16	1.29
27 EDUCATIONAL SERVICES	1.26	1.17	1.86
28 OTHER SERVICES	1.24	1.16	1.10
29 STATE/LOCAL GOV'T	1.62	1.59	1.35
TOTAL	38.41	29.54	34.79*
AVERAGE	1.32	1.30	1.45*

*Based on sectors 6-29.

generate directly and indirectly 1.93 units of employment in the economy. On a total basis, total employment attributable to employment multipliers for the 24 sectors, sectors 6 through 29, is 34.79 units. On an average basis, the value is 1.45 units.

(2) Type II Multipliers

When Households are considered to function as part of the endogenous producing sectors, a new input-output model will result. In this case, the Household sector is placed within the endogenous portion of the transactions matrix. For the coastal region, the augmented transactions table will have a matrix composed of 30 x 30 rows and columns which define the endogenous sectors. The inverse of this new matrix is given in Table 6 and labeled Direct, Indirect and Induced Requirements. It is in essence a new interdependence coefficients matrix and has a similar interpretation as given in Section II.

It should be pointed out that by including the Household sector among the producing sectors, the assumption is made that Households is a vital, internal sector and that it is a part of the interdependency of the producing sectors. It is not to be assumed independent outside the principal economic activities of the producing sectors. The main reason for the inclusion of Households within the producing sectors is to calculate the multipliers taking in consideration not only the direct and indirect impacts of an increase in output by each sector, but also the added and induced effects. It is the effect of consumption by Households. The multipliers obtained thus are termed Type II multipliers in contrast to Type I multipliers.

TABLE 6
DIRECT, INDIRECT, AND INDUCED REQUIREMENTS

SECTOR	1	2	3	4	5	6	7	8	9	10
1 FISHERIES	.01439	.00130	.01763	.00214	.00248	.00097	.00272	.08233	.00158	.00184
2 FORESTRY	.00091	1.03326	.00123	.00112	.00123	.00133	.01358	.00124	.01291	.29442
3 LIVESTOCK PRODUCTS	.00108	.00086	1.11717	.01510	.00124	.00064	.00170	.02866	.00110	.00124
4 CROPS & AGRICULTURAL	.00024	.00021	.05745	1.00118	.00041	.00017	.00094	.01411	.00032	.00029
5 AG FORESTRY, FISH SVC	.01910	.01932	.04738	.07553	1.00041	.00041	.00397	.00412	.00073	.00553
6 MINING	.00077	.00061	.00124	.00134	.00057	1.00400	.01243	.00108	.00099	.00100
7 CONSTRUCTION	.03582	.02845	.06063	.05520	.02494	.05488	1.05653	.04541	.03981	.04328
8 FOOD PROCESSING	.01008	.00806	.22262	.01485	.02492	.00078	.01547	1.10714	.00596	.01123
9 APPAREL & FINISHED	.00144	.00081	.00152	.00123	.00073	.00065	.00182	.00127	1.02838	.00114
10 LUMBER & WOOD	.00310	.00192	.00409	.00367	.00439	.00459	.04941	.00367	.00375	1.05046
11 PAPER & ALLIED	.00040	.00025	.00148	.00046	.00031	.00033	.00136	.00581	.00565	.00122
12 PRINTING/PUBLISHING	.00209	.00163	.00322	.00286	.00154	.00164	.00427	.00433	.00262	.00348
13 CHEMICAL/PETRO/OTHER	.00140	.00124	.00223	.00755	.00086	.00164	.00185	.00144	.00202	.00131
14 STONE, CLAY, GLASS	.00242	.00175	.00457	.00355	.00160	.00088	.02966	.00819	.00240	.00563
15 PRIMARY/FAB METALS	.00958	.00191	.00375	.00250	.00191	.00099	.02663	.00468	.00344	.00365
16 TRANSPORTATION EQUIP	.26184	.00161	.00668	.00258	.00173	.00158	.00335	.02291	.00235	.00241
17 MISCELLANEOUS MFG	.00745	.00549	.00506	.00631	.00455	.00717	.00856	.01537	.00456	.00122
18 WATER TRANSPORTATION	.01991	.01805	.01640	.02069	.00000	.01714	.00856	.01837	.00456	.00021
19 OTHER TRANSP/WHSE	.02682	.02557	.05401	.03090	.01974	.02415	.01647	.01874	.01874	.00021
20 COMMUNICATION/PU UTIL	.04534	.03530	.07404	.06510	.03401	.03286	.00072	.06663	.06386	.06456
21 EATING & DRINKING	.00770	.00635	.01527	.01200	.00555	.00054	.01825	.01156	.00633	.00863
22 SERVICE STATIONS	.00342	.00278	.00387	.00507	.00209	.00229	.00740	.00330	.00300	.00329
23 WHOLESALE/RETAIL	.10604	.08570	.17544	.14066	.07692	.06648	.21195	.13997	.13372	.12064
24 FINANCE/INS/REAL EST	.05781	.04762	.10386	.13083	.06017	.13706	.09156	.06892	.07197	.04156
25 HOTEL/MOTEL/LODGING	.00130	.00098	.00202	.00162	.00094	.00099	.00218	.00291	.00193	.00142
26 MEDICAL SERVICES	.01854	.01475	.02342	.01941	.01482	.01102	.02931	.02068	.01874	.00137
27 EDUCATIONAL SERVICES	.01039	.00822	.01542	.01156	.00754	.00717	.01669	.01210	.01182	.00196
28 OTHER SERVICES	.03709	.02912	.06574	.10038	.02518	.05187	.11840	.05859	.06542	.04806
29 STATE/LOCAL GOV'T	.04357	.03473	.05794	.04854	.03181	.02469	.04371	.05051	.04923	.05027
30 HOUSEHOLDS	.44624	.37112	.58777	.48542	.34766	.27231	.73286	.51758	.46822	.53756
TOTALS	2.21619	1.78894	2.75356	2.27411	1.70025	1.77823	2.66347	2.32818	2.09256	2.44552

TABLE 6
DIRECT, INDIRECT, AND INDUCED REQUIREMENTS

	11	12	13	14	15	16	17	1A	1C	20	21	22	23
1	.00170	.00172	.00168	.00183	.00186	.00130	.00188	.00002	.00794	.00000	.00319	.00278	.00271
2	.04382	.00306	.00375	.00264	.00208	.00132	.00324	.00285	.00781	.00256	.00138	.00135	.00130
3	.00112	.00114	.00105	.00121	.00121	.00093	.00153	.00208	.00190	.00133	.00165	.00162	.00149
4	.00028	.00029	.00028	.00031	.00031	.00021	.00119	.00042	.00450	.00008	.00054	.00046	.00087
5	.00098	.00058	.00062	.00062	.00060	.00039	.00065	.00100	.00091	.00024	.00230	.00075	.00142
6	.04652	.04721	.02252	.05674	.05158	.00113	.00116	.00212	.00106	.00310	.00133	.00130	.00142
7	.01023	.01030	.01060	.01103	.01102	.00795	.01231	.01934	.00480	.02039	.05884	.05781	.05255
8	.00111	.00111	.00105	.00121	.00123	.00251	.00268	.00198	.00174	.00030	.00143	.00140	.00142
9	.04392	.00530	.00465	.00811	.00696	.00453	.01052	.00419	.00577	.00041	.00476	.00469	.00430
10	.00050	.04900	.00465	.01082	.00247	.00057	.00501	.00122	.00112	.00016	.00060	.00053	.00053
11	.00004	1.03018	.00244	.00277	.00330	.00195	.00299	.00440	.00407	.00014	.00537	.00417	.00345
12	.00325	.00195	1.00776	.00274	.00183	.00054	.00394	.00327	.00307	.00025	.00124	.00028	.00028
13	.00297	.00258	.00482	1.00923	.00444	.00285	.00574	.00541	.00503	.00093	.00330	.00381	.00342
14	.00415	.00435	.00307	.00646	1.04435	.01337	.02111	.00585	.00141	.00124	.00343	.00309	.00287
15	.00233	.00232	.00218	.00275	.00303	1.01128	.00825	.00878	.00818	.00061	.01154	.00376	.00323
16	.00669	.00577	.00598	.00855	.01042	.00732	1.03392	.00728	.00477	.00017	.00611	.00598	.00555
17	.00414	.01544	.00385	.05448	.07424	.00747	.01742	1.03019	.00115	.00200	.00452	.00390	.00419
18	.04705	.02311	.04275	.07399	.05733	.00601	.02447	.22551	1.03543	.00865	.01466	.01579	.01007
19	.04939	.07120	.07580	.09777	.08131	.04014	.06554	.10326	.09597	1.04091	.09598	.09449	.08594
20	.00904	.00896	.00953	.00973	.01050	.00572	.01014	.01384	.01285	.00201	1.00874	.01562	.01450
21	.00391	.00381	.00370	.00421	.00445	.00264	.00423	.00421	.00271	.00094	.00448	1.00405	.00387
22	.11736	.11803	.11171	.12672	.13218	.08335	.12500	.19159	.17287	.02992	.18672	.18204	1.11556
23	.06445	.09110	.07827	.08004	.06949	.04173	.06940	.11840	.11004	.01811	.12090	.11917	.10943
24	.00289	.00260	.00256	.00206	.00224	.00127	.00212	.00314	.00292	.00095	.00371	.00364	.00339
25	.01978	.01963	.01953	.02077	.02074	.01545	.01905	.03383	.03135	.00571	.02631	.02573	.02347
26	.01156	.01160	.01136	.01314	.01284	.00843	.01144	.02880	.02438	.00805	.01976	.01942	.01774
27	.05983	.08670	.05452	.07530	.07074	.03185	.07395	.10001	.09284	.01805	.11595	.11492	.06678
28	.04844	.06562	.04739	.04520	.05396	.03553	.04772	.12183	.11303	.03505	.04930	.04801	.07491
29	.08547	.49240	.46168	.51859	.51835	.38834	.47417	.84543	.78474	.14259	.65472	.63950	.58400
30	.214843	.218250	.205277	.220126	.225619	1.075633	2.10375	3.00064	2.78571	1.35442	2.150104	2.43597	2.58697

TABLE 6
DIRECT, INDIRECT, AND INDUCED REQUIREMENTS

	24	25	26	27	28	29	30
1	.00138	.00242	.00317	.00317	.00333	.00298	.00430
2	.00184	.00150	.00134	.00140	.00125	.00313	.00175
3	.00041	.00162	.00158	.00186	.00174	.00193	.00302
4	.00027	.00043	.00052	.00052	.00056	.00080	.00068
5	.00041	.00077	.00078	.00078	.00098	.00138	.00122
6	.00146	.00045	.00150	.00150	.00138	.00562	.00199
7	.09525	.07009	.07332	.07356	.06076	.19750	.04392
8	.00834	.01445	.02592	.02592	.01399	.01993	.02692
9	.00087	.00592	.00197	.00197	.00158	.00231	.00251
10	.00536	.00500	.00478	.00481	.00423	.01111	.00610
11	.00041	.00057	.00054	.00081	.00134	.00116	.00071
12	.00238	.00382	.00353	.00924	.01206	.00591	.00554
13	.00060	.00269	.00208	.00207	.00099	.00290	.00048
14	.00425	.00492	.00384	.00395	.00474	.00852	.00532
15	.00385	.00491	.00314	.00319	.00318	.00766	.00409
16	.00228	.00336	.00302	.00306	.00810	.00377	.00484
17	.00416	.01374	.00631	.00642	.00898	.00722	.00735
18	.00243	.00408	.00340	.00348	.00605	.01105	.00405
19	.00556	.01580	.01180	.01190	.01504	.03847	.01072
20	.05531	.10131	.11467	.11500	.10821	.13158	.11944
21	.00691	.01207	.01040	.01044	.01176	.01238	.01558
22	.00303	.00533	.00472	.00475	.00517	.00565	.00774
23	.09245	.16341	.14248	.14902	.15793	.17754	.25572
24	1.13091	1.4318	1.1513	1.1558	1.0622	1.1927	1.2686
25	.00248	.02077	.00518	.00520	.00434	.00325	.00320
26	.01643	.02853	1.02700	.03117	.02709	.03344	.05273
27	.01367	.01748	.02222	1.01765	.01880	.24340	.02754
28	.05141	.10376	.08452	.08492	1.07622	.08782	.08879
29	.05544	.07129	.07469	.07499	.07882	1.08035	.11628
30	.29457	.70246	.67811	.68032	.67326	.81478	1.32312
	1.94883	2.52724	2.43938	2.44874	2.41802	3.04332	2.32882

By definition of the two types of multipliers it is obvious that:

Type II \rhd Type I,
since Type II is obtained by:

$$\frac{\text{Direct effect \& Indirect effect \& Induced effect,}}{\text{Direct effect}}$$

while Type I is obtained by:

$$\frac{\text{Direct effect \& Indirect effect}}{\text{Direct Effect}} .$$

The Type II multiplier is considered to be more realistic as a tool in analyzing the total effect on output, income and employment due to changes in these variables. For, in this case, changes due to consumer spending are taken into consideration.

For the coastal region, Type II multipliers for output, income and employment are given in Table 7. The interpretation of Type II multipliers is comparable to that of Type I discussed above.

If final demand for all sectors were to change simultaneously, a total increase of \$29 in final demand will result in a \$66 increase in output. On an average basis, it is \$2.28.

