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Multiregional Input-Output Accounts, 1977 - Volumes 2 - State Estimates of Outputs, Employment and Payrolls

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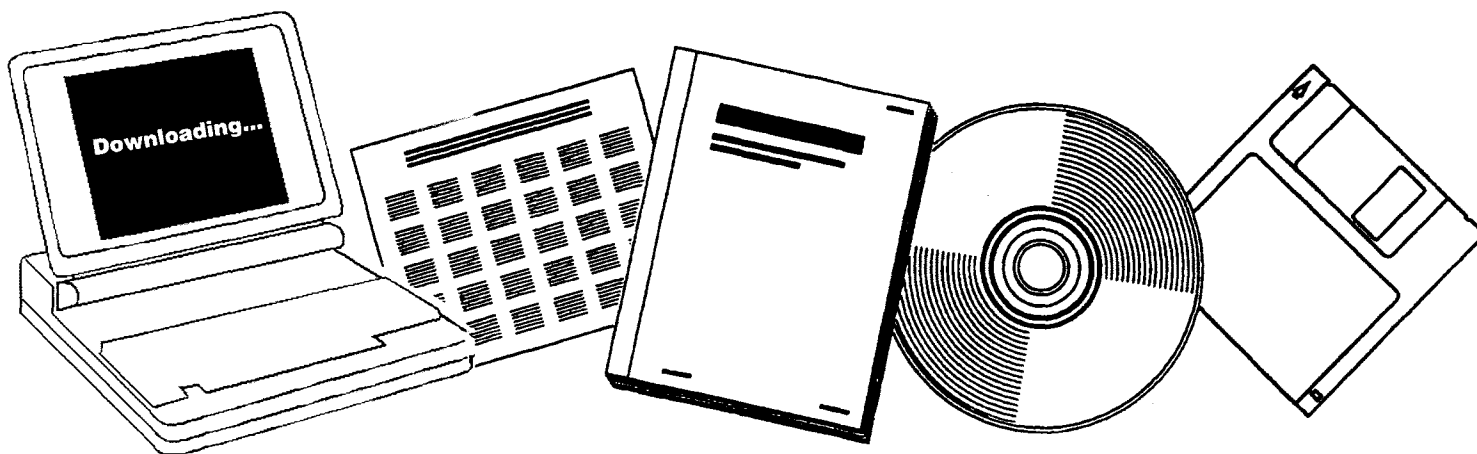
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**MULTIREGIONAL INPUT-OUTPUT ACCOUNTS, 1977.
VOLUME 2. STATE ESTIMATES OF OUTPUTS,
EMPLOYMENT AND PAYROLLS**

FAUCETT (JACK) ASSOCIATES, INC.
CHEVY CHASE, MD

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STATE ESTIMATES OF OUTPUTS, EMPLOYMENT AND PAYROLLS

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200 Independence Avenue, S.W.
Washington, D.C. 20201

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Submitted by

JACK FAUCETT ASSOCIATES

5454 Wisconsin Avenue
Chevy Chase, Maryland 20815
(301) 657-8223

Jack G. Faucett, Project Director

Linda K. Lent, Assistant Project Director

Harry J. Chmelynski, Assistant Project Director

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16. Abstracts <p>The multiregional Input-Output (MRIO) accounts provide estimates for 1977 of (1) output (by industry and commodity), (2) value added, (3) intermediate uses, and (4) final uses of goods and services, by sector and state. Interregional flows balance the production and consumption of goods and services between states. The project was also supported by the Department of Commerce (Economic Development Administration), the Federal Emergency Management Administration, and the Army Corps of Engineers.</p> <p>This volume explains the methodology used to develop state output, employment, and payroll measures for the MRIO accounts.</p>				
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The methods and procedures described in this report and the data compiled in accordance with these procedures were developed by Jack Faucett Associates (JFA) for the Department of Health and Human Services (HHS). The data development described herein was directed by Jack G. Faucett with the assistance of Linda K. Lent and Harry J. Chmelynski. Members of the staff responsible for significant portions of statistical research include Geoffrey Back, Barbara Coates, Monica Hawley, Jack Kurtz, Ida Pepperman, Dave Robie and Jon Skolnik. Nathaniel Ng, Prakash Sanghvi, and Robert Drzyzgula provided programming support for all data development. Advisory support was provided by several members of our Research Advisory Board, notably Roger Bolton, Jack Alterman and Saul Gass. In addition, Karen R. Polenske of MIT provided valuable advice and suggestions. Further support was provided by our government advisory panel, especially Paula Young of BEA and representatives from HHS and other agencies involved in data development for the Federal Government.

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CHAPTER 1

INTRODUCTION AND SUMMARY

This report explains the methodology used to develop state output, employment and payroll measures for the Multiregional Input-Output (MRIO) model under development by Jack Faucett Associates (JFA) for the Office of the Assistant Secretary for Planning and Evaluation, Department of Health and Human Services. Data were developed for 119 sectors, MRIO Sectors 001-119 as listed in Appendix A. This report is one in a series that document the development of the MRIO model, other reports are available upon request to JFA. JFA welcomes comments on this report and requests that any suggestions or criticism be submitted to the authors.

A computer tape containing the data developed according to the methods and procedures described herein was submitted to the Department of Health and Human Services along with this report. Users of these data should note carefully the data limitations indicated throughout this report and should also be aware that all data are preliminary and are currently under revision based on the results of the internal consistency checks described later in this chapter. Nonetheless, users are encouraged to notify cognizant JFA staff of any problems, errors or inconsistencies found upon examination of these data.

The output, employment and payroll data developed within this study provide a measure of 1977 activity by state for each MRIO sector. Output is measured in 1977 dollars, employment in number of employees or in some cases, full-time equivalent employees for 1977 and payroll in 1977 dollars. Employment and payroll data represent only paid employees, i.e., no estimation is made for self-employment or unpaid workers. Where data were available, a further estimate of production/nonsupervisory workers, worker hours and payroll was included. Because no other data base precisely follows the definitions and coverage of the sectors developed in this study, this data base is not readily comparable to any existing data set.

The data development described in this study was formulated according to two primary goals:

- (1) Choice of the best available data sources that will facilitate future updates of the model, and
- (2) Development of procedures within the model that will minimize "manipulation" of data and thereby maintain as far as possible the integrity of the initial data sets.

In pursuit of these goals, data sets that could not be expected to be available in future years were not considered suitable for inclusion. Moreover, procedures used to handle data within the model were also carefully scrutinized to avoid choices that could result in "apparent" adherence to theory or convention but in application result in the distortion of hitherto reliable data sets.

Data Source Selection

The data for this study have been selected so as to minimize difficulty in updating and maintain the highest possible level of accuracy. Thus, sources that could not be expected to be available for future updates were avoided except where these sources represented the only available source of data. Furthermore, every effort was made to locate common sources for each of the requisite data items, i.e., output, employment and payroll. The source that provides the best "fit" with the requirements of data development within the MRIO is the quinquennial Bureau of the Census data, e.g., the Census of Manufactures, and the Census of Service Industries. Therefore, Census data were used wherever possible in the development of requisite data.

Where Census data were unavailable, in whole or in part, other reliable data sources were sought. For the measurement of output it was usually necessary to make use of industry-specific data, e.g., U.S. Department of Agriculture for crop data and insurance association data for life insurance. Internal Revenue Service data were used in some cases to develop output data, but because of the sample selection technique and IRS coverage of company rather than establishment data, the appropriateness of these data is considerably limited.

If output data sources included employment data (number of employees and/or payroll), these data were also developed. However, use of employment data from industry-specific sources was made only after the data were compared with large scale employment data sources such as the Bureau of the Census' County Business Patterns or the Bureau of Labor Statistics' Employment and Earnings. The appropriateness of these large scale data sources as a mode of comparison or as a primary data source is described below.

In sectors where Census or other output data sources did not include data on employment and payroll, or where primary data required refinements due to suppression or combination, employment and payroll data were frequently drawn from the Bureau of the Census' County Business Patterns (CBP) or the Bureau of Labor Statistics' Employment and Wages data. CBP data were drawn from hard copy and cover most industries by state by four-digit SIC. The data are based on first-quarter FICA taxable payroll data supplemented by data collected by the Bureau of the Census' Annual Organization Survey. Data are tabulated on an establishment basis and are suppressed for any state having less than 50 employees within an industry.

Data from the Bureau of Labor Statistics were developed from ES-202 (Unemployment Insurance) data (referred to as UI data) from microfiche (Annual Averages 1977) or from Computer Tape No. 120380 (Monthly Employment and Quarterly Wage Data.) These data are developed for workers covered by state unemployment insurance laws and for Federal civilian workers covered by the Unemployment Compensation for Federal Employees program. The number of employees includes supervisory and nonsupervisory workers as well as employees on leave and part-time employees. The data are reported by individual establishments and workers are reported in the state of the physical location of the job. Total wages are reported by calendar quarters for all services performed. Within the UI tape, data are provided by four-digit SIC by state and are suppressed only where fewer than three establishments have reported.

Since the relative quality of data sources (particularly for nonmanufacturing sectors), varied considerably, all data developed in the initial data file were systematically ranked. A numerical quality code (1 to 4) was assigned by the sector analysts to each of the output, employment and payroll data items for each state, MRIO cell. In the case of manufacturing data, codes were assigned at the four-digit SIC levels. The quality code was based on the following guidelines:

- (1) Data item at the state/sector level comes directly from a quality data source. Or, data of this description was adjusted by estimation or imputation for only a very small (less than five percent of national MRIO sector total) subcomponent of the MRIO sector.
- (2) Data items were imputed due to suppression in primary source. Imputation of the residual national sector amount to missing states was accomplished by pro-rating based on another quality, state-level data source.
- (3) Quality data (type 1 or 2 above) were available for all subcomponents of an MRIO sector except for a small (less than 20 percent) subcomponent. For this subcomponent, state data were generated from a quality national level source and prorated to states using the state level variation in the value of a comparable item, also from a quality source.
- (4) All other data, not necessarily "bad" data, but data whose quality is unknown.

The assignment of a quality code to each data item provides an avenue whereby selective adjustment of relatively weaker cells may be made within a column or row of the model where scaling is required in later task efforts.

Data Development Methodology

When developing a data base of this nature, it is necessary to 1) carefully define the data elements and 2) provide consistent estimating techniques for data that fail to adequately match the definitions or that fail to provide all requisite data elements. While a careful structuring of the data elements will avoid many potentially troublesome inconsistencies in available data, some adjustment of primary data is always to be expected. The impact of data weaknesses upon the reliability of the overall model can, however, be minimized by careful selection of estimating techniques.

Establishment- Versus Activity-Based Data

The data have been developed on an establishment basis for the most part. The major exceptions are agriculture and construction which were developed on a product basis. The oil and gas well data were also divided somewhat synthetically into two separate activities or products. The rental and royalty components of the real estate and rental sector are also defined on an activity basis. Force account construction is redefined for the most part to the construction sectors where other construction activity is performed. There are only two or three other minor cases where establishment definitions and data were not preserved intact.

It is desirable to preserve the definition of each sector to coincide with the operating unit, i.e., the establishment, wherever possible, since most of the input and employment data are collected for the total establishment. No cost detail for specific products or services is usually available. (In fact, the development of costs in product detail necessarily involves the somewhat arbitrary allocation of costs that are common or joint in integrated operations.) Synthetic divisions of establishment data make it difficult to track model results back to establishment data in analytical and policy uses, and make it difficult to update the data. For these reasons, we have avoided redefining the establishment data except in the cases noted above; for these cases the general treatment for secondary products did not appear to be appropriate. The general treatment for secondary products is described in Appendix B.2.

Data Estimation Techniques

Where available data sets failed to include the required data elements in state detail, various estimation techniques were employed. Most instances of inadequate data can be summarized in three categories:

1. Data were suppressed, usually to prevent direct disclosure of individual establishment data.
2. Data were available at the national but not the state level.
3. Data were unavailable.

In the first category, data suppressions can occur in several forms:

- data are available at the required level of detail but suppressed for individual states
- state-level data are provided at a broader level of aggregation than required
- data may be both at a broader level than required and also suppressed for some states.

Data suppressed for individual states occurs frequently in Census data. Suppressed items are, however, included in national totals. Moreover, whereas output, employment and payroll data were usually suppressed, the number of establishments was included, and for the manufacturing sectors, the establishment size by employment interval was given. Though estimation based on the number of establishments can result in error because of the potential variability of establishment size, the number of establishments provided an adequate means of estimation if only a small portion of the total data were suppressed, e.g., less than three percent. However, where relatively larger suppressions were involved, more time-consuming (and accurate) methods are warranted. Methods used include development of employment and payroll from supplementary sources, e.g., UI or CBP data, and estimation of suppressed output based on an appropriate (usually national) ratio of employment or payroll to output. In all cases, the national total of all state-level data (estimated and available) was compared with the national total available from Census and scaling was applied to the imputed data, if required, to reconcile the two.

Where state-level data were available in combination with other elements, a split of these data were required. The split was accomplished by taking the "closest" reasonable ratio available. For example, if Census data were disaggregated by state by four-digit SIC for establishments with payroll but not for establishments without payroll, the distribution of the state output data for establishments without payroll were estimated based on with-payroll establishments. If, however, the only level wherein a required SIC was stated separately was at the national level, it was sometimes necessary to develop all state totals based on national data.

The need to develop state output totals based on national data arose only in cases where data for a very small (relative to total sector output) SIC was suppressed entirely by

Census at the state level (to avoid disclosure of individual establishment data). This occurred only in rare instance and had a negligible impact on the total generated for any given sector.

Where both the level of disaggregation and state level suppressions occurred, appropriate ratios and supplementary data sources have been used to distribute requisite data at the state level. In all cases, the technique(s) used to overcome inadequate data are explained within the appropriate chapters of this report.

For sectors not covered by Census data, sometimes the only output data available were national totals. However, in almost all cases, employment and payroll could be developed from the UI data base and/or County Business Patterns. Thus, one option for state distribution of output values was to apply ratios of payroll or employment data. However, sometimes state distribution of output could be more accurately accomplished from other sources, e.g., a 1976 or 1978 state distribution pattern. Thus, the actual pattern of distribution was decided only after weighing all the alternatives and selecting the most accurate option available.

In some cases, no measure of output data could be located for an identified type of establishment at the subsector level of detail. In this case, a similar activity for which data were available was used to inflate payroll to an estimated measure of output. Thus, in the case of state savings and loan associations not insured by the Federal Savings and Loan Insurance Corporation, output was inflated by the corresponding output-to-payroll-ratios of insured savings and loan associations.

In each of the subsequent chapters, the actual procedures used to estimate suppressed, combined, or unavailable data items are explained. Further detail on estimation procedures are maintained within the underlying worksheets or computer files that were used to develop each data element.

Departures From BEA's 1972 Methodology

The methodology used in developing the MRIO sector output totals departs from that of BEA principally in that industry redefinitions that involve the adjustment of establishment data have been kept to a minimum in the MRIO data. Industry redefinitions that do not involve the adjustment of establishment data follow closely the treatment by BEA. For example, government enterprises that produce services that are competitive

with private enterprise, e.g., transit systems and electric power, have been classified with the appropriate private sectors. (These cases are a function of the classification system only, since they do not involve the adjustment of establishment data). Further, adjustments to sector output totals (as derived from published sources) for undercoverage of important flows, have been made, or will be made in the course of developing the transactions data, similar to adjustments made by BEA. Imputations for implicit service flows, e.g., rent on owner-occupied housing and banking services in lieu of interest payments on deposits, have also been made following BEA concepts and the treatment of these flows in the NIPA accounts.

The adjustments made to establishment data, and the treatment of secondary products in the MRIO data, are described in Appendix B.2. Adjustments made by BEA and not made in the MRIO data are also noted.

The conceptual difficulties in measuring transportation output by state, not relevant in the BEA data, lead to somewhat arbitrary state assignments of output for freight transportation sectors. The assignment procedure is described in Appendix B.1, along with a description of the treatment of both trade and transportation margins in the MRIO. The methods for handling margins in the MRIO differs from the BEA methods but do not affect the output measures for these sectors at the national level.

The 1977 BEA I-O Table

Development of the national 1977 table is currently underway in BEA's Interindustry Economics Branch. The 1977 table is not scheduled for completion until 1983 and thus many aspects of the table are still being developed. Nonetheless, BEA has made considerable progress in the development of their national level output files and was able to supply JFA with preliminary output worksheets for numerous four-digit SIC's.¹ Data development for SIC's within the MRIO was compared with available BEA data and differences between the two data sets were examined.

¹BEA preliminary worksheets were received for about 300 of the approximately 1000 total four-digit SIC's. Because of the different procedures and the preliminary nature of the BEA data, complete reconciliation was not attempted at this time.

Data File Status

The MRIO data is not directly comparable with any existing data set at the state or national level. Characteristics that limit comparison are the sectoring plan and the definition of industry activity primarily on an establishment basis. When it is completed, the 1977 BEA I-O table will provide the closest comparable data, at the national level, but the comparison will require an aggregation of the 496-order BEA sectoring plan to the 123-order MRIO and will differ with respect to the different handling of establishment versus product based sector definitions.

Comparability with the Bureau of Labor Statistics 1977 Output Controls, which have been released, is awkward because the BLS output controls (though based for the most part on 1977 data as was the MRIO) were adjusted (by redefinitions) based on BEA's 1972 I-O methods. In 1972, BEA made many more redefinitions and adjustments than are intended in 1977. BEA plans to eliminate many of the redefinitions that are of lesser importance and difficult to duplicate. Direct comparison of national MRIO output totals with BLS totals would require extensive research into the nature and effect of BEA 1972 methods on the BLS controls.

In lieu of a comprehensive data set for use as a national control on MRIO totals, data are controlled to the best data available for a given sector or sectors. Thus, manufacturing data are being controlled to Census of Manufactures data, service sectors covered by Census to available Census totals, and so on. Ultimately, the MRIO will be made consistent with National Income and Product Accounts (NIPA) data, but this step will be delayed until final adjustments in the last stages of balancing.

Development and Use of Internal Consistency Checks

Assembly of output, employment and value added data for each state-level MRIO sector results in a large, but easily manageable, computer data file of approximately 6,000 records. Approximately one-half of the records contain data which was aggregated by computer from the Census of Manufactures tape. A large fraction of the remaining records were entered directly from analysts' worksheets. Finally, data records for construction and agriculture activities and for value-added were prepared by computer from a variety of establishment- and activity-based data sources.

The resulting data set may contain errors and apparent inconsistencies due to a variety of sources. The most significant sources of inconsistency discovered thus far have been of the following types:

1. Programming errors.
2. Data entry errors, including worksheet errors.
3. Methodology for estimation leads to anomalous results.
4. Inconsistent primary data, when several sources are used.