Similarly, if all sectors simultaneously experience a one dollar increase in income, a total increase of \$29 in income will generate \$52.53 of additional income throughout the economy because of the multiplier effect. On an average basis, it is about \$1.81. It can be shown that income Type II multipliers are a constant multiple of the corresponding Type I. In this study the constant factor is 1.33.

For Type II employment multipliers, the total effect due to these multipliers for the 24 sectors, sectors 6 through 29, is 51.17 units with

TABLE 7
TYPE II MULTIPLIERS

SECTOR	OUTPUT	MULTIPLIERS	
		INCOME	EMPL.
1 FISHERIES	2.22	1.99	2
2 FORESTRY	1.79	1.58	2
3 LIVESTOCK PRODUCTS	2.75	2.50	2
4 CROPS & AGRICULTURAL	2.27	2.07	2
5 AG FORESTRY, FISH SVC	1.70	1.48	2
6 MINING	1.78	2.38	2.21
7 CONSTRUCTION	2.66	1.70	2.07
8 FOOD PROCESSING	2.33	1.92	2.55
9 APPAREL & FINISHED	2.09	1.74	1.42
10 LUMBER & WOOD	2.45	2.00	1.80
11 PAPER & ALLIED	2.15	1.80	2.44
12 PRINTING/PUBLISHING	2.14	1.83	1.61
13 CHEMICAL/PETRO/OTHER	2.05	1.72	4.41
14 STONE, CLAY & GLASS	2.24	1.93	2.03
15 PRIMARY/METALS	2.26	1.93	2.42
16 TRANSPORTATION EQUIP	1.76	1.44	1.51
17 MISCELLANEOUS MFG	2.10	1.76	1.87
18 WATER TRANSPORTATION	3.00	1.93	2.34
19 OTHER TRANSP/WHSE	2.79	1.80	3.82
20 COMMUNICATION/PU UTL	1.35	1.84	1.48
21 EATING & DRINKING	2.50	1.72	1.29
22 SERVICE STATIONS	2.44	1.69	1.37
23 WHOLESALE/RETAIL	2.23	1.53	1.56
24 FINANCE/INS/REAL EST	1.97	1.88	1.97
25 HOTEL, MOTEL, LODGING	2.53	1.61	1.49
26 MEDICAL SERVICES	2.44	1.55	1.92
27 EDUCATIONAL SERVICES	2.45	1.55	3.66
28 OTHER SERVICES	2.42	1.54	1.32
29 STATE/LOCAL GOV'T	3.04	2.12	1.88
TOTAL	66.00	52.53	51.17
AVERAGE	2.28	1.81	2.13*

*based on sectors 6-29.

an average of 2.13 units if it is assumed that each sector experiences one unit increase in employment. Employment Type II multipliers for sectors 1 through 5 were not calculated for lack of data.

IV. EVALUATION OF THE MODEL

The purpose of this study is to lay the groundwork for an extensive investigation linking the effects of economic activities on the Mississippi Gulf Coast with the coastal ecologic system. The approach and methodology of input-output analysis seem to offer a logical and meaningful tool for such an investigation.

This report presents the first step in a continuing sequence of three stages. But, it could very easily be considered for its own merit. That is, an input-output model constructed for a specific region is a valuable instrument that can be used to comprehensively analyze in detail the overall economic structure and interrelationships existing in the area.

The researchers, in general, followed accepted procedures used in similar studies. Some of the difficulties that are encountered in the construction of any input-output model were of course experienced here also. Among the most serious of these is the lack of data in some instances, especially at the county level. Estimation procedures, common sense, and familiarity of the researchers with the region often complimented information obtained from secondary data. Other difficulties encountered were traceable to technical problems inherent in adapting the national model to fit a regional economy.

It should be emphasized that technical and data availability considerations impose limitations upon the precision of studies of this nature. All possible efforts were painstakingly made to minimize the effects of these constraints. Nevertheless, the reader should be aware that such constraints make all results such as these subject to some degree of aberration that may not be readily apparent. Consequently, this qualification should be kept in mind when interpreting and applying the results reported here.

V. APPENDICES

APPENDIX A

APPENDIX A

Theoretical Discussion of Input-Output Model

An input-output model describes interindustry relationships, analyzing these interrelationships in terms of sales between producing and non-producing sectors within the economy. The three major aspects which describe such a model consist of the following:

- (1) Transactions Matrix.
- (2) Technical Coefficients Matrix
- (3) Interdependence Matrix.

Transactions Matrix

Each element in the table represents the sales activity of each industry during a given time period. For the purpose of illustration, assume that there are N industries denoted by I, II, ..., N.

Define:

X_i	=	Total output of industry i in dollars.
X_{ij}	=	Total sales of industry i to industry j in dollars
D_i	=	Total of final demand for industry i in dollars

The transactions then can be described by the following equation:

$$(1) \quad X_i = \sum_{j=1}^n X_{ij} + D_i \quad (i=1, \dots, M)$$

These relationships can be shown in tabular form as given in Table 1.

TABLE 1
Transactions Matrix

	Output	Producers					Final Demand	Total
	Input	I	II	III	. . . . .	N		
Producers	I	X_{11}	X_{12}	X_{13}	. . . . .	X_{1n}	D_1	$X_1 = \sum_{j=1}^n X_{1j} + D_1$
	II	X_{21}	X_{22}	X_{23}	. . . . .	X_{2n}	D_2	$X_2 = \sum_{j=1}^n X_{2j} + D_2$
	III	X_{31}	X_{32}	X_{33}	. . . . .	X_{3n}	D_3	$X_3 = \sum_{j=1}^n X_{3j} + D_3$
	.						.	
	.						.	
	.						.	
	.						.	
N		X_{n1}	X_{n2}	X_{n3}	. . . . .	X_{nn}	D_n	$X_n = \sum_{j=1}^n X_{nj} + D_n$
Value Added (Final Purchases)		V_1	V_2	V_3	. . . . .	V_n		$\sum_{i=1}^n X_i = \sum_{i=1}^n \sum_{j=1}^n X_{ij} + \sum_{i=1}^n D_i$

For example, the first row of the table shows the sales of industry I to the other industries. The element X_{13} is the total sales of industry I to industry III. The final demand column describes the total sales of the producers to each sector of the economy which consumes the commodities supplied by the producing sectors but does not contribute to the economy a product of its own. Final demand sectors include households, government, and export operations, Appendix D. Column entries represent the total purchases of an industry from the other industries. In addition to the contribution of the N producing sectors to the production of each industry, a sector which supplies primary input products such as labor, government services, and imports is added to each

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column. These sectors are exogenous to the main producing elements and are given the name "Value Added," or Final Purchases (see Appendix D).

Technical Coefficients Matrix

Given the values X_{ij} defined in the previous section, let a_{ij} be defined as:

$$a_{ij} = \frac{X_{ij}}{X_j} .$$

The terms a_{ij} represent the amount of industry i which is necessary to produce one unit of commodity j . They are called the input-output technical coefficients.

Therefore: $X_{ij} = a_{ij}X_j$.

Substituting for X_{ij} in the system of equations (1), the following system of equations will result:

$$(2) X_i = \sum_{j=1}^n a_{ij}X_j + D_i \quad (i = 1, \dots, n)$$

The technical coefficients elements a_{ij} can be displayed in tabular form as shown in Table 2.

TABLE 2

Technical Coefficients Matrix

Output Input	Producers				
	I	II	III	...	N
I	a_{11}	a_{12}	a_{13}	.....	a_{1n}
II	a_{21}	a_{22}	a_{23}	.....	a_{2n}
III	a_{31}	a_{32}	a_{33}	.....	a_{3n}
.
.
.
N	a_{n1}	a_{n2}	a_{n3}	.....	a_{nn}

The columns can be explained as follows: In order to produce one unit of some commodity, inputs of other commodities are required. The a_{ij} means that the production of each unit of the j th commodity will require i of the other other commodity. For instance, $a_{32} = 19$ means that 19¢ worth of the product of industry II is required as an input for producing a dollar's worth of output in industry III.

The sum of the elements in each column of the technical coefficients matrix must be less than one. Thus, each column sum represents the partial input cost (not including the value added) incurred in producing a dollar's worth of the commodity produced by the industry represented by that column.

That is:
$$\sum_{i=1}^n a_{ij} < 1 \quad (j = 1, \dots, n).$$

From this, it is obvious that:

$$1 - \sum_{i=1}^n a_{ij}$$

is the payment to the "Value Added" sector, or final purchases.

An input-output model with a structure such that $\sum_{i=1}^n a_{ij} < 1$ is called an open model. It is a model which contains an endogenous section, made up of the direct-producing section, and an exogenous section, made up of the final sectors. The model is closed if all sectors are included in the system as endogenous.

where:

I is an $n \times n$ identity matrix,
 A is an $n \times n$ matrix of the technical coefficients a_{ij} ,
 X is a column vector of n total output elements,
 D is a column vector of n final demand elements,

The matrix $(I - A)$ is known as a Leontief matrix.

If the economy is assumed to have the linear structure described in the input-output model, then the coefficients a_{ij} describe the make-up of the inter-industry relationships for future periods of time as well as the base period of the study. Hence, a solution vector X is a production vector which satisfies a given final demand vector D. From this, the general input-output problem can be described as finding the vector X which satisfies equation (5).

Therefore:

$$(6) \quad \mathbf{X} = (\mathbf{I} - \mathbf{A})^{-1} \mathbf{D}$$

is the solution to (5). Let the elements of $(\mathbf{I} - \mathbf{A})^{-1}$ be denoted by:

$$(7) \quad [A_{ij}] = \begin{bmatrix} A_{11} & A_{12} & \dots & \dots & A_{1n} \\ A_{21} & A_{22} & \dots & \dots & A_{2n} \\ \dots & \dots & \dots & \dots & \dots \\ A_{n1} & A_{n2} & \dots & \dots & A_{nn} \end{bmatrix}$$

Then the system of equations (6) can be written as:

$$(8) \quad \begin{aligned} X_1 &= A_{11} D_1 + A_{12} D_2 + \dots + A_{1n} D_n \\ X_2 &= A_{21} D_1 + A_{22} D_2 + \dots + A_{2n} D_n \\ &\dots \dots \dots \\ X_n &= A_{n1} D_1 + A_{n2} D_2 + \dots + A_{nn} D_n. \end{aligned}$$

To analyze the rate of change of the solutions X_i with respect to exogenous final demands D_1, D_2, \dots, D_n , the partial derivatives of X with respect to D_i will result in the following:

$$\begin{aligned}
 \frac{\partial X_1}{\partial D_1} &= A_{11} & \frac{\partial X_1}{\partial D_2} &= A_{12}, \dots, \frac{\partial X_1}{\partial D_n} &= A_{1n} \\
 \frac{\partial X_2}{\partial D_1} &= A_{21} & \frac{\partial X_2}{\partial D_2} &= A_{22}, \dots, \frac{\partial X_2}{\partial D_n} &= A_{2n} \\
 & & & \dots & \\
 \frac{\partial X_n}{\partial D_1} &= A_{n1} & \frac{\partial X_n}{\partial D_2} &= A_{n2}, \dots, \frac{\partial X_n}{\partial D_n} &= A_{nn}
 \end{aligned}
 \tag{9}$$

As can be seen from this, the values A_{ij} in (9) are merely the respective column elements of the matrix in (7).

In compact form then:

$$\frac{\partial X}{\partial D} = (I - A)^{-1} = [A_{ij}].$$

The derivatives of the input-output model are useful as tools in economic planning. They can be used to derive the total output as reflected in vector X to satisfy any changes in the economy as reflected by the final demand. The elements A_{ij} are constant values. They indicate the amount by which each output X_i would change corresponding to unit changes in the final demands D_j . When $i = j$, for instance A_{22} , then a change in the final demand for sector II will affect the output X_2 of sector II directly and indirectly. When $i \neq j$, for instance X_{23} , then output X_2 of sector II is affected indirectly by the final demand D_3 of sector III. In this case sector III will have to alter its output to provide the necessary inputs to the other producing sectors. These sectors will then alter their production to satisfy the change in the

final demand D_3 of vector III. This means that the values A_{ij} in system of equations (8) will depend on all coefficients a_{ij} in system of equations (4).

The matrix $(I-A)^{-1}$ is used to make forecasts and impact analysis.

A more detailed discussion of the theoretical description of an input-output model may be found in Chiang [6], Gass [13], Leontief [16], and Miernyk [20].

Assumptions of Input-Output Analysis

The following assumptions are generally adopted:

- (1) Products produced by industries are homogeneous.
- (2) The technical coefficients a_{ij} are fixed, i. e., there is no assumption of change in these coefficients over time.
- (3) The production function which describes the physical nature of production is linearly homogeneous, i. e., a k-fold increase or decrease in input will result in a k-fold increase or decrease in output, respectively.
- (4) Errors of aggregation of industries into sectors are non-existent or minimal.

These assumptions are very restrictive and unrealistic. Many studies were undertaken to examine these assumptions empirically. Long [17] has found that the linear homogeneity assumptions are not realized in a majority of cases he studies. Curtis [8] suggests that due to technological change, the technical coefficients should be revised every four or five years. Meyer [19, p. 35] writes: The fact still remains that with all its problems and difficulties input-output does have the great advantage of being an empirically workable model that provides an organizational framework and set of consistency checks that are difficult to achieve with less formal techniques.