To reduce errors of the second type, all large data sets have been entered onto tape in a key-verify mode by a local full-service data entry firm. To date, errors of the first two types have been largely eliminated; those of the last two types are under examination currently and will be addressed throughout the remainder of the project.

The primary methods applied to the data set to check for internal consistencies have been the use of interval and ratio checks, repeated proofing of printouts by sector analysts and development of state and sector sums for reconciliation with other sources. To locate remaining data transcription errors in the data file, a variety of interval and ratio checks were applied, including comparison between individual data items in a state, MRIO cell as well as comparison across states within an MRIO sector for ratios of particular interest. Ratios examined include total value added to output, payroll to compensation, compensation to total value added, indirect business taxes to total value added, property-type income to total value added, output per employee, payroll per employee and payroll per unit of output.

Examination of these ratios for 51 state cells in a given MRIO industrial sector, both in numerical and graphical form, has allowed the staff to locate and examine all unusual entries in the data file. Once an anomaly has been located, the individual data are compared to original worksheets and then, if necessary, to the original data sources. In many cases it has been found that, although the ratio tests indicate an unusual combination of data items, the problem (if any) lies in the inconsistency of the original data sources. In other cases, the anomaly is a result of the imputation, redefinition, or disaggregation methodology applied. Where the error results from a simple transcription or calculation error, these have been corrected. Other problems of the last two types were revised on a case-by-case basis.

MRIO Sectors Not Covered in this Report

There are several sectors that are not included and/or for which state distributions are not described in this report. These are:

1. Freight Transportation
 - Railroads
 - Waterways
 - Trucking
 - Pipelines
2. Directly Allocated Imports
3. Scrap
4. Government Industry
5. Household Industry

Freight Transportation output was assigned to states in association with state-to-state transportation flows as described in Appendix B.1.

Data on directly allocated imports by state were developed in association with the transactions data and are discussed in the separate JFA report State Inputs to Industries, 1977. Data on scrap flows will be developed in the same manner.

Data for the Government industry and the Household industry, consisting of wage and salary payments which constitute output, were developed in association with the development of data for final demand. A description of the methods used to develop these data appear in the JFA report State Estimates of Final Demands, 1977.

Report Overview

Chapters 2-24 detail the methods and procedures used to develop MRIO output, employment and payroll by sector at the state level. A complete concordance of MRIO sectors with BEA I-O sectors and 1977 SIC's appears in Appendix A. Two procedures paper are included in Appendix B which describe technical details of the assignment of margins and the treatment of redefinitions within the model. Appendix C provides a reference guide to all data sources referred to in this report, including complete bibliographic data.

Throughout the report, references are made to source documents used in the development of sector data. In the text, reference to sources include a short title and a source number. The full bibliographic citation of each source is provided in Appendix C, while complete identification of the page or table number of the referenced data items are carried on the worksheet data underlying each sector. All worksheets developed under this research have been archived by Jack Faucett Associates and are available to support more detailed data needs and to guide future efforts to update the accounts.

CHAPTER 2

AGRICULTURE, FORESTRY AND FISHERIES

MRIO Sectors:

- 001: Dairy Farm Products
- 002: Livestock and Poultry
- 003: Cotton, Grain and Tobacco
- 004: Fruits, Nuts, Vegetables, and Miscellaneous Crops and Services
- 005: Forestry Products
- 006: Commercial Fishing and Trapping

As shown in Exhibit 2-1, this group of MRIO sectors includes all of SIC major groups:

- 01: Agricultural Production — Crops;
- 02: Agricultural Production — Livestock;
- 07: Agricultural Services (excluding SIC 074, Veterinary Services);
- 08: Forestry, and
- 09: Commercial Fishing, Hunting and Trapping.

Data Sources and Estimation

Production Data

Lacking Census-based output data for 1977 for the above sectors, a variety of U.S. Department of Agriculture (USDA) sources were used to estimate 1977 values of production by state and for each commodity group (i.e., MRIO sector). These resources were primarily crops, dairy, livestock, and poultry production reports from the Economic Statistics Service's (formerly the Economic Statistics and Cooperatives Service) Crop Reporting Board (Sources 02131-4) supplemented by data from the Agricultural Statistics (Source 02001).

EXHIBIT 2-1

MRIO CONCORDANCE WITH 1977 SIC CODES

Sectors 001, 002, 003, 004, 005, 006: Agriculture, Forestry and Fisheries

<u>MRIO Sector</u>	<u>BEA I-O Code</u>	<u>1977 SIC</u>
001: Dairy Farm Products	10100 Dairy Farm Products	0241, pt. 0191, pt. 0259, pt. 0291
002: Livestock and Poultry	10200 Poultry and Eggs	025 (excluding pt. 0259), pt. 0191, pt. 0219, pt. 0291
	10301 Meat Animals	021 (excluding pt. 0219), pt. 0191, pt. 0259, pt. 0291
	10302 Miscellaneous Livestock	027, pt. 0191, pt. 0219, pt. 0259, pt. 0291
003: Cotton, Grain and Tobacco	20100 Cotton	0231, pt. 0191, pt. 0219, pt. 0259, pt. 0291
	20201 Food Grains	pt. 011, pt. 0191, pt. 0219, pt. 0259, pt. 0291
	20202 Feed Grains	pt. 011, pt. 0139, pt. 0191, pt. 0219
	20203 Grass Seeds	pt. 0139, pt. 0191, pt. 0219, pt. 0259, pt. 0291
	20300 Tobacco	0131, pt. 0191, pt. 0219, pt. 0259, pt. 0291

EXHIBIT 2-1 (cont'd)

MRIO CONCORDANCE WITH 1977 SIC CODES

Sectors 001, 002, 003, 004, 005, 006: Agriculture, Forestry and Fisheries

<u>MRIO Sector</u>	<u>BEA I-O Code</u>	<u>1977 SIC</u>
004: Fruits, Nuts, Vegetables, and Miscellaneous Crops and Services	20401 Fruits	pt. 017, pt. 0191, pt. 0219, pt. 0259, pt. 0291
	20402 Tree Nuts	0173, pt. 0179, pt. 0191, pt. 0219, pt. 0259, pt. 0291
	20501 Vegetables	0134, pt. 0119, pt. 0139, 0161 pt. 0191, pt. 0219, pt. 0259, pt. 0291
	20502 Sugar Crops	0133, pt. 0191, pt. 0219, pt. 0259, pt. 0291
	20503 Miscellaneous Crops	pt. 0119, pt. 0139, pt. 0191, pt. 0219, pt. 0259, pt. 0291
	20600 Oil Bearing Crops	0116, pt. 0119, pt. 013, pt. 0173, pt. 0219, pt. 0259, pt. 0291
	20701 Forest Products	pt. 018, pt. 0191, pt. 0219, pt. 0259, pt. 0291
	20702 Greenhouse & Nursery Services	pt. 018, pt. 0191, pt. 0219 pt. 0259, pt. 0291, pt. 07 (excluding 074)*
005: Forestry Products	30000	0811-4; 091, 097
006: Commercial Fishing & Trapping	40000	092, 0254, 085

* Indicates those industries in which there was a change in composition between the 1972 and 1977 SIC's.

Source

- 02001: Agricultural Statistics, 1979 and 1980.
- 02131: Crop Production Reports, Field Crops, Potatoes and Sweet Potatoes, Non-citrus Fruits and Nuts, Citrus Fruits, Vegetables, Crop Values, Grain Stocks, Rice Stocks, Hop Stocks, Soybean Stocks, Peanut Stocks and Processing, and Seed Crops.
- 02132: Livestock Reports, Meat Animals, Wool and Mohair.
- 02133: Poultry and Egg Reports, Poultry, Chickens and Eggs.
- 02134: Milk and Dairy Product Reports, Milk, Dairy Products.
- 02136: Miscellaneous Reports, Honey, Mushrooms, Mink, and Floriculture.

In addition to these sources, state-specific value of sales data in the 1978 Census of Agriculture (Source 03109) were used as a proxy for 1977 value of production data in the case of several minor commodities not covered by USDA sources (mink pelts, horses and other equines, milk goats and goat milk, angora goats, catfish, tropical fish and bait fish, rabbits and rabbit pelts, chinchillas, trout, misc. forestry products, and various greenhouse and nursery products) and for total receipts received by agricultural services (minus SIC 074, Veterinary Services, which appear in MRIO sector 114).

Timber removal and value data for MRIO sector 005, Forestry Products, were based on cost of stumpage cut data in the 1977 Census of Manufactures (Source 03105), Subject Series, Selected Materials Consumed, 1977 value of production data for SIC 2411, Logging Camps and Contractors, in the 1977 Census of Manufactures, and 1972 timber removal and value data by state in the USDA, Forest Service publication Timber in the United States Economy 1963, 1967, and 1972 (Source 02301). This was necessary lacking estimates of 1977 timber removals and prices by states or by region. The total 1977 value of stumpage purchased by major SIC group 24 was prorated by state by an evenly-weighted average of the percentage distributions, by state, of timber cut in 1972, and the value of production for SIC 2411 in 1977. Data on miscellaneous forestry products (other than timber) came from USDA analysts and represent 1977 value of marketings for these products (i.e., Christmas trees, maple syrup, etc.)

For sector 006, Commercial Fishing, Hunting and Trapping, National Marine Fishery Service data (Source 03811) were used to establish fisheries output for 1977. Commercial hunting and trapping data came from a 1977 published chart from the International Association of Fish and Wildlife Agencies' Fur Resources Committee on wild fur catches and pelt values by state for all fur bearing species in the U.S. in 1977 (Source 22091).