APPENDIX B

APPENDIX B

Regionalization of the National Input-Output Model

There are two methods in common use to prepare regional input-output tables. The first is the direct survey approach, which determines the interindustry relationships by directly obtaining the actual sales and purchases of the sectors within the region with surveys. Most researchers in the area of input-output techniques have consented to the fact that such a procedure is extremely costly and time consuming. A second, more popular method utilizes secondary data sources to adjust national direct requirements coefficients to reflect regional activities. The current study is based on such a procedure. The following steps summarize the techniques and approaches used.

- (1) The 83 sectors of the national input-output tables for 1971 [57] were aggregated into 25 sectors. Of these, 24 sectors represent producing sectors while the 25th represents the primary input sector, the value added. A computer routine was used to execute the summation. The routine adopted for this study was developed by Curtis [8] and has been used successfully in many regional studies in Mississippi and Alabama. Some of the 24 sectors were further disaggregated to reflect the nature of specific economic activities in the Coastal region. The result

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is an input-output model with 29 endogenous sectors.

The aggregation scheme for grouping common sectors is based on the Standard Classification Code (SIC) developed by the Department of Commerce.

- (2) The aggregated national technical coefficients were scaled by the location quotient of each sector in the region. An assumption is made that the national technical coefficients hold as well for any region if the proper scaling is used. The location quotient measures the relative importance of a sector in relation to the comparable national sector, Morrison [32]. It can be computed in either of two ways:

(a) Employment:

Let LQ_j = Employment location quotient

N_j^R = Regional employment in sector j

N^R = Total regional employment

N_j = National employment in sector j

N = Total national employment

Then:

$$LQ_j = \frac{N_j^R / N^R}{N_j / N}$$

(b) Output:

Let LQ_j = Output location quotient

O_j^R = Regional output in sector j

O^R = Total regional output

O_j = National output in sector j

O = Total national output

Then:

$$LQ_j = \frac{O_j^R / O^R}{O_j / O}$$

$LQ_j = 1$ implies that the region is self sufficient in sector j.

$LQ_j < 1$ implies that the region is less than self sufficient in sector j. It indicates that imports from other regions are necessary.

$LQ_j > 1$ implies that the region is more than self sufficient. It indicates that exports to other regions are possible.

A summary of the location quotients for the Coastal region based on employment or output is given in Table 1.

Applying the location quotients to the national technical coefficients yields an adjusted direct requirements table, the adjustments being the scaling of the national technical coefficients to reflect more accurately the regional industrial structure.

- (3) Monetary gross outputs of the 24 regional sectors are then determined. These values are used as control totals throughout the study. Some of the data were available directly through state and federal publications; for others an indirect estimating procedure had to be used. The details of obtaining these control totals are given in Appendix C. When the control totals are multiplied by the regionalized technical coefficients, they provide crude estimates of the direct requirements table.
- (4) Four of the sectors were disaggregated into two or more sectors. It was felt that several of the economic activities of the Coastal region were prominent enough to be treated as individual sectors. A disaggregation procedure based on weighted totals was used. The following disaggregation in sectors was used.

TABLE 1
Location Quotients

Sector	Location Quotient
1. Forestry & Fishery Products	21.4427
2. Livestock & Livestock Products	.3118
3. Crops & Other Agricultural Products	.1338
4. Agriculture, Forestry & Fish. Serv.	1.4941
5. Mining	.2400
6. Construction	1.1540
7. Food & Kindred Products	.9680
8. Apparel & Other Textile Products	.4460
9. Lumber & Wood Products	.7450
10. Paper & Allied Products	2.0000
11. Printing & Publishing	2570
12. Chemicals, plastic, etc.	1.1680
13. Stone, Clay & Glass Products	.6690
14. Primary & Fab. Metals	.4210
15. Transportation Equipment	8.6210
16. Other Manufacturing	.1160
17. Water & Other Transportation	1.7655
18. Communication of Public Util.	1.1000
19. Wholesale & Retail Trade	.8330
20. Finance, Insurance & Real Estate	.6570
21. Hotels & Personal & Retail Services	2.4270
22. Medical, Education Services	.3707
23. Other Services	1.0200
24. State & Local Government	1.3570

*Sectors 1-4, Location quotient is based on output.
Sectors 5-29, Location quotient is based on employment.

<u>Additional Sector Disaggregation</u>		
<u>Sector No.</u>	<u>Initial</u>	<u>Disaggregation</u>
1	Forestry & Fishery Products	Fisheries Forestry
17	Water & Other Transportation	Water Transportation Other Transportation
19	Wholesale & Retail Trade	Eating & Drinking Service Station
22	Medical & Educational Services	Wholesale/Retail Medical Services Educational Services

At this stage, a crude transactions table with 29 endogeneous sectors is obtained.

- (5) A modification of some of the entries in the transaction table was necessary. That is, distribution of the output was altered in some cases to adjust for dissimilarities between the national and the regional input-output structure. Any available information was used to make this adjustment possible. Finally, a "reasonable" transaction table was obtained which more accurately delineates the economic activities of the Coastal region.
- (6) The exogeneous sectors known as the final demand and final purchases (value added) discussed in Appendix A are estimated by a procedure outlined in detail in Appendix D.

The regionalization procedure used in this study follows approximately similar methods used in constructing regional input-output models. For more detailed treatment Adcock [1], Barnard [2], Carter [5], Curtis [7], [8], [9], Isard [14], [15], McMenamin [18], Mierynk [21], Moore [31], and Morrison [32] give descriptions and analyses of regional studies based on secondary data.

APPENDIX C

APPENDIX C

Evaluation of Total Output Mississippi Coastal Region 1972

In order to prepare the input-output model for the Mississippi Coastal region, control totals for output of each of the 29 producing sectors had to be determined. The control totals are incorporated into a 29 x 29 transaction matrix using national technical coefficients and location quotients as explained in Appendix B.

The process of determining the control totals took many forms. In some cases data existed to estimate totals directly through federal, state and private sources. In other cases, data on output at the regional level were not available; hence, different estimating procedures are employed depending on the nature of the available data. In most of the cases, the estimating method utilizes a technique which scales national or state data downward to the regional level with ratios of regional employment to national or state employment.

This appendix displays in detail the information that was necessary to compute the control output for each sector. Table 1 shows the basis of monetary output measurement for each sector. Following Table 1 is a comprehensive nomenclature of the 29 endogenous sectors used in the model. Exogenous sectors are treated in Appendix D. Information for

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each sector is given regarding both essential data used to estimate regional control output and the specific economic activities that comprise the sector. Such information includes total output and employment data, where applicable, at the national, state, and local levels. Since total output per sector was obtained through either direct sources--in which case data are merely recorded--or by means of indirect estimation, the techniques for indirectly estimating output are given when necessary. In addition, location quotients, standard industrial classification codes, and BEA 1971 sector numbers are listed.

TABLE 1

BASIS OF MONETARY MEASUREMENT OF GROSS
OUTPUT TOTALS OF THE COASTAL REGION, 1972

Sector	Monetary Basis of Output Measurement
1	Value of landings
2	Value of forestry products sold by landowners
3	Total sales of counties (livestock sales)
4	Total sales plus value of government payments plus rental value received by farms
5-7, 18-20, 24-26, 18	Value of sales (gross receipts)
8-17	Value of shipments
21-23	Gross margin (receipts less cost of goods sold)
27-29	Total budget (expenditures)

SECTOR 1
FISHERIES

Regional Dollar Output Total: \$11,900,000
Source: [47], [48]

State Dollar Output Total: NA
Source:

National Dollar Output Total: NA
Source:

Regional Employment Total: NA
Source:

State Employment Total: NA
Source:

National Employment Total: NA
Source:

Location Quotient: NA

SIC code number(s): 091, 097

BEA 1971 National I/O Model number(s): Included in 3

Sector Composition:

- a. Commercial fishing
- b. Hunting, trapping, and Game propogation.

SECTOR 2

FORESTRY

Regional Dollar Output Total: \$7,900,000
Source: [22]

State Dollar Output Total: NA
Source:

National Dollar Output Total: NA
Source:

Regional Employment Total: NA
Source:

State Employment Total: NA
Source:

National Employment Total: NA
Source:

Location Quotient: NA

SIC code number(s): 081, 082, 084

BEA 1971 National I/O Model number(s): Included in 3

Sector Composition:

- a. Timber tracts
- b. Forest nurseries and tree seed gathering, extracting
- c. Gathering of miscellaneous forest products

SECTOR 3

LIVESTOCK & LIVESTOCK PRODUCTS

Regional Dollar Output Total: \$4,160,000
Source: [22]

State Dollar Output Total: NA
Source:

National Dollar Output Total: \$38,570,000,000
Source: [57]

Regional Employment Total: NA
Source:

State Employment Total: NA
Source:

National Employment Total: NA
Source:

Location Quotient: .3118

SIC code number(s): 021, 025 (except 0254), 027, 029

BEA 1971 National I/O Model number(s): 1

Sector Composition:

- a. Livestock
- b. Poultry and eggs (except poultry hatcheries)
- c. Animal specialties
- d. General farm, primarily livestock

SECTOR 4

CROPS & OTHER AGRICULTURE

Regional Dollar Output Total:	<u>\$1,582,000</u>
Source: [22], [43], [44]	
For explanation and computation see following discussion	
State Dollar Output Total:	<u>NA</u>
Source:	
National Dollar Output Total:	<u>\$34,183,000,000</u>
Source: [57]	
Regional Employment Total:	<u>NA</u>
Source:	
State Employment Total:	<u>NA</u>
Source:	
National Employment Total:	<u>NA</u>
Source:	
Location Quotient:	<u>.1138</u>
SIC code number(s): 01	
BEA 1971 National I/O Model number(s): 2	
Sector Composition:	
a. Agricultural production, crops	c. Fruits and tree nuts
b. Vegetables and melons	d. Horticultural specialties

CROPS AND OTHER AGRICULTURE

Local output for Crops and other Agriculture is defined as:

direct local output and payments from state to local area. Direct local output is \$1,510,000, and payments from state to local area for 1972 had to be estimated using 1969 data, since 1972 data are not available. The following procedure is followed:

Estimated state government payments (1972)

$$= \frac{\text{State Payments to Local Area, 1969}}{\text{Total State Farm Payments, 1969}} \times \text{Total State Farm Payments, 1972.}$$

$$= \frac{56,660}{99,571,956} \times 125,900,000 = \$71,763$$

Hence:

$$\begin{aligned} \text{local output} &= \text{Direct Local Output and Estimated State Government Payments} \\ &= 1,510,000 \text{ and } 71,763 = \$1,581,763 \\ &\approx \$1,582,000 \end{aligned}$$

References:

Direct Local Output: [22]

State Payments:

1969 data: [44]

1972 data: [43]

SECTOR 5

AGRICULTURE, FORESTRY, & FISHERIES SERVICE

Regional Dollar Output Total: \$1,667,000
 Source: [10], [43]
 See following discussion for calculation

State Dollar Output Total: NA
 Source:

National Dollar Output Total: \$3,225,000,000
 Source: [57]

Regional Employment Total: NA
 Source:

State Employment Total: NA
 Source:

National Employment Total: NA
 Source:

Location Quotient: 1.4941

SIC code number(s) 071, 072, 074, 075, 076, 078, 0254, 092, 085

BEA 1971 National I/O Model number(s): 4

Sector Composition:

- a. Soil and Crop preparation
- b. Veterinary and other animal services
- c. Farm labor and management services
- d. Landscape and horticultural services
- e. Poultry and fish hatcheries
- f. Forestry services

AGRICULTURE, FORESTRY & FISHERY SERVICES

Total output for Harrison & Jackson counties is known to be:

Harrison	\$339,000
Jackson	<u>\$661,000</u>
Total	<u>\$1,000,000</u>

However, no data were available for Hancock County. It is estimated to be \$667,000 using the following method:

County	Area (Square Miles)	Rural Population (Percentage)	Estimated Rural Land Area (Square Miles)	Estimated Rural Land Area (Percentage)
Hancock	482	.433	209	.40
Harrison	585	.170	99	.19
Jackson	736	.288	212	.41

Therefore, 60% of services in the area accounted for \$1,000,000:
From this, total service output is estimated to be

$$\frac{1,000,000}{.60} = \$1,667,000$$

Source:[10], [43]

SECTOR 6

MINING

Regional Dollar Output Total:	<u>\$9,458,000</u>
Source:	
State output $\times \frac{\text{Regional Employment}}{\text{State Employment}}$	
State Dollar Output Total:	<u>\$320,600,000</u>
Source: [39]	
National Dollar Output Total:	<u>\$32,723,000,000</u>
Source: [57]	
Regional Employment Total:	<u>180</u>
Source:[24]	
State Employment Total:	<u>6,100</u>
Source{52}	
National Employment Total:	<u>625,000</u>
Source: [51]	
Location Quotient:	<u>.2400</u>

SIC code number(s): 13, 14

BEA 1971 National I/O Model number(s): 5, 6, 7, 8, 9, 10

Sector Composition:

a. Oil and gas extraction

b. Mining and quarrying of non-metallic minerals and gravel

SECTOR 7

CONSTRUCTION

Regional Dollar Output Total: Source: [30]	<u>\$119,400,000</u>
State Dollar Output Total: Source:	<u>NA</u>
National Dollar Output Total: Source: [57]	<u>\$146,558,000,000</u>
Regional Employment Total: Source: [25]	<u>5,296</u>
State Employment Total: Source: [52]	<u>36,000</u>
National Employment Total: Source: [51]	<u>3,831,000</u>
Location Quotient:	<u>1.1540</u>