To develop production data for each MRIO sector, value of production data in 1977 dollars (or, in some cases, 1978 value of sales) were assembled from the above sources for each commodity grouping which comprised a MRIO sector. For example, state-specific value of production data on chickens, eggs, broilers, turkeys, cattle, sheep, hogs, livestock products (e.g., wool), and a variety of miscellaneous livestock combined together constituted the total output for MRIO sector 002, Livestock and Poultry. Following the concordance shown in Exhibit 2-1, commodity groupings were made as complete as the available data sources would allow for each MRIO sector. In those instances where 1978 value of sales reported in the Census of Agriculture were used, this data were simply added, without correction to 1977 dollar equivalents, to the 1977 value of production data recorded for the other commodities in the group (as indicated above, this procedure involved only minor commodities).

Employment and Payroll Data

Employment and payroll data also had to be estimated on a product basis for each MRIO sector, however, the only data available were 1978 dollars of hired farm labor by type of farm by state in the Census of Agriculture and total 1977 dollars of hired farm labor by state in the USDA source Economic Indicators of the Farm Sector: State Income and Balance Sheet Statistics, 1979 (Source 02111). A special estimation technique was developed in order to impute hired labor by product by state in 1977 for MRIO sectors 001, 002, 003, and 004. Employment and payroll data for MRIO sectors 005 and 006 came from the Bureau of Labor Statistics' Employment and Wages: Monthly Employment and Quarterly Wage Data (Computer Tape No. 120380) for 1977 (Source 12110) adjusted to reflect year averages.

The estimation of 1977 employment and payroll by product group for the first four MRIO sectors involved a manipulation of the data on value of sales and dollars of hired farm labor by SIC found in Table 35 of each state volume of the 1978 Census of Agriculture. The first step was to combine the value of sales data by commodity and by type of farm to reflect MRIO sector commodity groups. This involved several stages:

1. The estimation of value of sales data for selected products by SIC withheld to avoid disclosure. Specific estimates were made when the values suppressed represented ten percent or more of the total state total sales value for each commodity. Where the missing sales values re-

presented less than ten percent of the state total for that commodity, the missing value was prorated to the SIC value of sales that were not suppressed.

2. Adding in Commodity Credit Corporation value of sales for grain and cotton to their respective sales totals; and
3. Splitting the sales values of what Census reported as "other crops" between the cotton, grain, and tobacco grouping and the fruits, nuts, and vegetables grouping proportional to these group's total value of sales. This was done based on an evaluation of the crops that could have been reported by farmers in this category on the Census forms, and their distribution by MRIO sector.

The next step followed was to adjust the 1978 Census sales data for grains to remove the value of sales for soybeans included in that total and add these data to sector 004 which includes soybeans in our concordance (i.e., SIC 0116). This was done by subtracting 1978 value of soybean sales by state reported by USDA Crop Production Reports (Source 02131) from the Census-derived sector 003 totals and adding it to the Census-derived sector 004 totals.

A further adjustment of the Census sales data was necessary to account for significant on-farm consumption of total production for several feed crops (oats, corn, barley, sorghum, and hay) so that any estimate of invested labor would more closely reflect all production not just that portion which was sold. Assuming that this large difference between total production and sales occurred primarily on livestock farms also producing grains, 1978 Census data on grain sales by livestock farms were augmented by the difference between 1978 value of production and sales for the five feed crops as reported in the USDA Crop Production Reports (Source 02131). This augmented total was then combined with the other commodity totals to estimate the total value of output for sector 003.

After these adjustments, the state matrices were assumed to represent the value of production by MRIO sector by type of farm. The total dollars of hired farm labor by type of farm was then prorated across the four MRIO commodity groups. Summing the results across all types of farms then gave the total 1978 dollars of hired farm labor

input for each commodity group. This total 1978 dollars of hired farm labor input relative to the total 1978 dollars of output for each commodity group resulted in a coefficient to apply to the 1977 total value of production data for each commodity group taken from the USDA sources. So applied, an estimate was obtained of the associated 1977 dollars of hired farm labor input invested in that production by commodity group. These estimates were then adjusted by scalar to total 1977 dollars of hired farm labor data for each state reported in Economic Indicators of the Farm Sector (Source 02111), and then divided by 1977 wage rates by state for all hired farm labor from USDA Farm Labor reports (Source 02136) to give an estimate of employment by sector in full-time equivalent hours. Scalars ranged in size from 0.5 to 1.9 with 23 states requiring a scalar between 0.9 and 1.2.

Adjustments to Coverage and Redefinitions

Following the preliminary estimation of output and employment for the six MRIO sectors, a redefinition of output was estimated to adjust the total sector controls. The only sector whose output is augmented by a major redefinition from agriculture, forestry and fisheries is:

022 Dairy Products (a manufacturing sector) — for milk processed and bottled on the farm

Farmers process milk and sell that milk directly to consumers. This output of processed milk is a primary product of the manufacturing sector, Dairy Products (MRIO Sector 022) and BEA redefined the output in 1972. Following our general methodology, our procedure has been to leave the output of processed milk sold by farmers direct to consumers as a secondary product of MRIO Sector 001. Values, by state for milk processed on the farm and sold directly to consumers in 1977 were taken from USDA Milk and Dairy Product Reports: Milk (Source 02134) data.

In addition, it was noted that the value of milk bought from farmers by processing plants in MRIO sector 022 reported in the 1977 Census of Manufactures (Source 03105) was less than the value of milk sold by farmers to processing plants reported by the USDA (Source 02134). Following BEA's methodology, the difference in these values was assumed to be an imputed flow of raw milk to be included in the total for fluid milk input to Sector 022 from Sector 001. This difference was apportioned by state

according to the percentage of each state's value of milk sold to processing plants by farmers relative to the U.S. total.

Data Limitations*

Several data limitations should be noted based on the descriptions above. These include:

1. The technique used to estimate 1977 hired farm labor employment by MRIO sector may fail to reflect the actual distribution of this labor by commodity group for that year.
2. The technique used to estimate 1977 employment does not account for unpaid family labor or operator employment which constituted, in 1977, 69 percent of the U.S. total agricultural work force.
3. Adjustments of 1978 value of sales data for the minor commodities included with the 1977 value of production data to 1977 dollar equivalents were not made. These minor commodities were part of MRIO Sectors 002, 004, and 005.

* All work on these MRIO sectors was done without the benefit of BEA 1977 national control totals except for fisheries output.

CHAPTER 3

MINING

MRIO Sectors:

- 007: Iron and Ferroalloy Ores
- 008: Nonferrous Ores
- 009: Coal
- 010: Crude Petroleum
- 011: Natural Gas and Liquids
- 012: Stone, Clay, Sand and Gravel
- 013: Chemical and Fertilizer Minerals

As shown in Exhibit 3-1, this group of MRIO sectors includes all of major SIC groups:

- 10: Metal Mining
- 11: Anthracite Mining
- 12: Bituminous Coal and Lignite Mining
- 13: Oil and Gas Extraction
- 14: Nonmetallic Mineral Mining

Note that the MRIO sectoring plan splits major SIC groups 13 and 14 into two separate MRIO sectors and combines major groups 11 and 12 into one MRIO sector.

Data Sources and Estimation

Production Data

Several data sources were used to establish production quantity and value data for these MRIO mining sectors. From the 1977 Census of Mineral Industries (Source 03106) came data on production quantities, value added, cost of materials, value of shipments, and values of inventory change for mined or quarried products. Value of shipments adjusted for product inventory change was taken as the estimate of value of production. It was not possible to obtain the output measure by adding cost of materials and value added

EXHIBIT 3-1

MRIO CONCORDANCE WITH 1977 SIC CODES

Sectors 007, 008, 009, 010, 011, 012, 013: Mining

<u>MRIO Sector</u>	<u>BEA I-O Code</u>	<u>1977 SIC</u>
007: Iron and Ferroalloy Ores	50000 Iron and ferroalloy ores mining	101 Iron Ores 108 Ferroalloy Ores, Except Vanadium
008: Nonferrous Ores	60100 Copper ore mining 60200 Nonferrous metal ores mining, except copper	102 Copper Ores 103 Lead and Zinc Ores 104 Gold and Silver Ores 105 Bauxite and Other Aluminum Ores pt. 108 Metal Mining Services 109 Miscellaneous Metal Ores
009: Coal	70000 Coal mining	1111 Anthracite pt. 1112 Anthracite Mining Services 1211 Bituminous Coal and Lignite pt. 1213 Bituminous Coal and Lignite Mining Services
010: Crude Petroleum		pt. 131 Crude Petroleum and Natural Gas pt. 132 Natural Gas Liquids pt. 138 Oil and Gas Field Services
011: Natural Gas and Liquids		pt. 131 Crude Petroleum and Natural Gas pt. 132 Natural Gas Liquids pt. 138 Oil and Gas Field Services

EXHIBIT 3-1 (cont'd)

MRIO CONCORDANCE WITH 1977 SIC CODES

Sectors 007, 008, 009, 010, 011, 012, 013: Mining

<u>MRIO Sector</u>	<u>BEA I-O Code</u>	<u>1977 SIC</u>
012: Stone, Clay, Sand, and Gravel	90001 Dimension, crushed and broken stone mining and quarrying	141 Dimension Stone
		142 Crushed and Broken Stone including Riprap
	90002 Sand and gravel mining	144 Sand and Gravel
	90003 Clay, ceramic and refractory minerals mining	145 Clay, Ceramic, and Refractory Minerals
	90004 Nonmetallic mineral services and miscellaneous minerals mining and quarrying	pt. 148 Nonmetallic Minerals (Except Fuels) Services
		149 Miscellaneous Nonmetallic Minerals, Except Fuels
013: Chemical and Fertilizer Minerals	10000 Chemical and fertilizer mineral mining	147 Chemical and Fertilizer Mineral Mining

as was possible with manufacturing, since the Census data included purchased machinery installed and contract work (which includes contracted capitalized exploration and development) in the cost of materials measure.

Production quantity and value data were also taken from the following sources:

Source:

- 10101 1977 Minerals Yearbook: Metals and Minerals
- 10101 1978-9 Minerals Yearbook: Area Reports - Domestic
- 06103 Bituminous Coal and Lignite Production and Mine Operations - 1977
- 06103 Coal - Pennsylvania Anthracite for the Calendar Year 1977
- 22011 Gas Facts - 1978
- 22031 Basic Petroleum Data Book

Data from these sources were used only for comparison with Census-derived production estimates and for guidance in estimating suppressed data.

Employment Data

Data on employees, payroll, production workers, production workers hours, and wages were also taken from the 1977 Census of Mineral Industries. In those cases where these data were suppressed, SIC-specific, state data in the 1977 County Business Patterns (Source 03114) were used as a surrogate for Census employment and payroll figures.

To develop output and employment data for each MRIO mining sector, known data at the two-digit SIC level and for all mining within the state were used as a control. In those cases where data at the two-digit SIC level were suppressed, they were estimated either as: a simple residual from the all mining total given data for the other two-digit SICs, a residual adjusted to reflect known data at the component three-digit SIC levels (or data estimated at the three-digit level), or, where more than one two-digit SIC was suppressed, by using various ratios derived from the unallocated residual. Using this ratio estimation technique required that at least some estimate of employment (or employment and payroll) was available. This is where data from the 1977 County Business Patterns were predominantly used. Production data from the other sources were also used in some cases in determining relative importance of mining activity and total product value.

Once the output and employment data were estimated or known from Census data for all two-digit SIC major groups, these data were assigned to the component MRIO sectors, based on all data available for the three- and four-digit SICs comprising each MRIO sector. For major SIC groups 10, 13, and 14 this required a split between two MRIO sectors (007 and 008, 010 and 011, and 012 and 013, respectively) while all of SIC 12 and 11 could be assigned to MRIO 009: Coal.

When data were split for SIC 10 between sectors 007 and 008 and for SIC 14 between 012 and 013, estimates were again determined either as a simple residual from known three-digit SIC data (e.g., MRIO sector 013 contains only SIC 147) or by again using various ratios all based initially on employment estimates. In some cases, most of the establishments, employees, payroll, and value added were noted to be associated with the SICs comprising one of the two MRIO sectors in a major SIC group. Therefore, the decision was made in these instances to allocate all of the two-digit SIC level data to that one MRIO sector and to "zero out" the other MRIO sector as its output and employment was assumed to be small (i.e., less than \$1 million or 100 employees).

The split of SIC 13 between MRIO sectors 010 and 011, however, was not a simple residual or ratio estimation problem as the split between crude petroleum and natural gas extraction is a "synthetic" division of what is considered to be one four-digit SIC: 1311 Oil and Natural Gas Extraction. This "synthetic split" method as well as the estimations for force account construction are described in the following section.

Adjustments to Coverage and Redefinitions

Force Account Construction

Mineral development and exploration activities in the mining sector, such as drilling oil and gas wells or sinking mine shafts, are considered to represent "construction" activities performed by the mining industry's work force on current account. Some portion of this construction is performed by the "producing" mining SICs while the rest is contract work provided to the producing SICs by the various mining services.¹ This force-account construction, in the input-output model, is redefined from the particular consuming industry (in this case, mining) or final demand sector and is added to the construction sector of the economy as an adjustment in coverage. Output, employment,

¹There are five mining service SICs: 108 - metal mining services, 1112 - anthracite mining services, 1213 - bituminous coal and lignite mining services, 138 - oil and gas field services, and 148 - nonmetallic mining services.

payroll, cost of materials, value added, and the value of shipments in the consuming industry and the construction sector are all adjusted for the value of force-account construction.

In estimating force account construction in the mining sector, capitalized values of construction work by type in the revised estimates of the National Income and Product Accounts (NIPA) contained in the July 1979 Survey of Current Business (Source 03501) were used. In 1977, slightly over \$10 billion was spent on mining exploration, shafts, and wells. Of this total, \$9,135 billion represented capitalized expenditures on petroleum exploration and well drilling. This figure was assumed to be the control total for force account construction in MRIO sectors 010 and 011. The remainder (\$932 million) was taken to be the control total for all other mining (i.e., nonpetroleum exploration and development) force account construction. This latter figure would be apportioned among the remaining five MRIO mining sectors.

Of the \$9,135 billion in petroleum mining force account construction, it was assumed that most of it represented output of the oil and gas field services in 1977 along with some capitalized expenditure on exploration and development by the oil and gas producing SIC (Note: in the estimation of force account construction the synthetic split between oil and gas was not attempted.) With total force account construction output established to be \$9,135 billion, estimates of the employment, payroll, cost of materials, and value added associated with this output were calculated based on the ratios of value of shipments (adjusted for inventory change) to employment, payroll, etc., determined from the national level oil and gas field services data. State level oil and gas field service data were also scaled to the \$9.1 billion control total to provide estimates of force account construction by state.

The remaining \$932 million of other mining force account construction was split among the remaining five MRIO mining sectors proportional to the sum of capitalized exploration and development expenditures of the SICs comprising those sectors. For sectors 008, 009, and 012, this sum included any capitalized exploration and development expenditures by their associated mining services SICs. Again, estimates of employment, payroll, etc. associated with each sector's force account construction were estimated from the ratio of value of shipments (adjusted for inventory) to employment, payroll, etc., determined from the national level mining services data. Splitting the national MRIO sector totals was again accomplished by using, where available, mining services value of production data by state or by using MRIO sector output totals by state.

Once force account construction values were estimated in this fashion, these values by state were removed from the particular MRIO sector output and employment totals and redefined to the construction sector. (The original data are stored in an Initial Data File and the adjustments are made in a special Redefinition Data File.) Petroleum sector force account construction output and employment was removed prior to making the synthetic split between oil and gas described below, but after the combined output for Sectors 010 and 011 was adjusted for the output of the natural gas liquids SIC since no force account construction was assumed to be associated with that SIC. (No attempt was made to split total mining force account construction between the three BEA construction sector I-Os involved: 11061 - new petroleum and natural gas well drilling, 110602 - new petroleum, natural gas, and solid mineral exploration, and 110603 - new access structures for solid mineral development).

Synthetic Split of Oil and Gas Extraction

In our concordance, SIC major group 13: Oil and Gas Extraction is divided into two MRIO sectors (010 - Crude Petroleum and 011 - Natural Gas and Liquids) reflecting differences in the input patterns to the two petroleum sectors. However, data on output and employment available in the Census of Mineral Industries are a combined value for both oil and gas extraction and the field services. A method, therefore, was required to split the output and employment data for SIC 13. Apportioning the value of production was relatively straightforward as the Census of Mineral Industries provided data on the value of oil and natural gas shipments and inventory change¹ by state. Splitting employment, payroll, and cost of materials, however, was more complex. Regression analyses of operating manhours per unit of production relative to percent oil production and production per well provided a first-cut estimate that employment, etc., should be split based on a 60-40 weighting of oil production (in barrels) and gas production (in barrels equivalent), respectively, by state.² This 60-40 weight would be applied to split the data for SIC 13 only after removing output and employment associated with natural gas liquids production and output and employment estimated for force account construction. Once done, then natural gas liquids output and employment would be added to the natural gas estimates to derive the MRIO Sector 011 total.

¹ Inventory data, however, were not shown in product inventories versus inventories of supplies detail. It was assumed that the inventory values shown primarily represented products.

² Analyses of the appropriateness of the 60-40 split methodology are continuing and changes will be made later if warranted.

Data Limitations*

Several data limitations should be noted based on the estimation techniques described above. These include:

1. The estimation of suppressed data may fail to reflect the actual distribution of these data by MRIO sector.
2. Estimations for force account construction in each mining sector may not reflect either the total amount by sector and/or the distribution of force account construction by state.
3. The "synthetic" split methodology developed to apportion employment and payroll between oil and natural gas production may not reflect the actual distribution of these data by state or at the national level.

* All work on the mining sectors was done without the benefit of 1977 output control totals from BEA.

CHAPTER 4

CONSTRUCTION INDUSTRIES

MRIO Sectors:

- 014: Residential Building Construction (New)
- 015: Non-Residential Building Construction (New)
- 016: Public Utility Construction (New)
- 017: Highways and Streets (New)
- 018: Other Construction (New)
- 019: Maintenance Construction

As shown in Exhibit 4-1, this group of MRIO sectors includes all of SIC major groups 15 (Building Construction - General Contractors and Operative Builders), 16 (Construction Other Than Building Construction - General Contractors), and 17 (Construction -Special Trade Contractors), as well as SIC 6552 (Subdividers and Developers, Except Cemeteries). In addition, all force-account construction is included in MRIO Sectors 014 through 019 (Force-account construction is construction work performed by the work force of the consuming industry or final demand sector.)

As can be seen from Exhibit 4-1, each of the six MRIO construction sectors are made up of parts of each of the SIC construction industries. This is because the MRIO classification is activity-based (type of construction) while the SIC is establishment-based (type of contractor). Establishments classified in a particular SIC are generally involved in several of the MRIO construction sectors.