SIC code number(s): 15, 16, 17

BEA 1971 National I/O Model number(s): 11, 12

Sector Composition:

- a. New building construction
- b. General contractors

- c. Special trade contractors
- d. Maintenance and repair construction

SECTOR 8

FOOD PROCESSING

Regional Dollar Output Total: \$99,838,000
 Source:
 State output x $\frac{\text{Regional Employment}}{\text{State Employment}}$

State Dollar Output Total: \$956,300,000
 Source: [38]

National Dollar Output Total: \$109,981,000,000
 Source: [57]

Regional Employment Total: 2,015
 Source: [27]

State Employment Total: 19,300
 Source: [52]

National Employment Total: 1,739,000
 Source: [51]

Location Quotient: .9680

SIC code number(s): 20

BEA 1971 National I/O Model number(s): 14

Sector Composition:

- | | |
|------------------------------|------------------------------------|
| a. Meat and seafood products | e. Sugar and confectionary |
| b. Dairy products | f. Beverages |
| c. Bakery products | g. Miscellaneous food preparations |

SECTOR 9

APPAREL & OTHER FINISHED

Regional Dollar Output Total:	<u>\$9,915,000</u>
Source:	
State Output x $\frac{\text{Regional Employment}}{\text{State Employment}}$	
State Dollar Output Total:	<u>\$553,900,000</u>
Source: [38]	
National Dollar Output Total:	<u>\$32,557,000,000</u>
Source: [57]	
Regional Employment Total:	<u>734</u>
Source: [27]	
State Employment Total:	<u>41,100</u>
Source: [52]	
National Employment Total:	<u>1,374,000</u>
Source: [51]	
Location Quotient:	<u>0.4461</u>

SIC code number(s) 23

BEA 1971 National I/O Model number(s): 18, 19

Sector Composition:

- | | |
|---|--|
| a. Men's, youth's, and boy's outerwear and undergarments | d. Hats, caps, and millinery |
| b. Women's, misses', and juniors' outerwear and undergarments | e. Fur goods |
| c. Girl's, children's, and infants' outerwear | f. Miscellaneous fabricated textile products |

SECTOR 10

LUMBER AND WOOD

Regional Dollar Output Total:	<u>\$15,635,000</u>
Source:	
State Output x $\frac{\text{Regional Employment}}{\text{State Employment}}$	
State Dollar Output Total:	<u>\$655,200,000</u>
Source: [38]	
National Dollar Output Total:	<u>\$18,671,000,000</u>
Source: [57]	
Regional Employment Total:	<u>556</u>
Source: [27]	
State Employment Total:	<u>23,300</u>
Source: (52]	
National Employment Total:	<u>623,000</u>
Source: [51]	
Location Quotient:	<u>.7452</u>

SIC code number(s): 24

BEA 1971 National I/O Model number(s): 20, 21

Sector Composition:

- | | |
|----------------------------------|--|
| a. Logging camps and contractors | d. Wood containers |
| b. Sawmills and planing mills | e. Wood buildings and mobile homes |
| c. Millwork, veneer, and plywood | f. Miscellaneous wood products
(except furniture) |

SECTOR 11

PAPER & ALLIED PRODUCTS

Regional Dollar Output Total:	<u>\$81,038,000</u>
Source:	
State Output x $\frac{\text{Regional Employment}}{\text{State Employment}}$	
State Dollar Output Total:	<u>\$348,700,000</u>
Source: [38]	
National Dollar Output Total:	<u>\$27,625,000,000</u>
Source: [57]	
Regional Employment Total:	<u>1,650</u>
Source: [27]	
State Employment Total:	<u>7,100</u>
Source: [52]	
National Employment Total:	<u>689,000</u>
Source: [51]	
Location Quotient:	<u>2.00</u>

SIC code number(s): 26

BEA 1971 National I/O Model number(s): 24, 25

Sector Composition:

a. Industrial and coated paper

b. Paperboard containers and boxes

SECTOR 12

PRINTING AND PUBLISHING

Regional Dollar Output Total: \$6,003,000
 Source:

State Output x $\frac{\text{Regional Employment}}{\text{State Employment}}$

State Dollar Output Total: \$57,500,000
 Source:[38]

National Dollar Output Total: \$27,223,000,000
 Source: [57]

Regional Employment Total: 334
 Source:[27]

State Employment Total: 3,200
 Source: [52]

National Employment Total: 1,084,000
 Source:[51]

Location Quotient: .257

SIC code number(s): 27

BEA 1971 National I/O Model number(s): 26

Sector Composition:

- a. Newspapers and periodicals
- b. Commercial printing
- c. Miscellaneous publishing
- d. Manifold business forms
- e. Service industries for printing printing trade

SECTOR 13
CHEMICALS, PETROLEUM REFINING & RELATED

Regional Dollar Output Total:	<u>\$211,228,000</u>
Source:	
State Output $\times \frac{\text{Regional Employment}}{\text{State Employment}}$	
State Dollar Output Total:	<u>\$866,400,000</u>
Source: [38]	
National Dollar Output Total:	<u>\$92,230,000,000</u>
Source: [57]	
Regional Employment Total:	<u>1,682</u>
Source: [27]	
State Employment Total:	<u>6,900</u>
Source: [52]	
National Employment Total:	<u>1,202,000</u>
Source: [51]	
Location Quotient:	<u>1.168</u>

SIC code number(s): 28, 29

BEA 1971 National I/O Model number(s): 27, 28, 29, 30, 31

Sector Composition:

- | | |
|---|---|
| <ul style="list-style-type: none"> a. Industrial organic and inorganic chemicals b. Agricultural chemicals c. Plastics, synthetics and fibers d. Drugs e. Soap, detergents, cleaning preparations, and cosmetics | <ul style="list-style-type: none"> f. Paints, varnishes, lacquers, enamels, and related g. Petroleum refining h. Paving and roofing materials i. Miscellaneous petroleum products |
|---|---|

SECTOR 14

STONE, CLAY, GLASS

Regional Dollar Output Total:	<u>\$17,392,000</u>
State Output x $\frac{\text{Regional Employment}}{\text{State Employment}}$	
State Dollar Output Total:	<u>\$217,400,000</u>
Source: [38]	
National Dollar Output Total:	<u>\$19,093,000,000</u>
Source:[57]	
Regional Employment Total:	<u>528</u>
Source: [27]	
State Employment Total:	<u>6,600</u>
Source: [52]	
National Employment Total:	<u>659,000</u>
Source: [51]	
Location Quotient:	<u>.669</u>

SIC code number(s):32

BEA 1971 National I/O Model number(s): 35, 36

Sector Composition:

- | | |
|---|--|
| a. Glass and glassware: flat, pressed, and blown | e. Pottery and related products |
| b. Glass products made of purchased glass | f. Cut stone and stone products |
| c. Cement, concrete, gypsum, and plaster products | g. Abrasive, asbestos, and miscellaneous non-metallic mineral products |
| d. Structural clay products | |

PRIMARY & FABRICATED METALS

Regional Dollar Output Total: \$55,284,000
 Source:

State Output $\times \frac{\text{Regional Employment}}{\text{State Employment}}$

State Dollar Output Total: \$499,400,000
 Source: [38]

National Dollar Output Total: \$106,439,000
 Source: [57]

Regional Employment Total: 1,328
 Source: [27]

State Employment Total: 12,000
 Source: [52]

National Employment Total: 2,636,000
 Source: [51]

Location Quotient: .421

SIC code number(s): 33, 34

BEA 1971 National I/O Model number(s): 37, 38, 39, 40, 41, 42

Sector Composition:

- | | |
|---|--|
| a. Iron and steel foundries | e. Nonferrous foundries (castings) |
| b. Primary smelting and refining of nonferrous metals | f. Fabricated structural metal products |
| c. Secondary smelting | g. Metal cans and shipping containers |
| d. Rolling, drawing, and extruding of nonferrous metals | h. Metal forgings and stampings |
| | i. Miscellaneous fabricated metal products |

SECTOR 16

TRANSPORTATION EQUIPMENT

Regional Dollar Output Total: \$523,621,000
 Source:

State Output x $\frac{\text{Regional Employment}}{\text{State Employment}}$

State Dollar Output Total: \$681,000,000
 Source: [38]

National Dollar Output Total: \$92,343,000,000
 Source: [57]

Regional Employment Total: 18,299
 Source: [27]

State Employment Total: 23,800
 Source: [52]

National Employment Total: 1,772,000
 Source: [51]

Location Quotient: 8.621

SIC code number(s): 37

BEA 1971 National I/O Model number(s): 59, 60, 61

Sector Composition:

a. Ship and boat building and repairing

b. Miscellaneous transportation equipment

SECTOR 17

MISCELLANEOUS MANUFACTURING

Regional Dollar Output Total:	<u>\$28,622,000</u>
Source:	
State Output x $\frac{\text{Regional Employment}}{\text{State Employment}}$	
State Dollar Output Total:	<u>\$1,703,700,000</u>
Source: [38]	
National Dollar Output Total:	<u>\$218,360,000,000</u>
Source: [57]	
Regional Employment Total:	<u>1,017</u>
Source: [27]	
State Employment Total:	<u>60,600</u>
Source: [52]	
National Employment Total:	<u>7,312,000</u>
Source: [51]	
Location Quotient:	<u>.116</u>

SIC code number(s) : 22, 25, 30, 31, 35, 36, 38, 39

BEA 1971 National I/O Model number(s): 13, 15, 16, 17, 22, 23, 32, 33, 34, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 62, 63, 64

Sector Composition:

- | | |
|---|--|
| <ul style="list-style-type: none"> a. Furniture and fixtures b. Rubber and miscellaneous plastics products c. Leather and leather products d. Electrical and other machinery and equipment supplies | <ul style="list-style-type: none"> e. Measuring, analyzing, and controlling instruments; medic and optical goods; watches and clocks f. Miscellaneous manufacturing industries |
|---|--|

WATER TRANSPORTATION

Regional Dollar Output Total:	<u>\$25,070,000</u>
Source:	
State Output x $\frac{\text{Regional Employment}}{\text{State Employment}}$	
State Dollar Output Total:	<u>\$63,000,000</u>
Source: [54]	
National Output x $\frac{\text{State Employment}}{\text{National Employment}}$	
National Dollar Output Total:	<u>\$5,476,284,000</u>
Source: [54]	
Regional Employment Total:	<u>955</u>
Source: [29]	
State Employment Total:	<u>24,000</u>
Source: [42]	
National Employment Total:	<u>208,600</u>
Source: [51]	
Location Quotient:	<u>3.826</u>

SIC code number(s): 44

BEA 1971 National I/O Model number(s): Included in 65

Sector Composition:

- | | |
|--|-------------------------------|
| a. Deep Sea foreign and domestic transport | c. Local water transportation |
| b. Transportation on rivers and canals | d. Incidental services |

OTHER TRANSPORTATION AND WAREHOUSING

Regional Dollar Output Total:	<u>\$32,850,000</u>
Source:	
State Output x $\frac{\text{Regional Employment}}{\text{State Employment}}$	
State Dollar Output Total:	<u>\$599,470,000</u>
Source:[54]	
National Output x $\frac{\text{State Employment}}{\text{National Employment}}$	
National Dollar Output Total:	<u>\$142,190,827,000</u>
Source: [54]	
Regional Employment Total:	<u>564</u>
Source:[29]	
State Employment Total:	<u>10,300</u>
Source:[42]	
National Employment Total:	<u>2,443,100</u>
Source:[51]	
Location Quotient:	<u>193</u>

SIC code number(s): 40, 41, 42, 43, 45, 46, 47

BEA 1971 National I/O Model number(s): Included in 65

Sector Composition:

- | | |
|---|----------------------------------|
| a. Railroad transport | d. Air transportation |
| b. Local and suburban transit and interurban highway passenger transportation (bus, cab., etc.) | e. Pipelines, except natural gas |
| c. Motor freight and warehousing | f. Transportation Services |
| | g. U.S. Postal Service |

COMMUNICATIONS AND PUBLIC UTILITIES

Regional Dollar Output Total: \$121,866,632
 Source: For explanation and
 calculation, following page

State Dollar Output Total: NA
 Source:

National Dollar Output Total: \$85,030,000,000
 Source: [57]

Regional Employment Total: 2,457
 Source:[29]

State Employment Total: 16,000
 Source:[52]

National Employment Total: 1,865,300
 Source: [51]

Location Quotient: 1.100

SIC code number(s): 48, 49

BEA 1971 National I/O Model number(s): 66, 67, 68

Sector Composition:

- | | |
|--|---------------------------------------|
| a. Telephone and telegraph | f. Electric, gas, and other utilities |
| b. Radio and television | g. Water supply |
| c. Other communications services | h. Sanitary services |
| d. Electric power Services | i. Steam supply |
| e. Natural gas production & distribution | |

COMMUNICATION & PUBLIC UTILITY

U. S. Corporate Data:

Communication:	\$40,731,500,000
Public Utilities:	\$50,055,631,000
<u>Total</u>	<u>\$90,787,131,000</u>

Local Corporate Data:

$$\begin{aligned}
 & 90,787,131,000 \times \frac{\text{Local Employment}}{\text{National Employment}} \\
 & = 90,787,131,000 \times \frac{2457}{1,865,300} \\
 & = 90,787,131,000 \times .0013172 \\
 & = 119,584,809
 \end{aligned}$$

State Proprietorship:

$$\begin{aligned}
 & \text{Communication \& Public Utilities} = 14,599,000 \\
 & \text{Local Proprietorship: } 14,599,000 \times \frac{\text{Local Employment}}{\text{State Employment}} \\
 & = 14,599,000 \times .1563 = 2,281,823
 \end{aligned}$$

Therefore, total communication and public utility = 119,584,809 + 2,281,823 = \$121,866,632.

References: U. S. [55]
State: [54]

SECTOR 21

EATING & DRINKING PLACES

Regional Dollar Output Total: \$26,499,000
 Source:

State Output x $\frac{\text{Regional Employment}}{\text{State Employment}}$

State Dollar Output Total: \$99,100,000
 Source: [41], [54], [55]

For explanation and computation see discussion on following page

National Dollar Output Total: \$18,585,000,000
 Source: [41], [54], [55]

$$35.4 \times .525 = 18.585$$

Regional Employment Total: 3,851
 Source: [29]

State Employment Total: 14,400
 Source: [42]

National Employment Total: 2,850,700
 Source: [51]

Location Quotient: 1.128

SIC code number(s): 58

BEA 1971 National I/O Model number(s): Included with 69

- Sector Composition:
- a. Restaurants
 - b. Fast food franchises

c. Bars and taverns

EATING AND DRINKING PLACES

Establishments engaged in eating and drinking are in general composed of three types: proprietorships, partnerships and corporations. Their contribution to the economy is in the form of services. In order to estimate its dollar output, a criterion is used whereby total sales is multiplied by a coefficient representing the weighted margin of cost of goods sold divided by total sales. In order to compute this coefficient, allowance was made for the magnitude of the three different types of establishments. On a national basis these margins are: .46, .525, and .560 for proprietorships, partnerships, and corporations, respectively. The weighted margins for the U.S. are obtained as shown in the following table:

Computation of the Weighted Margin
for Cost of Goods Sold x Sales in U. S.
Eating & Drinking Places, 1972

Organization	Total Sales U. S. A. (Billions)	Percent of Total	U. S. Margin	Weighted U. S. Margin
Proprietorships	11.5	.3249	.460	.1495
Partnerships	2.8	.0791	.525	.0415
Corporations	21.1	.5960	.560	.3338
Total	35.4	1.0000		.5248 = .525

Using .525 as the weighted U.S. margin of the cost of goods sold to total sales, total sales for the State of Mississippi is adjusted accordingly as shown below:

Adjustment for Output in Mississippi
Eating & Drinking Places, 1972

Total State Output Unadjusted (Millions)	Margin	Total State Output Unadjusted (Millions)
188.7	.525	99.1

Finally, to obtain an estimate of the dollar amount of the services of eating and drinking places of the coastal region, the adjusted state output is multiplied by the ratio of regional employment to state employment, that is:

$$\text{Regional output} = \text{State output} \times \frac{\text{Regional Employment}}{\text{State Employment}}$$

Sources: U. S. Margins: [54], [55]

SECTOR 22
SERVICE STATIONS

Regional Dollar Output Total:	\$8,542,000
Source:	
State Output x $\frac{\text{Regional Employment}}{\text{State Employment}}$	
State Dollar Output Total:	\$54,100,000
Source: [41], [54], [55]	
For explanation and computation, see discussion on following page.	
National Dollar Output Total:	\$20,469,000,000
Source: [41], [54], [55]	
116.3 x .176 = 20.469	
Regional Employment Total:	979
Source: [29]	
State Employment Total:	6,200
Source: [42]	
National Employment Total:	651,900
Source: [51]	
Location Quotient:	1,254
SIC code number(s): 554	
BEA 1971 National I/O Model number(s): Included in 69	
Sector Composition:	
a. Gasoline service stations	

SERVICE STATIONS

Establishments engaged as service stations are in general composed of three types: proprietorships, partnerships and corporations. Their contribution to the economy is in the form of services. In order to estimate its dollar amount, a criterion is used whereby total sales is multiplied by a coefficient which is a weighted margin representing the cost of goods sold divided by total sales. In order to compute this coefficient, allowance is made for the magnitude of the three different types of establishments. On a national basis, these margins are: .215, .244, and .166, for proprietorships, partnerships and corporations, respectively. The weighted margin for the U. S. is obtained as shown in the following table:

Computation of the Weighted Margin
for Cost of Goods Sold to Sales in the U. S.
Service Stations, 1972

Organization	Total Sales U. S. A (Billions)	Percent of Total	U. S. Margin	Weighted U. S. Margin
			$\frac{\text{Cost of Goods Sold}}{\text{Total Sales}}$	
Proprietorships	20.7	.1780	.215	.0382
Partnerships	2.7	.0232	.244	.0057
Corporations	92.9	.7988	.166	.1326
Total	116.3	1.0000		.1765 \approx .176

Using the figure of .176 as the weighted U. S. margin of the ratio of goods sold to total sales, total sales for the state of Mississippi is adjusted accordingly as shown below:

Adjustment for Output in Mississippi
Service Stations, 1972

Total State Output Unadjusted (Millions)	Margin	Total State Output Adjusted (Millions)
307.3	.176	54.1

Finally, to obtain an estimate of the dollar amount of the services of service stations of the coastal region, the adopted state output is multiplied by the ratio of regional employment to state employment, that is:

$$\text{Regional output} = \text{State output} \times \frac{\text{Regional Employment}}{\text{State Employment}}$$

Sources: U. S. Margins: [54], [55]

SECTOR 23

WHOLESALE AND RETAIL TRADE

Regional Dollar Output Total:	<u>\$203,965,000</u>
Source:	
State Output x $\frac{\text{Regional Employment}}{\text{State Employment}}$	
State Dollar Output Total:	<u>\$1,764,400,000</u>
Source: [41],[54],[55]	
For explanation and calculation, see discussion on following page.	
National Dollar Output Total:	<u>\$189,715,000,000</u>
Source: [54], [55]	
807.3 x .235 = 189.715	
Regional Employment Total:	<u>11,603</u>
Source: [29]	
State Employment Total:	<u>100,400</u>
Source: [52]	
National Employment Total:	<u>12,472,000</u>
Source: [51]	
Location Quotient:	<u>.777</u>

SIC code number(s): 50, 51, 52, 53, 54, 55, 56, 57, 59

BEA 1971 National I/O Model number(s): Included in 69

Sector Composition:

- | | |
|---|--|
| a. Wholesale: durable and nondurable goods | f. Apparel and accessory stores |
| b. Building materials, hardware, garden supply, mobile home dealers | g. Furniture, home furnishings, and equipment stores |
| c. General merchandise stores | h. Miscellaneous retail |
| d. Food stores | |
| e. Automotive dealers | |

WHOLESALE/RETAIL TRADE

Establishments engaged in wholesale/retail trade are in general composed of three types: proprietorships, partnerships and corporations. Their contribution to the economy is in the form of services. In order to estimate its dollar amount, a criterion is used whereby total sales is multiplied by a coefficient which is a weighted margin of the cost of goods sold divided by total sales. In order to compute this coefficient, allowance for the magnitude of the three different types of establishments was undertaken. On a national basis, these magnitudes are: .258, .286, and .229 for proprietorships, partnerships and corporations, respectively. The weighted margin for the U.S. is obtained as shown in the following table:

Computation of the Weighted Margin
For Cost of Goods Sold to Sales in the U.S.
Wholesale/Retail Trade, 1972

Organization	Total Sales U. S. A. (Billions)	Percent of Total	U. S. Margin: <u>Cost of Goods Sold</u> Total Sales	Weighted U. S. Margin
Proprietorships	123.7	.1532	.258	.0396
Partnerships	23.6	.0292	.286	.0084
Corporations	660.0	.8175	.229	.1872
Total	807.3	1.0000		.2352 ≈ .235

Using the figure of .235 as the weighted U.S. margin of the ratio of goods sold to total sales, total sales for the state of Mississippi is adjusted accordingly as shown below:

Adjustment for Output in Mississippi
Wholesale/Retail Trade, 1972

Total State Output Unadjusted (Millions)	Margin	Total State Output Adjusted (Millions)
7,507.9	.235	1,764.4

Finally, to obtain an estimate of the dollar amount of the services of wholesale/retail trade of the coastal region, the adjusted state output is multiplied by the ratio of regional employment to state employment, that is:

$$\text{Regional Output} = \text{State Output} \times \frac{\text{Regional Employment}}{\text{State Employment}}$$

Sources: U.S. Margins: [54], [55]

SECTOR 24

FINANCE, INSURANCE & REAL ESTATE

Regional Dollar Output Total:	<u>\$110,902,000</u>
Source:	
State Output x $\frac{\text{Regional Employment}}{\text{State Employment}}$	
State Dollar Output Total:	<u>\$882,978,000</u>
Source:	
For explanation and computation, see discussion on following page	
National Dollar Output Total:	<u>\$158,886,000,000</u>
Source: [57]	
Regional Employment Total:	<u>3,101</u>
Source: [29]	
State Employment Total:	<u>27,400</u>
Source: [42]	
National Employment Total:	<u>3,943,000</u>
Source:[51]	
Location Quotient:	<u>.657</u>
SIC code number(s): 60, 61, 62, 63, 64, 65, 66, 67	
BEA 1971 National I/O Model number(s): 70, 71	
Sector Composition:	
a. Banking	e. Real estate
b. Savings institutions and credit agencies	f. Holding and other investment offices
c. Security and commodity brokers, dealers, exchanges and services	
d. Insurance, insurance agents, brokers and service	

FINANCE, INSURANCE & REAL ESTATE

Finance, Insurance & Real Estate is made up of: proprietorships, partnerships and corporate receipts. Data for the State of Mississippi are available for proprietorships and partnerships. Corporate data had to be found as a ratio of national data.

$$\frac{\text{State Employment}}{\text{National Employment}} = \frac{24,700}{3,943,000} = .00626$$

$$\frac{\text{Local Employment}}{\text{State Employment}} = \frac{3,101}{24,700} = .1256$$

National Corporate receipts: \$118,529,000,000

$$\begin{aligned} \text{Estimated State Corporate receipts} &= \\ 118,529,000,000 \times .00626 &= \$741,991,540 \\ &= 741,992,000 \end{aligned}$$

State receipts for finance, insurance, and real estate

Proprietorships	\$ 83,380,000
Partnerships	57,606,000
Corporate	<u>741,992,000</u>
Total:	\$882,978,000

$$\text{Estimated Local Output} = 882,978,000 \times .1256 = 110,902,000$$

HOTELS, MOTELS, AND LODGING

Regional Dollar Output Total: \$29,067,000
 Source:

State Output x $\frac{\text{Regional Employment}}{\text{State Employment}}$

State Dollar Output Total: \$71,400,000
 Source: [40]

National Dollar Output Total: NA
 Source:

Regional Employment Total: 2,524
 Source: [29]

State Employment Total: 6,200
 Source: [52]

National Employment Total: 868,300
 Source: [51]

Location Quotient: 2,427

SIC code number(s): 701

BEA 1971 National I/O Model number(s): 72

Sector Composition:

- a. Hotels
- b. Motels, tourist courts
- c. Camps

MEDICAL SERVICES

Regional Dollar Output Total:	<u>\$35,660,000</u>
Source:	
For explanation and computation, see discussion on following page	
State Dollar Output Total:	<u>NA</u>
Source:	
National Dollar Output Total:	<u>\$19,626,000,000</u>
Source: [53], [54]	
Regional Employment Total:	<u>1,779</u>
Source: [42]	
State Employment Total:	<u>16,200</u>
Source: [52]	
National Employment Total:	<u>3,426,600</u>
Source: [51]	
Location Quotient:	<u>.3490</u>

SIC code number(s): 80

BEA 1971 National I/O Model number(s): Included in 77.

Sector Composition:

- | | |
|--|-------------------------------------|
| a. Offices and physicians and dentists | e. Medical and dental laboratories |
| b. Osteopathic physicians and other health practitioners | f. Outpatient care facilities |
| c. Nursing and personal care facilities | g. Other health and allied services |
| d. Hospitals | |

MEDICAL SERVICES

Total receipts of medical services of the coastal region are obtained by projecting the dollar payroll of the region using a national coefficient. National data for 1972 are as follows:

Organization	Payroll (thousands)	Receipts (thousands)
Proprietorships	2,105,584	15,229,974
Partnerships	1,082,777	4,396,136
Total	3,188,361	19,626,110

$$\frac{\text{Payroll for Medical \& Health Services}}{\text{Total Receipts}} = \frac{3,188,361}{19,626,110} = .16245$$

Local payroll is obtained as follows:

Harrison County	\$4,436,000
Jackson County	1,260,000
Hancock County	97,000
Total	<u>\$5,793,000</u>

Therefore, an estimate of total receipts for medical and health services for the Coastal region is:

$$\frac{\text{Local Payroll}}{.16245} = \frac{5,793,000}{.16245} = \$35,660,000$$

It must be noted that total output for Medical Services does not include some government-administered hospitals and clinics such as the V.A. facilities. Such public sector services are allocated to the Federal Government sector.

References: [53], [54]

SECTOR 27

EDUCATIONAL SERVICES

Regional Dollar Output Total: \$38,016,000

Source: [23], [28]

For explanation and computation see following three pages

State Dollar Output Total: NA

Source:

National Dollar Output Total: NA

Source:

Regional Employment Total: 539

Source: [42]

State Employment Total: 6,700

Source: [42]

National Employment Total: 1,152,100

Source: [51]

Location Quotient: .3910

SIC code number(s): 82

BEA 1971 National I/O Model number(s) included in 77.