For example, according to the 1977 Census of Construction Industries, establishments classified as "General Contractors - Single Family Houses" (SIC 1521) receive about 90 percent of their "New Construction" receipts from constructing single-family houses. These receipts would be included in MRIO Sector 014 - Residential Building Construction. Establishments classified as primary to SIC 1521 receive more than six percent of their "New Construction" receipts from constructing nonresidential buildings, which compose MRIO Sector 015. About one percent of their "New Construction" receipts comes from nonbuilding construction, which would be divided among MRIO Sectors 016,

EXHIBIT 4-1

MRIO CONCORDANCE WITH 1977 SIC CODES

Sectors 014, 015, 016, 017, 018, 019: Construction Industries

<u>MRIO Sector</u>	<u>BEA I-O Code</u>	<u>1977 SIC</u>
014: Residential Building Construction	110101 New Residential 1-Unit Structures, Nonfarm	pt. 15, pt. 16, pt. 17, pt. 6552
	110102 New Residential 2-4 unit Structures, Nonfarm	pt. 15, pt. 16, pt. 17, pt. 6552
	110103 New Residential Garden Apartments	pt. 15, pt. 16, pt. 17, pt. 6552
	110104 New Residential High-Rise Apartments	pt. 15, pt. 16, pt. 17, pt. 6552
	110105 New Residential Additions and Alterations, Nonfarm	pt. 15, pt. 16, pt. 17, pt. 6552
015: Nonresidential Building Construction	110106 New Hotels and Motels	pt. 15, pt. 16, pt. 17, pt. 6552
	110107 New Dormitories and other Group Housing	pt. 15, pt. 16, pt. 17, pt. 6552
	110201 New Industrial Buildings	pt. 15, pt. 16, pt. 17, pt. 6552
	110202 New Office Buildings	pt. 15, pt. 16, pt. 17, pt. 6552
	110203 New Warehouses	pt. 15, pt. 16, pt. 17, pt. 6552
	110204 New Garages and Service Stations	pt. 15, pt. 16, pt. 17, pt. 6552
	110205 New Stores and Restaurants	pt. 15, pt. 16, pt. 17, pt. 6552
110206 New Religious Buildings	pt. 15, pt. 16, pt. 17, pt. 6552	
110207 New Educational Buildings	pt. 15, pt. 16, pt. 17, pt. 6552	

EXHIBIT 4-1 (cont'd)

MRIO CONCORDANCE WITH 1977 SIC CODES

Sectors 014, 015, 016, 017, 018, 019: Construction Industries

<u>MRIO Sector</u>	<u>BEA I-O Code</u>	<u>1977 SIC</u>
015: Nonresidential Building Construction (cont'ed)	110231 New Hospitals	pt. 15, pt. 16, pt. 17, pt. 6552
	110232 New Residential Institutions and Other Health Facilities	pt. 15, pt. 16, pt. 17, pt. 6552
	110241 New Amusement and Recreation Buildings	pt. 15, pt. 16, pt. 17, pt. 6552
	110250 Other Nonfarm Buildings	pt. 15, pt. 16, pt. 17, pt. 6552
016: Public Utility Construction	110301 New Telephone and Telegraph Facilities	pt. 16, pt. 17, pt. 6552
	110302 New Railroads	pt. 16, pt. 17, pt. 6552
	110303 New Electric Utility Facilities	pt. 16, pt. 17, pt. 6552
	110304 New Gas Utility Facilities	pt. 16, pt. 17, pt. 6552
	110305 New Petroleum Pipelines	pt. 16, pt. 17, pt. 6552
	110306 New Water Supply Facilities	pt. 16, pt. 17, pt. 6552
	110307 New Sewer System Facilities	pt. 16, pt. 17, pt. 6552
	110308 New Local Transit Facilities	pt. 16, pt. 17, pt. 6552
017: Highways and Streets	110400 New Highways and Streets	pt. 16, pt. 17, pt. 6552
018: Other Construction	110501 New Farm Housing Units and Additions and Alterations	pt. 15, pt. 17, pt. 6552
	110502 New Farm Service Facilities	pt. 15, pt. 17, pt. 6552
	110601 New Petroleum and Natural Gas Well Drilling	pt. 138
	110602 New Petroleum, Natural Gas, and Solid Mineral Exploration	pt. 108, pt. 1112, pt. 1213, pt. 138, pt. 148

EXHIBIT 4-1 (cont'd)

MRIO CONCORDANCE WITH 1977 SIC CODES

Sectors 014, 015, 016, 017, 018, 019: Construction Industries

<u>MRIO Sector</u>	<u>BEA I-O Code</u>	<u>1977 SIC</u>
018: Other Construction (cont'd)	110603	New Access Structures for Solid Mineral Development pt. 108, pt. 1112, pt. 1213, pt. 148
	110701	New Military Facilities pt. 15, pt. 16, pt. 17, pt. 6552
	110702	New Dams and Reservoirs pt. 15, pt. 16, pt. 17, pt. 6552
	110703	Other New Conservation and Development Facilities pt. 15, pt. 16, pt. 17, pt. 6552
	110704	Other New Nonbuilding Facilities pt. 15, pt. 16, pt. 17, pt. 6552
019: Maintenance Construction	120100	Maintenance and Repair, Residential pt. 15, pt. 17, pt. 6552
	120201	Maintenance and Repair of Other Nonfarm Buildings pt. 15, pt. 16, pt. 17, pt. 6552
	120202	Maintenance and Repair of Farm Residential Buildings pt. 15, pt. 17, pt. 6552
	120203	Maintenance and Repair of Farm Service Facilities pt. 15, pt. 17, pt. 6552
	120204	Maintenance and Repair of Telephone and Telegraph Facilities pt. 16, pt. 17, pt. 6552
	120205	Maintenance and Repair of Railroads pt. 16, pt. 17, pt. 6552
	120206	Maintenance and Repair of Electric Utility Facilities pt. 16, pt. 17, pt. 6552
	120207	Maintenance and Repair of Gas Utility Facilities pt. 16, pt. 17, pt. 6552
	120208	Maintenance and Repair of Petroleum Pipelines pt. 16, pt. 17, pt. 6552

EXHIBIT 4-1 (cont'd)

MRIO CONCORDANCE WITH 1977 SIC CODES

Sectors 014, 015, 016, 017, 018, 019: Construction Industries

<u>MRIO Sector</u>	<u>BEA I-O Code</u>	<u>1977 SIC</u>
019: Maintenance Construction (cont'ed)	120209 Maintenance and Repair of Water Supply Facilities	pt. 16, pt. 17, pt. 6552
	120210 Maintenance and Repair of Sewer Facilities	pt. 16, pt. 17, pt. 6552
	120211 Maintenance and Repair of Local Transit Facilities	pt. 16, pt. 17, pt. 6552
	120212 Maintenance and Repair of Military Facilities	pt. 15, pt. 16, pt. 17, pt. 6552
	120213 Maintenance and Repair of Conserv. & Devel. Facilities	pt. 15, pt. 16, pt. 17, pt. 6552
	120214 Maintenance and Repair of Highways and Streets	pt. 16, pt. 17, pt. 6552
	120215 Maintenance and Repair of Petroleum and Natural Gas Wells	pt. 138
	120216 Maintenance and Repair of Other Nonbuilding Facilities	pt. 15, pt. 16, pt. 17, pt. 6552

017, and 018. Furthermore, such establishments receive about 19 percent of their "Total Construction" receipts from "Maintenance and Repair," which corresponds to MRIO Sector 019. Also, establishments classified as primary to SIC 1521 account for only 38 percent of "Total Construction" receipts for single family houses. Most of the remaining receipts for single family houses come from establishments classified as "Operative Builders" (SIC 1531) or as "Special Trade Contractors" (SIC 17).

Because of this difference in classifications (Census establishments versus MRIO activities), only some of the Census data could be used directly. Descriptions of the available data, the various adjustments made to these data, and the estimation techniques used to fill in missing data appear in the following sections.

Data Sources and Estimation

The primary data source was the 1977 Census of Construction Industries (Source 03104). Included in the Census is a 28 volume Industry Series (one volume for each four-digit SIC plus a summary volume) and a 10 volume Geographic Series (one volume for each Census region which contains state-level data, as well as one summary volume.)

Although most of the Census data are establishment-based, there is one table for each four-digit SIC in the Industry Series, and one for each state in the Geographic Series, which gives gross receipts by construction activity. These activities correspond very closely to the MRIO activities. Thus, Table 5 of the Industry Series and Table 7 of the Geographic Series were used as the main data sources.

The other data source used in this task was the 1977 "Value of New Construction Put in Place, (C-30 Series)" (Source 03122). The VIP series measures the dollar value of all new construction put in place during a particular time period, in this case 1977. The data are broken down by activities which correspond closely to the MRIO activities. In view of the fact that BEA uses the VIP series to establish national control totals for output, this series was used to establish national output controls for this study. It was necessary, however, to make several adjustments to the published VIP data. These adjustments will be explained in the next section.

There are several differences between the Census data and the VIP data which should be mentioned. First, the Census represents actual receipts obtained in 1977 regardless

of when the construction took place, while the VIP series represents the value of construction work actually done in 1977, regardless of when payment was received. Second, the Census includes data on only those establishments classified in the construction industry, while the VIP series reports the value of all construction work. Thus, force-account construction is not included in the Census but is included in the VIP. Third, the Census data for construction activities are given in gross receipts. This leads to a form of double-counting, since both the prime contractor and subcontractor are reporting some of the same receipts. The VIP series, on the other hand, reports the value of construction based on final costs so there is no double-counting. Fourth, architectural and engineering fees are not included in the receipts reported by the Census, but are included in the VIP data.