Sector Composition:

- | | |
|--|------------------------|
| a. Elementary and secondary schools,
all districts | d. Vocational schools |
| b. Colleges, universities, junior
colleges, special schools | e. University branches |
| c. Libraries and information centers | |

EDUCATIONAL SERVICES

Amount and Source of Expenditure Funds
For Educational Services

Institutional Category	State/Local Govt. Funds	Federal Govt. Funds	Non- Government Funds	Total Budget
<u>Separate School Districts^a</u>				
Biloxi	4,172,006	1,448,736		5,620,742
Gulfport	3,925,408	831,593		4,757,001
Pascagoula	4,431,773	247,147		4,678,920
Moss Point	3,031,602	240,748		3,272,350
Ocean Springs	1,664,158	272,225		1,936,383
Long Beach	1,693,538	186,467		1,880,005
Bay St. Louis	1,130,252	184,232		1,314,484
Pass Christian	946,110	128,651		
<u>County School Districts^a</u>				
Hancock	931,349	100,065		1,031,414
Harrison	3,611,405	597,368		4,208,773
Jackson	2,729,898	356,679		3,086,577
<u>Special Schools^a</u>				
Harrison County Excep. Children	246,826	62,720		309,546
<u>Junior/Senior Colleges^b</u>				
MGCJC ^c	3,199,309	548,453	822,680	4,570,442
USM - Gulf Park			275,000	275,000
Sector Total	31,713,634	5,205,084	1,097,680	38,016,398

a [23]

b Includes Vo-Tech schools

c [28]

EDUCATIONAL SERVICES

Educational services output in the Coastal region consists of expenditures by educational institutions such as separate school districts, county school districts, special schools, and junior-senior colleges. The total budget outlay for the school year 1971-1972 is established at \$38,016,398 as shown in the Table below. The amount and source of expenditures for separate school districts, county school districts, and special schools are obtained from published sources of the Mississippi State Department of Education. Data for the junior-senior colleges and vocational schools are estimated. Estimated expenditures for USM Gulf Park are provided by the University of Southern Mississippi. Expenditures by Mississippi Gulf Coast Junior College are derived below:

Estimation of Expenditures for Regional
Mississippi Gulf Coast Junior
College Campuses*

Of the total \$5,179,078 in expenditures by Mississippi Gulf Coast Junior College, .88247792 is allocated to the three campuses in the study area \$4,570,422

The approximate breakdown by source of these expenses is as follows:

State/Local funds, 70%	\$3,199,309
Federal Funds, 12%	548,453
Non-Government funds, 18%	<u>822,680</u>
Total	\$4,570,442

The sources of budget funds are are broken out in columns, one, two and three of the table as follows: (1) state and local government, (2) federal government, and (3) non-government. Thus, educational expenditures of

*Source: [28]

EDUCATIONAL SERVICES

\$5,205,084 backed by federal government funding are identified and must be netted out of output by the Federal Government Civilian sector to avoid double counting. Funds provided by state and local governments of \$31,713,634, the major source, are entered in the transactions table as purchases by the State and Local sector from Educational Services. Non-governmental funds such as tuition fees are included as consumption expenditures in the Household sector.

SECTOR 28

OTHER SERVICES

Regional Dollar Output Total:	<u>\$93,499,000</u>
Source:	
State Output x $\frac{\text{Regional Employment}}{\text{State Employment}}$	
State Dollar Output Total:	<u>\$467,359,000</u>
Source: [40]	
For explanation and computation, see following page	
National Dollar Output Total:	<u>\$59,107,000,000</u>
Source: [57]	
Regional Employment Total:	<u>10,767</u>
Source: [29]	
State Employment Total:	<u>53,800</u>
Source: [52]	
National Employment Total:	<u>8,813,300</u>
Source: [51]	
Location Quotient:	<u>1.0200</u>

SIC code number(s) : 71, 73, 75, 76, 78, 79, 81, 83, 84, 86, 88, 89

BEA 1971 National I/O Model number(s): 73, 75, 76 [sector 74 omitted by BEA]

Sector Composition:

- | | |
|--|---|
| a. Personal and business services | g. Social services |
| b. Automotive repair and garages | h. Museums, art galleries, botanical and zoological gardens |
| c. Miscellaneous repair services | i. Membership organizations |
| d. Motion pictures | j. Private household domestic services |
| e. Amusement and other recreational services | k. Miscellaneous services |
| f. Legal services | |

OTHER SERVICES

Total outlays for other services in 1972 for the Coastal region are obtained from state level data as follows:

State Total Services	\$538,759,000
Less: Hotel, Motel, Lodging	71,400,000
State "Other Services"	<u>\$467,359,000</u>

Source: [41]

Regional output = State output x $\frac{\text{Regional Employment}}{\text{State Employment}}$

$$= 467,359,000 \times \frac{10,767}{53,800} \approx \$93,499,000$$

SECTOR 29

STATE AND LOCAL GOVERNMENT

Regional Dollar Output Total: \$141,417,000
 Source:

For explanation and computations, see discussion on following page

State Dollar Output Total: NA
 Source:

National Dollar Output Total: NA
 Source:

Regional Employment Total: 8,159
 Source: [37]

State Employment Total: 30,000
 Source: [37]

National Employment Total: 5,020,000
 Source: [51]

Location Quotient: 1.3570

SIC code number(s) : No category

BEA 1971 National I/O Model number(s): 79

Sector Composition:

- a. County governments
- b. Municipal governments
- c. State government

STATE AND LOCAL GOVERNMENT

Output of state and local government is defined as the services contributed as indicated by total expenditures. For this study, state and local government include state, county, municipal and school districts. Not all direct data for receipts are available. In the case of counties, or municipalities, and school districts, it is considered that receipts are equal to expenditures, shown in detail below:

County Expenditures, 1972

Jackson	\$12,853,837
Hancock	3,756,694
Harrison	14,622,000
Total	<u>\$31,232,531</u>

Municipality Expenditures, 1972

Bay St. Louis	\$ 1,003,534	
Biloxi	14,900,965	
Gulfport	21,625,509	
Long Beach	3,726,256	
Moss Point	4,289,695	
Ocean Springs	1,154,396	
Pascagoula	7,276,371	
Pass Christian	1,752,000	(1973 estimate)
Waveland	346,565	
Total	<u>\$56,075,291</u>	

Separate School Districts Expenditures

Bay St. Louis	\$ 1,314,484
Biloxi	5,620,743
Gulfport	4,757,001
Long Beach	1,880,005
Moss Point	3,272,350
Ocean Springs	1,936,383
Pascagoula	4,678,920
Pass Christian	1,074,761
Total	<u>\$24,534,647</u>

Therefore, total expenditures by counties, municipalities, and school districts are:

Counties	\$ 31,232,531	
Municipalities	56,075,291	
School districts	24,534,647	
Total	<u>\$111,842,469</u>	≈ \$111,840,000

STATE & LOCAL GOVERNMENT

To estimate state receipts from the coastal region, tax data for 1972 are obtained as follows:

Taxes	Hancock	Harrison	Jackson	Total
Personal Income	314,213	3,796,014	3,290,952	7,401,179
Corporate Income	14,510	520,211	272,938	807,659
Franchise	32,490	178,965	84,134	295,589
Sales	1,790,748	20,954,907	12,082,834	34,828,489
Total	2,151,961	25,450,097	15,730,858	43,332,916

It is known that at the state level, **taxes** from personal income, corporate income, franchise and sales account for 70.7% of total state revenue as follows:

Corporate & personal	20.4%
Franchise	2.5
Sales	47.8
	<u>70.7%</u>

Therefore, estimated total state revenue from the coastal region is given by:

$$\frac{43,332,916}{.707} = \$61,291,000.$$

Adding direct regional revenues with state revenues we obtain:

Total state and local revenues

$$= \$111,840,000 + \$61,291,000$$

$$= \$173,131,000$$

In order to reflect educational activities as an independent sector in this study, state and local revenues are adjusted for such activities which are estimated to be \$31,714,000. The final figure for state and local revenue is then:

Total State & Local Revenues	\$173,131,000
Less Educational Expenditures	<u>31,714,000</u>
Adjusted State & Local Revenues	\$141,417,000

Sources: [30]

APPENDIX D

APPENDIX D

Estimation of Final Demand and Final Purchases

After aggregating and weighting the endogenous portion of the national model into 29 regionalized producing sectors, it is necessary to estimate exogenous sales and purchases made by non-producing sectors. Non-producing sectors include Households, Federal Government, and Import/Export. Sales per endogenous sector to non-producing sectors comprise final demand; purchases per endogenous sector from non-producing sectors represent final purchases or "value added." The study utilizes an approach outlined by Moore and Peterson, [31] with some modification in the handling of exports.

The first step involves the estimation of the total magnitude of final sales or purchases available within each endogenous sector. Second, final sector control totals must be established. Third, the control totals are allocated within the a priori quantity of final sales or purchases available for each sector. Finally, exogenous interactions between final demand and final purchases sectors are identified to balance the transactions table.

Final Demand

Final sales reflect exogenous demands for finished goods and services by final users and are composed of expenditures by Household, Federal Government, and Exports sectors. Final demand by Households is specifically defined

as annual personal consumption expenditures. Final sales to the Federal Government sector equal transfer and service expenditures by civilian and military installations such as payrolls, transfer payments, grants-in-aid, and construction activity. Export demand depicts sales by area firms to customers outside the Mississippi Gulf Coast region. The following discussion outlines the steps involved with estimating and allocating final demand parameters for the Mississippi Gulf Coast.

(1) To estimate the magnitude of total output per sector available for final demand, total intermediate demand (endogenous row total) must be subtracted from total output for each sector as shown in Table 1. For example, to estimate the amount of final demand in the Fisheries sector, total endogenous sales of \$11,818,000 shown in Column (2) are subtracted from total Fisheries output (sales) of \$11,900,000 in Column (1). This yields \$82,000 in Column (3) for allocation among final demand sectors.

As Column (3) shows, however, this procedure results in a negative final demand for the Forestry sector because endogenous sales exceed total sales. Other sectors displaying negative final demand after initial aggregation and weighting include: (1) Livestock and Livestock Products, (2) Crops, (3) Mining, (4) Water Transportation, and (5) Other Transportation and Warehousing. Negative final demand implies that the sector is a net importer, unable to provide enough output to meet area demand. Other possible explanations include distortions resulting from the multiplicative effect of using location quotients to weigh national coefficients and the aggregative effect of combined heterogeneous sectors at the two and three digit levels.

In addition, 21 other sectors were judged to have an insufficient amount of final demand and two sectors too much for the same reasons cited for the six negative sectors. Therefore, adjustments are made as shown in Columns (4) through (6). Seven sectors required no adjustment and are the same as Columns (2) and (3). The principal source of data used for adjustment is a survey of business firms in the Mississippi Gulf Coast region in 1976 [10]. Firms were queried as to what percentage of their total sales were made to customers outside the three-county area (Export demand). Thus, if the survey indicated that the Fisheries sector annually sold approximately \$2,500,000 to firms in Alabama and Louisiana, then final demand must allow at least enough to accommodate this amount. In addition, consumption demand by Households (Step three) provides another benchmark to key the adequacy of final parameters [9], [45], [49], [50]. Other checks of exogenous magnitudes are provided by several published studies of the Mississippi economy [4], [8], [10], [11], [33], [46], [56]. A final determinant is a first-hand knowledge of the structure of the Coastal economy by the researchers validated with phone calls to area firms and to the regional research and development center. The final column in Table 1 shows the magnitudes of final demand as a percent of total output per sector after all adjustments have been completed.

(2) A priori control totals for final expenditures must be computed for the Household and Federal Government sectors only. Exports do not need a controlling total because the study uses primary data on a per-sector basis which ultimately sums to an ex-post control total.

TABLE 1

ESTIMATION OF FINAL SALES AS A
PROPORTION OF TOTAL OUTPUT
(Thousands)

Sector	(1)	(2)		(3)		(4)		(5)	(6)
	Total Output	Unadjusted Endogenous Row Total	Unadjusted Final Demand	Unadjusted Final Demand	Adjusted Endogenous Row Total	Adjusted Final Demand	Adjusted Final Demand as Percent of Total Output		
Fisheries	11,900	11,818	82	82	8,217	3,683	31		
Forestry	7,900	16,614	-	8,714	7,896	4	*		
Livestock & Livestock Produce	4,160	8,717	-	4,557	2,700	1,460	35		
Crops & Other Agricultural	1,582	1,846	-	264	1,552	30	2		
Agricultural, Forestry & Fisheries	1,667	1,473	194	194	1,252	415	25		
Mining	9,458	12,156	-	2,698	2,669	6,789	72		
Construction	119,400	36,685	82,715	82,715	36,685	82,715	69		
Food Processing & Kindred Products	99,838	24,279	75,559	75,559	11,533	88,305	89		
Apparel & Other Finished Products	9,915	2,867	7,048	7,048	2,557	7,358	74		
Lumber & Wood	15,659	11,406	4,253	4,253	12,302	3,357	21		
Printing & Publishing	81,038	58,912	22,126	22,126	2,505	78,533	97		
Chemical, Petroleum & Allied Products	6,003	3,503	2,500	2,500	2,212	3,791	63		
Stone, Clay, & Glass	211,228	89,760	121,468	121,468	2,957	208,271	99		
Primary & Fabricated Metals	17,392	11,164	6,228	6,228	6,588	10,804	62		
Transportation Equipment	55,284	36,672	18,612	18,612	13,581	41,703	75		
Other Manufacturing	523,622	17,474	506,148	506,148	9,269	514,353	98		
Water Transportation & Other Transportation & Warehousing	28,622	8,103	20,519	20,519	8,103	20,519	72		
Communication & Public Utilities	25,070	34,024	-	8,954	19,417	5,653	23		
Eating & Drinking Places	32,850	44,593	-	11,743	27,395	5,455	17		
Service Stations	121,867	48,525	73,342	73,342	41,525	80,342	66		
	26,499	5,541	20,958	20,958	5,541	20,958	79		
	8,542	1,827	6,715	6,715	1,687	6,855	80		

TABLE 1 -- CONTINUED

Sector	(1) Total Output	(2) Unadjusted Endogenous Row Total	(3) Unadjusted Final Demand	(4) Adjusted Endogenous Row Total	(5) Adjusted Final Demand	(6) Adjusted Final Demand as a Percent of Total Output
Other Wholesale/Retail Trade	203,965	33,126	170,839	33,126	170,839	84
Finance, Insurance, Real Estate	110,900	46,702	64,198	46,702	64,198	58
Hotels, Motels, & Lodging	29,067	10,441	18,626	2,366	26,701	92
Medical Services	35,660	454	35,206	448	35,212	99
Educational Services	38,016	495	37,521	32,192	5,824	15
Other Services	93,499	77,649	15,850	40,074	53,425	57
State & Local Govt.	141,417	16,106	125,311	16,106	125,311	89

◊ Less than 1%

To estimate total household consumption expenditures in the three counties for 1972, it is assumed that aggregate spending patterns are fairly consistent with local patterns. As shown in the computations below, total personal income is multiplied by the national average propensity to consume in 1972 to yield regional personal consumption expenditures by Households of \$827,874,000. Total earned and unearned figures equal the sum of incomes received in Harrison, Hancock, and Jackson counties.

Household Consumption Expenditures, 1972

Gulf Coast Personal Income (\$Thousands)*

Earned	845,091
Transfers	+189,751
Total PI	<u>1,034,842</u>

National Average Propensity to Consume (\$Millions)**

Aggregate Non-Consumption:

Personal Taxes	142.2
Personal Savings	+49.7
Total Taxes & Savings	<u>191.9</u>

Aggregate Consumption:

1972 Personal Income (U. S.)	939.2
Taxes and Savings	-191.9
Consumption Expenditures	<u>747.3</u>

$$\text{APC: } \frac{747.3}{939.2} = .8$$

Household Control Total (\$Thousands)

$$\$1,034,842 \quad \times \quad .8 \quad = \quad \$827,874$$

*Source: [46]

**Source: [35]

Total Federal Government expenditures in the three county area in 1972 are provided by the office of the Congressman of the Fifth Mississippi Congressional District. It is noted that these figures reflect the total sector, including expenditures of both civilian and military installations. However, Federal Government military activities in the region such as Keesler Air Force Base and naval shipbuilding contracts are significant enough to warrant separation from civilian activity.

Harrison County	\$291,728,488
Hancock County	39,941,948
Jackson County	553,195,367
Total Fed. Govt.	\$884,865,803

To disaggregate the Federal Government sector into civilian and military installations, it is necessary to develop per-county ratios of personal income earned by civilian and military employees, respectively, to the total income earned by all Federal Government employees in 1972. Assuming a proportional relationship between income and expenditure in Harrison and Hancock Counties, these ratios are then applied to total federal expenditures for Harrison and Hancock Counties as shown in Table 2. Thus, for Harrison County incomes paid by military installations comprise about seventy percent of total government payrolls and seventy percent of county-wide federal expenditures, or \$204,210,000. The remaining 30 percent is allocated to the civilian sector. Proportionality is justified for these two counties because the incomes of the government employees are paid directly by the government installation, i. e., payrolls are a budgeted federal expenditure item.

TABLE 2
 ALLOCATION OF FEDERAL GOVERNMENT OUTPUT
 BETWEEN CIVILIAN AND MILITARY SECTORS
 (Thousands)

Income			Output		
Harrison County:	Personal Income	Percent Total	Sector	Expenditure	Percent Total
Civilian	59,989	30	Civilian	87,518	30
Military	141,623	70	Military	204,210	70
Total Fed. Gov't.	201,612	100	Total Fed. Gov't.	291,728	100
Income					
Hancock County:	Personal Income	Percent Total	Sector	Expenditure	Percent Total
Civilian	4,156	90	Civilian	35,948	90
Military	446	10	Military	3,994	10
Total Fed. Gov't.	4,602	100	Total Fed. Gov't.	39,942	100
Income					
Jackson County:	Personal Income	Percent Total	Sector	Expenditure	Percent Total
Civilian	5,438	62	Civilian	31,321	6
Military	3,328	38	Military	521,875	94
Total Fed. Gov't.	8,766	100	Total Fed. Gov't.	553,195	100

In Jackson County, Federal Government expenditures are dominated by U.S. Navy shipbuilding contracts to one large private firm in the Transportation Equipment sector. The use of income ratios to allocate proportionately the \$553,195,000 of federal expenditures would significantly understate military output at 38 percent and overstate civilian spending at 62 percent. This is because the payrolls of the private sector workers who produced the output for the government are not an expenditure item within the federal budget and, as such, are not reflected in the military category of published income data. For example, when the **Federal Military (NAVY)** lets massive shipbuilding contracts to the shipbuilding firm in the Transportation Equipment sector, it buys back the output **directly** from the endogenous firm and the firm, in turn, pays the workers' salaries. Thus, workers in the Transportation Equipment sector receive the incomes that should proportionately be allocated to the **Federal Military sector** to reflect military expenditures with income ratios.

Table 2 adjusts income ratios to the output column for Jackson County to register the interaction of the **Federal Government with the private sector** by adding to the amount already allocated by income ratios an estimate of the total contracts (output) awarded to the shipbuilding firm in 1972 as shown below.

$$\frac{\text{Shipbuilder Employment}}{\text{Transportation Sector Employment}} = \frac{17,600}{18,299} \approx 96\%$$

$$\begin{aligned} .96 \times \$532,622 &= \$502,677 - \text{Contracts Awarded} \\ &+ 19,198 - \text{Income Ratio Expenditure} \\ \hline &= \$521,875 - \text{Adjusted Military} \end{aligned}$$

Source: [27]

The firm's proportion of sector employment is multiplied by total sector output. The adjustment yields military expenditures of \$521,875,000 or 94 percent; the remaining \$31,321,000 or 6% is considered to be civilian expenditures.

TABLE 3
FINAL DEMAND CONTROL TOTALS: FEDERAL
GOVERNMENT EXPENDITURES
(Thousands)

	Output	Percent of Total
Civilian	149,582	17
Military	730,078	83
Total	879,660	100

Table 3 summarizes the results into control totals for Federal Government civilian and military installations by summing civilian and military expenditures, respectively, for all three counties. It is noted that \$5,205,000 must be subtracted from gross civilian expenditures of \$154,787,000 to avoid double counting of federal spending already accounted for in the Educational Services sector (see Educational Services, Appendix C).

(3) Component final demand expenditures must be allocated within control totals established for each final demand sector in step one. First, household consumption expenditures are allocated in accordance with (1) studies of urban and rural expenditures and income in the southern region, (2) economic studies of contiguous areas, and (3) the 1971 national input-output model [4], [8], [45], [49], [50], [56], [57]. Percentages are developed by dividing **Household**

expenditures per sector by total consumption. In the southern consumer studies only four sectors were adequately comparable with sectors in the present study.

Input-output studies of a sub-state region in Mississippi and the state of Alabama are then compared by sector and found to be consistent for sectors common to both studies [8], [9]. However, the two area studies contain only twelve common sectors. Furthermore, only four of these sectors are comparable to the southern consumption studies. Finally, the household column of the national 83-sector model is aggregated into percentages conforming to endogenous sectors in the present study and compared with consumption percentages in the other studies. In three out of four sectors corresponding across the board to all four studies, national percentages are not significantly different from regional ratios. Isolated comparisons of percentages between national sectors and any one or two corresponding area sectors exhibited seventy percent consistency, suggesting that national patterns apply at the local level within reasonable bounds. Therefore, initial estimates of Household final demand within the \$827,874,000 control total are developed from the national model whenever data are lacking. The results are shown in Column (1) of Table 4.

Allocations of exports are based on a survey of firms on the Mississippi Gulf Coast for an economic base study [10]. Firms in all three counties were queried concerning the percentage of annual sales made to customers outside the three county region. Survey sectors are then disaggregated to match the format of the present study and the percentages averaged. However, only

two-thirds of the endogenous sectors could be broken out. Weighted averages are used in heterogeneous sectors such as manufacturing whereas simple averages are used in homogeneous sectors such as trade and lodging.

Dollar estimates of exports are derived by multiplying sector output by averages derived from the survey. The final results comprise the unadjusted export column of Table 4.

Federal Government civilian and military expenditures are roughly estimated from the aggregated national model by dividing column entries by column totals. However, the assumption that national coefficients apply to the local economy for the Federal Government is not as justifiable as for Households because of liberation of activities and geographical aspects. Nevertheless, the allocations do provide a basis for judging the importance of the Federal Government and for allocating government as a residual. Column (3) in Table 4 shows regional Federal Government purchases computed from percentages of the aggregated national model. Civilian and military purchases are combined in the unadjusted column but are broken out in the adjusted Columns (6) and (7).

After the unadjusted final demand parameters are estimated in Columns (1), (2), and (3) of Table 4, final demand must be reallocated on the basis of regional adjustments. Basically, this is achieved by keying on at least two known parameters and entering the third as a residual. Data problems at the county level require much discretion in adjusting the sectors. For most sectors unadjusted Households and Exports are adjusted and pegged as knowns. Then, Federal Government Civilian and Military purchases are entered as residuals based on control total proportion when local data

or prior knowledge is insufficient. This differs from an approach outlined by Moore and Peterson by treating exports as a known to capitalize upon primary survey data [31].

For example, of the \$82,715,000 of final demand available in the Construction sector, \$41,394,000 of Household expenditures and \$20,298,000 of Export demand estimated in Table 4 are entered in the appropriate adjusted cells. This leaves \$21,023,000 for Federal Government purchases. Control total proportioning gives \$3,574,000 and \$17,449,000 to the civilian and military sectors, respectively. Regional building permit data indicate, however, that control total proportioning would understate civilian construction expenditures [26]. With this information civilian purchases are adjusted upward to \$9,020,000.

For sectors in which the Federal Government is known to be a significant buyer, either Exports or Households are entered as residuals and/or adjusted downward. For example, it is known that the Federal Military bought an estimated \$502,667,000 directly from one firm in the Transportation Equipment sector (see page 100). Furthermore, the size and composition of the export sample is judged inadequate to infer sector characteristics. In addition, information provided by the regional R & D Center suggests that the civilian sector does not purchase from the Transportation Equipment sector and that unadjusted Household purchases may be understated. Adjustments within the allotted \$514,853,000 of final demand include subtracting estimated naval contracts of \$502,667,000 from unadjusted exports and allocating it to the Federal Military and then increasing Households one million to \$1,764,000. This leaves a residual of \$9,922,000 for Exports.

TABLE 4
ALLOCATION OF FINAL DEMAND: HOUSEHOLD, FEDERAL GOVERNMENT,
AND EXPORT EXPENDITURES

Sector	(1) Unadjusted Households	(2) Unadjusted Exports	(3) Unadjusted Federal Gov't.	(4) Adjusted Household	(5) Adjusted Exports	(6) Adjusted Civilian Gov't.	(7) Adjusted Military Gov't.
Fisheries	1,118	e	4,291	1,110	2,500	0	73
Forestry	a	e	a	4	0	0	0
Livestock & Livestock Products	2,301	c	88	1,301	71	15	73
Crops & Other Agriculture	6,002	e	1,313	24	2	1	3
Ag., Forestry & Fisheries Serv.	198	e	161	229	3	15	168
Mining	132	e	1,453	132	5,204	0	1,453
Construction	41,394	20,298	82,728	41,394	20,298	9020	12,003
Food Processing & Kindred	93,066	73,780	8,218	13,524	73,780	1	1,000
Apparel & Other Finished	26,840	9,707	6,146	550	5,395	524	889
Lumber & Wood	546	5,434	469	246	3,046	0	65
Paper & Allied	2,492	81,038	2,149	10	78,523	0	0
Printing & Publishing	6,482	747	4,356	2,404	720	287	380
Chemical, Petroleum, Allied	28,627	208,270	48,167	10	208,256	2	3
Stone, Clay & Glass	861	9,061	470	861	9,473	105	365
Primary & Fabricated Metals	2,078	41,463	12,073	180	41,463	10	50
Transportation Equipment	764	516,815	502,677	1,764	9,922	0	502,667
Other Manufacturing	48,422	28,622	44,170	3,016	17,468	10	25
Water Transportation	11,590	25,070	59,132	367	5,261	0	25
Other Transportation & Warehousing	b	1,905	b	1,550	2,905	250	750
Communications & Public Utilities	40,566	2,010	16,291	57,566	2,010	4,753	16,013
Eating & Drinking Places	c	e	c	7,423	13,250	43	242
Service Stations	c	e	c	4,100	2,485	46	224
Wholesale & Retail Trade	182,132	20,845	18,993	149,982	18,357	425	2,075
Finance, Insurance, & Real Estate	166,833	13,752	12,514	57,098	6,100	170	830
Hotels, Motels, & Lodging	22,005	25,288	11,262	1,163	25,288	43	207
Medical Services	72,853	c	34,037	32,644	1,500	258	810
Educational Services	d	e	d	619	0	5,205	0
Other Services	39,986	11,024	51,064	39,986	10,939	425	2,075
State & Local Government	3,742	e	4,192	63,637	61,237	75	362

aDue to a lack of comparable disaggregation, Forestry is included in Fisheries initially.

bOther Transportation and Warehousing is included in Water Transportation.

cEating & Drinking and Service Stations are included in Wholesale and Retail.

dEducational Services are included in Medical Services.

eCategory cannot be broken out from sample.