Fifth, there are significant differences in the two series due to definitional differences and misclassification by respondents. For example, VIP data for buildings often include auxiliary facilities such as parking lots, streets, water and sewer connections, sidewalks, and fences built in conjunction with the buildings. The Census classifications are based on the function of the structure while VIP classifications, as in the example above, are sometimes based on the ownership of the project. Regarding misclassification by respondent, in the Census the respondents select the category of construction from a preprinted list on the questionnaire, and interpretation of these categories could vary among respondents. In the VIP series, most classifications are assigned by analysts based on the project description.

Finally, statistics by construction activity for approximately 720,000 nonemployer establishments are not available in the Census. (The Census classifies these as "establishments without payroll.") These establishments accounted for \$20.2 billion gross receipts, or about eight percent of total construction receipts. The VIP series includes the value of new construction performed by such establishments. The value of maintenance construction performed by such establishments is not included in the VIP series.

Exhibit 4-2 shows the individual construction activities which comprise each of the MRIO sectors. Also shown is the concordance between the MRIO activities and the corresponding activities from the Census and the VIP series.

EXHIBIT 4-2

MRIO	MRIO Activity	Census Activity	Value in Place Activity	
014	Residential Building Construction			
	1 unit 2-4 units Garden Apartments High Rise Apartments Additions and Alterations	Single Family Houses Apartment Buildings	1 Unit Structures 2 or More Units Additions and Alterations Housing & Redevelopment (public)	
015	Nonresidential Building Construction			
	Hotels and Motels Dormitories, Group Housing } Industrial Buildings } Warehouses }	Other Residential Buildings Industrial Buildings & Warehouses	Nonhousekeeping Industrial	
	Office Buildings Garages and Service Stations } Stores and Restaurants }	Office and Bank Buildings Stores, Restaurants, Garages	Office Other Commercial	
	Religious Buildings Educational Buildings Hospitals Institutions, Health Facilities } Amusement, Recreation Other Nonfarm Buildings	Religious Buildings Educational Buildings Hospitals and Institutions Amusement, Social, Recreation Other Nonresidential	Religious Educational Hospital and Institutional Miscellaneous	
	016	Public Utility Construction		
	Telephone and Telegraph Railroads Local Transit Electric Utility Gas Utility Pipelines Water Supply } Sewer System }	Power and Communication Lines Railroads Subways Power Plants, Nuclear Power Plants, Except Nuclear Pipelines Sewer and Water Mains Sewer and Water Treatment Plants	Telephone and Telegraph Railroad Electric Light and Power Gas Petroleum Pipelines Water Supply Facilities Sewer Systems	
	017	Highways and Streets		
			Highways and Streets Bridges and Elevated Highways Tunnels	Highways and Streets

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EXHIBIT 4-2 (cont'd)

MRIO	MRIO Activity	Census Activity	Value in Place Activity
018	Other Construction Farm Housing Farm Service Facilities Petroleum, Gas Well Drilling Petroleum, Gas, Mineral Exploration Access Structures, Mining Military Facilities Dams and Reservoirs Conservation and Development Other Nonbuilding Facilities	Farm Buildings Dams and Reservoirs Conservation and Development Other Nonbuilding Outdoor Swimming Pools Airports Parking Areas Fencing Marine Construction Harbor and Port Facilities Blast Furnaces, Refineries Oilfields Construction Work, NSK	Farm Nonresidential Military Facilities Conservation and Development Other Private Public
019	Maintenance Construction Residential Buildings Nonresidential Buildings Farm Residential Farm Service Facilities Telephone and Telegraph Railroads Local Transit Electric Utilities Gas Utilities Petroleum Pipelines Water Supply Facilities Sewer Facilities Military Facilities Conservation and Development Highways and Streets Petroleum and Gas Wells Other Nonbuilding Facilities		

Data Collection and Development

The data to be developed at both the national level and state level for each of the MRIO sectors are:

- Net Receipts
- Total Employment
- Construction Workers Employment
- Total Payroll
- Construction Workers Payroll

The VIP series provides only the value of new construction by activity at the national level. It gives no data at the national level on employment, payroll, or maintenance and repair activities. The VIP gives no state-level data. Therefore, the VIP data can only be used to establish national controls for each activity, and this can only be done after the following adjustments have been made: the value of architectural and engineering fees and force-account construction must be subtracted out from the total for each activity. These values were estimated by Mr. George Roff, Bureau of the Census, for a paper entitled "Comparison of the 1977 Census of Construction Industries and the Value of New Construction Put in Place Series," (Source 03126) prepared by Mr. Alan I. Blum, Construction Statistics Division, Bureau of the Census. After subtracting out the architectural and engineering fees and force-account construction, the remainder will be compared to the Census' net receipts by activity for new construction.

As previously mentioned, the Census contains two sets of tables that give gross receipts by activity for both "New Construction" and "Maintenance and Repair." Table 5 in the Industry Series gives gross receipts by activity for each of the 27 four-digit SICs, while Table 7 in the Geographic Series gives gross receipts by activity for 50 states and the District of Columbia.

The Census also provides totals for the following categories for each four-digit SIC and for each state:

- Net Receipts
- Total Employment
- Construction Workers Employment
- Total Payroll
- Construction Workers Payroll

The Census information referred to above is for "establishments with payrolls." Limited data are also available for "establishments without payroll," which make up about eight percent of total gross construction receipts. For such establishments, however, there are no data on net receipts, or on "new construction" receipts versus "Maintenance and Repair" receipts. The following data are available by state for these establishments:

- Number of proprietors and working partners
- Total business receipts

The limited data on establishments without payroll lead to several problems. First, it is unclear what proportion of the \$20.2 billion in total business receipts accounted for by such establishments represents construction receipts. For the purposes of this project, and lacking any information to the contrary, it was assumed that all these receipts were from construction activities.

Second, it is unknown how much of this \$20.2 billion represents work which has been subcontracted to other establishments by establishments without payroll (representing duplication in the data) and therefore should not be included in net receipts. These establishments without payroll are predominantly one- or two-man operations that seem to fall into one of two categories: those that report more than \$100,000 in receipts, and probably subcontract all the work, therefore accounting for very little net receipts; those that report less than \$100,000 in receipts, and probably perform most of the work themselves, therefore accounting for a substantial amount of net receipts. The establishments reporting more than \$100,000 each account for \$9.4 billion in receipts while those reporting less than \$100,000 each account for \$10.7 billion in receipts.

Third, the distribution of receipts over the individual construction activities is unknown. The Industry Series, U.S. Summary volume, reveals that most of these receipts come from building contractors (\$8.3 billion) and special trade contractors (\$8.5 billion) rather than from heavy construction contractors (\$0.9 billion). Building contractors and special trade contractors are predominantly involved in the construction of residential and nonresidential buildings. In view of the generally small size of the establishments without payroll, it seems likely that they are involved in the construction of smaller buildings, such as residential buildings, rather than larger buildings, such as industrial and commercial buildings. In fact, the receipts from such establishments may account

for a large part of the difference between the output of residential construction reported by the Census and that reported by the VIP.

Fourth, there is no way to determine what proportion of the receipts represent new construction as opposed to maintenance and repair construction. Because of the nature of establishments without payroll, it is thought that a larger proportion of their receipts are from maintenance activities than is the case for other establishments.

In view of the above, it has been decided to allocate \$10 billion in net receipts from establishments without payroll, this amount to be split evenly between new construction and maintenance construction. The five billion dollars allocated to new construction was all allocated to MRIO 014, new residential buildings.

The methodology for developing the data by construction activity made use of the national data and the more limited state data (the state data did not include a distribution of construction activity receipts by SIC, but only totals by activity and general statistics on establishments). Therefore, it was necessary to estimate the relationship between net and gross receipts by construction activity, and between employment (and payrolls) and construction activity. Both relationships were developed at the national level. Data so distributed to the states were then reconciled with state totals on net receipts and employment (and payrolls) reported by SIC industry. This reconciliation adjusted for overall state differences, especially for employment/output ratios and state wage differentials.

The steps in developing the national relationships (adjustments) referred to above and their distribution by state are described below.

Estimation of Net Receipts by Activity at the State Level

This section describes the procedures used to estimate net receipts by activity at the state level. The Census publishes gross receipts by activity at the state level. Since the construction work (and the receipts) of one firm may be subcontracted to other construction firms and also be included in the other firm's receipts, it was necessary to convert these gross receipts to net receipts in order to avoid double-counting. The only way to make this conversion using only state-level data would be to calculate the ratio of (net receipts)/(gross receipts) for each state. These ratios would then be applied to

the gross receipts by activity, for the respective states, to obtain an estimate of net receipts by activity. This methodology, however, assumes that the ratio of (net receipts)/(gross receipts) is constant over all activities within a state. This is not believed to be a valid assumption.

In light of the above, the following alternative procedure was used. At the national level, the ratio of (net receipts)/(gross receipts) was calculated for each activity. These national ratios were then applied to the gross receipts of the respective activities within each state. This yielded preliminary estimates of net receipts by activity at the state level. These preliminary estimates were then scaled to reach the published total of net receipts for each state. This methodology assumes that the ratio of (net receipts)/(gross receipts) for a particular activity is similar across all states. Differences between states are accounted for during the scaling. The detailed steps of the methodology outlined above follow:

Step 1: Collection of gross receipts by activity for each SIC at the national level — Table 5 in the 27 individual volumes of the Industry Series was used to compile "Gross New Construction Receipts" and "Gross Maintenance and Repair Receipts" by construction activity for each four-digit SIC.