In dealing with final demand sectors, discretion is used in adjusting survey-based exports depending on factors such as survey coverage, sample composition, and secondary data reliability for Households and Federal Government. For all agricultural sectors Exports are residual.

Final Purchases

Final purchases reflect the net value added to production by non-producing sectors after intermediate inputs are supplied by endogenous sectors. Final purchases from Households are composed of wages and salaries paid to workers by firms in each sector. Value added by the Federal Government is estimated as sector tax payments. Imports comprise the residual necessary to make purchases (input) equal to sales (output) and reflects purchases of labor, materials, and other inputs outside the study region. In addition, Imports also include other net value added and expense items such as profit and depreciation.

(1) To estimate the total amount of final purchases per sector, total intermediate purchases (endogenous column total) are subtracted from total purchases (total output) as shown in Appendix Table 5. No adjustments are required because rows have been adjusted previously to estimate final demand.

Thus, the Fisheries sector pays out approximately \$7,733,000, or 65 percent of total outlays, to Households, Federal Government, and Imports as wages, taxes, and inputs outside the area, respectively. Final purchases as a percent of total purchases are consistent with local patterns and regional studies of similar areas.

TABLE 5

ESTIMATION OF FINAL PURCHASES AS A PROPORTION
OF TOTAL PURCHASES

Sector	Total Purchases	Endogenous Column Total	Final Purchases	Percent of Total Purchases
Fisheries	11,900	4,167	7,733	65
Forestry	7,900	876	7,024	89
Livestock, Livestock Products	4,160	2,125	2,035	49
Crops, Other Agricultural	1,582	531	1,051	66
Agricultural, Forestry, Fisheries Products	1,667	114	1,553	93
Mining	9,458	2,202	7,256	77
Construction	119,400	34,670	84,730	71
Food Processing,	99,838	30,400	69,438	70
Apparel, Other Finished	9,915	2,150	7,765	78
Lumber, Wood	15,655	6,350	9,309	59
Paper, Allied	81,038	18,212	62,826	78
Printing, Publishing	6,003	1,472	4,531	75
Chemical, Petroleum, Allied	211,228	39,702	171,526	81
Stone, Clay, Glass	17,392	4,907	12,485	72
Primary, Fabricated Metals	55,284	14,301	40,983	74
Transportation Equipment	523,622	31,026	492,596	94
Other Manufacturing	28,622	6,067	22,555	79
Water Transportation	25,070	9,465	15,605	62
Other Transportation, Warehousing	32,850	9,560	23,290	71
Communication, Public Utilities	121,867	9,459	112,408	92
Eating, Drinking Place	26,499	7,309	19,190	72
Service Station	8,542	2,115	6,427	75
Other Wholesale/Retail Trade	203,965	31,913	172,052	84
Finance, Insurance, Real Estate	110,900	23,350	87,550	79
Hotels, Motels, Lodging	29,067	6,836	22,231	76
Medical Services	35,660	7,050	28,610	80
Educational Services	38,016	7,704	30,312	80
Other Services	93,499	17,636	75,863	81
State & Local Govt.	141,417	67,488	73,929	52

(2) The control total for Households is roughly equivalent to personal income earned and unearned for all three study counties in 1972. Earned and unearned income of \$845,091,000 and \$189,751,000 respectively, total \$1,034,842,000 (see Final Demand, Step 2).

Federal Government requires only one control total. There is no need to identify civilian and military subsectors because taxes are paid to one government entity. Thus, the combined government budget of \$879,660,000 computed previously is assumed to equal government tax revenues. Actually, expenditures greatly exceed revenues in the area, the difference being "exported" taxes collected in other regions and spent locally.

(3) Allocations of personal income earned by Households per sector are made according to industry classifications published at the county level by the Bureau of Economic Analysis [46]. Disclosed sectors common to all three counties are summed.

However, it is necessary to estimate personal income for undisclosed sectors such as Mining, Finance, and Other Services. Because these sectors are included in the BEA's private industry category, private personal income is used as a sub-control total. Ratios or averages of ratios of undisclosed sector income to total private sector income are developed from BEA data columns of years containing disclosed figures for all sectors. The respective ratios corresponding to the undisclosed 1972 sectors are then multiplied by 1972 total private income. If no disclosed ratio corresponds to a single undisclosed sector, the sum of ratio-estimated undisclosed sectors may then be subtracted from the total amount of personal income undisclosed to account for the remaining unknown sector.

For example, to estimate Mining and Other Services personal income in Jackson County, a five year average of Other Services income to total private income is applied to 1972 total private county income to derive Other Services. This amount is then subtracted from the total quantity of undisclosed personal income to yield income earned in the Mining sector. Similar processes are executed for the other two counties and the results summed to give regional personal income earned in these sectors.

After BEA industries for all three counties are summed, earned incomes in additional sectors are broken out according to output proportion to match the desired level of disaggregation. The final results are presented in Column (1) of Appendix Table 6.

Government tax revenues are allocated by proportioning down taxes paid by industries at the national level to the local level with employment ratios. In Appendix Table 7, for example, total federal taxes paid by the Construction industry of \$2,905,764,000 in Column (8) are multiplied by the ratio of coastal employment to national employment in Column (9) to give \$4,017,000 in federal taxes paid by regional Construction firms. The total is composed of taxes paid by corporations, partnerships, and proprietorships. Proprietorship and partnership taxes at the national level are estimated by applying corporate income tax as a percentage of taxable income to proprietorship and partnership taxable income. Corporate tax rates are assumed to be comparable to other business tax rates. Where more disaggregation is desired, as in Fisheries, Forestry, Livestock, and Crops, the needed sectors are broken out with output proportion in Column (2) of Table 6.

TABLE 6
 ALLOCATION OF FINAL PURCHASES: HOUSEHOLD, FEDERAL
 GOVERNMENT AND IMPORT INCOME

Sector	(1)			(2)			(3)			
	Households	Federal	Government	Households	Federal	Government	Households	Federal	Government	Imports
Fisheries	2,795		336							4,602
Forestry	1,855		223							4,946
Livestock, Livestock Products	977		117							941
Crops, Other Agricultural	372		45							634
Agricultural, Forestry, Fishery Products	391		139							1,023
Mining	1,084		446							5,726
Construction	51,352		4,017							29,361
Food Processing	26,854		2,176							40,408
Apparel & Other Finished	2,667		524							4,574
Lumber & Wood	4,205		532							4,572
Paper & Allied	21,797		1,564							39,465
Printing & Publishing	1,614		332							2,585
Chemical, Petroleum, Allied	56,807		7,170							107,549
Stone, Clay, Glass	4,678		493							7,314
Primary & Fabricated Metals	14,865		960							25,158
Transportation Equipment	140,840		37,227							314,529
Other Manufacturing	7,699		1,234							13,622
Water Transportation	10,959		378							4,268
Other Transportation, Warehousing	14,361		1,111							7,818
Communication, Public Utilities	9,442		4,520							98,446
Eating & Drinking Places	10,096		1,151							7,943
Service Stations	3,238		371							2,818
Other Wholesale/Retail Trade	77,705		8,863							85,484
Finance, Insurance, Real Estate	23,246		5,561							58,743
Hotels, Motels, Lodging	12,707		1,353							8,171
Medical Services	15,626		1,664							11,320
Educational Services	16,656		1,774							11,882
Other Services	40,869		4,351							30,643
State & Local Govt.	54,354		43							19,532

TABLE 7
FEDERAL INCOME TAXES PAID 1972
(Thousands)

	(1) Nat'l. Corp. Taxable Income ^a	(2) Income Taxes Corp., a Nat'l.	(3) Tax as % of Taxable Income (2/1)	(4) Nat'l. Part- nership Taxable Income ^b	(5) Partner- ship In- come Tax [4x3]	(6) Nat'l Pro- prietorship Taxable Income ^b	(7) Proprietor- ship Income Tax [6x3]	(8) Total Income Tax Nat'l. [2.5+7]	(9) Regional Adjust- ment:		(10) Regional Tax [8x9] (000's) ^c
									Reg. Emp.	Nat'l. Emp.	
Fisheries, Forestry, Livestock, Crops	348,397	128,665	.36930571	662,041	244,496	4,755,811	1,756,348	2,129,509	.0003386	.0003386	721
Ag., For., Fisheries	153,621	57,738	.37584705	86,890	32,657	473,185	177,845	268,240	.0005168	.0005168	139
Mining	3,635,671	1,740,472	.47872098	-385,716	-184,560	-13,223	-6,330	1,549,581	.00028800	.00028800	446
Construction	2,391,363	942,508	.39413004	907,826	357,802	4,073,412	1,605,454	2,905,764	.00138241	.00138241	4,017
Food Processing, Kindred	3,962,289	1,049,418	.46675495	52,156	24,344	37,958	17,717	1,877,955	.00115871	.00115871	2,176
Apparel, Other Fin. Text.	2,059,448	937,859	.45539339	44,250	20,151	51,729	23,557	981,567	.00053421	.00053421	524
Lumber & Wood	1,202,012	475,801	.39563715	99,025	39,198	206,330	81,673	596,672	.00089246	.00089246	532
Paper-Allied	1,492,303	653,301	.4377804					653,301	.00239478	.00239478	1,564
Print.-Publish	2,144,709	977,142	.45560587	49,377	22,496	167,871	76,483	1,076,121	.00030812	.00030812	332
Chem. Petro	10,558,424	5,120,756	.48499246	787	382	5,638	2,734	5,123,872	.00139933	.00139933	7,170
Stone, Clay, Glass	1,268,856	582,146	.45879595	20,953	9,613	52,307	23,998	615,757	.00080121	.00080121	493
Prim. Fab. Metal.	3,899,730	1,795,065	.46030494	45,496	20,942	89,484	41,190	1,905,491	.00050379	.00050379	960
Transportation Equip.	7,531,186	3,598,466	.47780867	-12,130	-5,796	25,625	12,244	3,604,914	.01032675	.01032675	37,227
Other Mfg.	18,594,729	8,771,700	.4717304	97,846	46,157	125,052	58,991	8,876,848	.00013909	.00013909	1,234
Water Transp.	158,600	70,502	.4445271	16,696	7,422	10,611	4,717	82,641	.00457814	.00457814	378
Other Transp. & Whse.	9,126,770	4,292,608	.4703315	127,133	59,795	981,805	461,774	4,814,177	.00023085	.00023085	1,111
Comm. & Pub. Util.	7,084,618	3,368,501	.4754668	25,283	12,021	107,791	51,251	3,431,773	.00131721	.00131721	4,520
Wholesale, Retail Trade	13,648,213	5,700,493	.4176732	2,221,340	927,794	8,300,117	3,466,736	10,095,023	.00102870	.00102870	10,385
Fin., Ins., Real Estate	13,773,394	5,933,209	.4307731	-949,200	-408,890	3,591,823	1,547,261	7,071,580	.00078646	.00078646	5,561
Other Services	2,665,456	1,062,887	.3987636	4,672,278	1,863,134	7,778,231	3,101,675	6,027,696	.0015166	.0015166	9,142
Educational Services	34,582	12,971	.3752530	12,843	4,744	179,168	67,233	84,948	.0005806	.0005806	49
Medical Services	328,172	98,107	.2989499	1,777,811	531,476	7,830,024	2,340,785	2,970,368	.0005191	.0005191	1,542

a(55: pp. 10-15)

b(54: pp. 6-9, pp. 83-86)

cSee Appendix C, Sector Output

(4) The final step involves accounting adjustments to specify exogenous interactions between final demand and final purchases sectors. These adjustments are necessary to balance the transactions matrix. For example, summing tax revenues across the federal government final purchases row results in \$88,675,000, far short of the control total of \$879,660,000. Furthermore, summing down the government final demand columns (civilian and military) yields expenditures of \$564,513,000, also short of the control total. This discrepancy reflects the fact that expenditures exceed revenues in the region.

To balance the table the transactions matrix is adjusted to register exported taxes that are collected in other regions but spent locally by entering as government exports \$641,107,000 of taxes collected from outside sources. Federal income taxes paid by households of \$149,781,000 and token amounts paid by civilian and military installations are then entered to complete the balancing process for the government row. Similarly, Federal Government final demand columns are adjusted by accounting for \$314,966,000 in federal government payrolls and transfer payments (unearned income) which increase expenditures to the control total. Other balancing adjustments include entering \$195,199,000 in the import cell of the household final demand column to represent that portion of consumption spent outside the study area, and \$89,765,000 in the export cell of the household purchases row to account for "exported" income earned by those residing outside the region.

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