- Gross receipts at the activity level for SIC 6552 were not published in the Industry Series. These receipts were estimated by deducting the sum of receipts for SICs 15, 16, and 17 from total construction receipts, which is made up of receipts from SICs 15, 16, and 17 plus SIC 6552. These data were included in the Industry Series, U.S. Summary, Table 8.
- Gross receipts for "Other Residential Buildings," "Amusement, Social, and Recreational Buildings," and "Hospitals and Institutional Buildings" for SICs 16 and 6552, and gross receipts for "Harbor and Port Facilities," and "Sewage and Water Treatment Plants" for SICs 17 and 6552, were estimated.

Step 2: Calculation of total gross receipts by activity at the national level — The gross receipts compiled in Step 1 were summed across all SICs for each activity.

- Step 3:** Calculation of net receipts by activity for each SIC at the national level -
-For each SIC, the ratio of (net receipts)/(gross receipts) was applied to the gross receipts for each activity.
- Step 4:** Calculation of total net receipts by activity at the national level -The net receipts calculated in Step 2 were summed across all SICs for each activity.
- Step 5:** Collection of gross receipts by activity at the state level - Table 7 in the Geographic Area Series was used to compile "Gross New Construction Receipts" and "Gross Maintenance and Repair Receipts" by activity for each state. When data were withheld, the following estimating techniques were used.
- To estimate "Gross New Construction Receipts" when "Total Gross Construction Receipts" was given, the national ratio of (Gross New Construction Receipts)/(Total Gross Construction Receipts) for the activity was multiplied by "Total Gross Construction Receipts" for the state-level activity. Subtract the result from "Total Gross Construction Receipts" to obtain "Gross Maintenance and Repair Receipts."
 - When "Total Gross Construction Receipts" was not available for the state-level activity, the national ratio of (activity gross receipts)/(total gross receipts) was multiplied by the state-level "total gross receipts" (i.e., for all construction activities).
 - The estimated receipts were then scaled to reach the published state total.
- Step 6:** Preliminary estimate of net receipts by activity at the state level - First, the ratio of (net receipts)/(gross receipts) was calculated for each activity at the national level (using net receipts data from Step 4 and gross receipts data from Step 2). Then, these national ratios were applied to the respective gross receipts by activity at the state level. The result was a preliminary estimate of net receipts by activity for each state.

Step 7: Final estimate of net receipts by activity at the state level — The net receipts estimated in Step 6 were scaled to reach the state total of net receipts published in the Geographic Area Series. More than 90 percent of the scalars were in the 0.9 to 1.1 range.

Estimation of Employment and Payroll
By Activity at the State Level

This section describes the procedures used to estimate the following by activity at the state level:

- All Employment
- Construction Workers Employment
- All Employment Payroll
- Construction Workers Payroll

The Geographic Area Series provides individual state totals for each of these four categories. The employment and payroll data could have been distributed among activities, within each state, proportionately to net receipts. This would assume, however, that the relationship between employment (or payroll) and net receipts was the same across all activities within a given state. This assumption was not considered valid.

As was the case for net receipts, national ratios were used to obtain preliminary estimates of employment and payroll at the state level. National ratios were obtained from a BEA paper entitled Employment and Employee Compensation in the 1972 Input-Output Study (Source 03518). For example, the ratio of (all employment)/(net receipts) was calculated for each activity at the national level. These national ratios were then applied to the net receipts of the respective activities within each state. This yielded preliminary estimates of all employment by activity at the state level. These preliminary estimates of all employment were then scaled to reach the published total of all construction employment for each state. This methodology assumes that the relationship between employment and net receipts for a particular activity is similar across all states. Differences between states are accounted for by the scaling procedure.

The detailed steps of the procedure outlined above follow. This section refers mainly to all employment, but will apply to the other employment and payroll categories.

- Step 1: Calculation of national ratios for each activity — For each activity, the national ratio of, for example employment/net receipts, was calculated using the data for the appropriate BEA activities from the 1972 BEA paper cited above. In some cases, data were aggregated to correspond to Census activities.
- Step 2: Preliminary estimates of employment by activity at the state level — The national ratios of employment/net receipts calculated in Step 1 above were applied to the respective net receipts by activity for each state. This yielded a preliminary estimate of employment by activity at the state level.
- Step 3: Final estimate of employment by activity at the state level — The employment estimated in Step 2 was scaled to reach the individual state totals published in the Geographic Area Series. For the employment and payroll categories, 88 percent of the scalars ranged between 0.8 and 1.2.

Construction Receipts by State: Location of Establishment
versus Location of Construction

The methodology described up to this point was used to estimate net receipts by location of establishment. This section will explain how these estimates were converted to net receipts by location of construction work. About 14 percent of total gross construction receipts represent construction work performed by establishments outside of their home state.

The principal source of comprehensive state data on construction is the Census of Construction Industries, 1977. Most of the data provided by this source are establishment-based, by state in which the construction establishment is located. Data are provided by state in which the construction actually takes place, but these data are for establishment receipts by type of contractor (SIC) and are not reported by type of construction activity. Further, no differentiation is made between new construction and maintenance and the data are given only in gross receipts rather than net receipts.

Exhibit 4-3 shows gross construction receipts by state: by location of construction work, and by location of establishment. The ratios of receipts by location of construction work to receipts by location of establishment are also shown. In many cases, receipts for construction actually performed in the state vary considerably from receipts collected by establishments in the state. Since these ratios are unlikely to be constant across all construction activities within a state, they could not be applied directly to the states' output data. Instead, adjustments were made for each state at the MRIO level, using relationships between gross receipts by construction location and gross receipts by establishment location for SIC's that most closely match the types of construction activity.

Each of the 27 SIC volumes in the Census of Construction Industry Series contain the following tables:

- Table 8: Participation in Construction Work in Home State and Other States by Location of Establishments with Payroll. Taken together, these tables provide gross receipts by establishment location, by state, for each of the 27 SICs.
- Table 9: Construction Receipts for Establishments with Payroll by Location of Construction Work. Taken together, these tables provide gross receipts by location of construction, by state, for each of the 27 SICs.

Thus, the data in these tables can be used to establish ratios of gross receipts by location of work to gross receipts by location of establishment. These ratios can then be applied to the estimates of net receipts by location of establishment, yielding estimates of net receipts by location of construction work.

The ratios can be calculated for each of the 27 SICs or for groups of SICs. In fact, the SICs were grouped to correspond as nearly as possible to the MRIO new construction sectors. The groupings are shown below:

MRIO 014 -- Residential Buildings
SIC 1521 - Single family housing construction
SIC 1522 - Residential construction, n.e.c.
SIC 1531 - Operative builders

EXHIBIT 4-2:
CONSTRUCTION RECEIPTS BY STATE
LOCATION OF ESTABLISHMENT VERSUS LOCATION OF CONSTRUCTION
(Thous. \$)

	Gross Receipts		Ratio Col. 1 / Col. 2
	Const. Loc.	Estab. Loc.	
United States	214,844,319	214,844,319	1.0
NORTHEAST			
New England			
Maine	869,822	795,930	1.231
New Hampshire	820,883	775,529	1.058
Vermont	879,962	233,568	1.238
Massachusetts	2,838,854	4,073,813	.896
Rhode Island	814,433	721,933	.938
Connecticut	2,325,426	2,633,000	.881
Middle Atlantic			
New York	10,411,522	10,519,618	.990
New Jersey	2,338,735	2,489,388	.972
Pennsylvania	9,195,828	10,166,864	.904
NORTH CENTRAL			
East North Central			
Ohio	2,908,730	2,930,851	.925
Indiana	4,802,237	4,688,990	1.024
Illinois	11,872,892	11,866,811	1.001
Michigan	7,891,812	7,549,335	1.019
Wisconsin	4,050,272	4,206,483	.962
West North Central			
Minnesota	4,053,048	4,561,849	.889
Iowa	2,112,757	2,745,882	1.134
Missouri	4,018,510	4,500,045	.893
North Dakota	918,409	718,375	1.279
South Dakota	683,943	522,240	1.307
Nebraska	1,782,712	1,722,480	.941
Kansas	2,400,051	2,349,877	1.021
SOUTH			
South Atlantic			
Delaware	614,825	1,067,481	.875
Maryland	4,475,322	5,268,141	.849
District of Columbia	1,500,486	846,044	2.322
Virginia	2,658,029	4,670,796	1.162
West Virginia	1,823,400	1,107,396	1.647
North Carolina	4,470,402	4,229,842	1.033
South Carolina	2,441,483	2,925,498	.837
Georgia	4,267,333	4,216,749	1.009
Florida	6,864,861	6,782,933	1.022
East South Central			
Kentucky	2,873,951	2,404,789	1.196
Tennessee	2,529,299	2,548,989	.992
Alabama	2,536,858	2,495,064	1.012
Mississippi	1,933,436	1,201,403	1.604
West South Central			
Arkansas	1,868,797	1,450,928	1.288
Louisiana	2,403,646	4,421,222	1.219
Oklahoma	2,810,785	2,268,954	1.102
Texas	10,565,180	10,442,626	.994
WEST			
Mountain			
Montana	964,766	788,195	1.229
Idaho	1,092,282	1,061,289	1.029
Wyoming	1,028,815	620,497	1.629
Colorado	2,928,100	4,082,458	.965
New Mexico	1,087,327	1,126,748	1.243
Arizona	2,756,186	2,960,811	1.227
Utah	1,872,234	1,742,122	.960
Nevada	1,451,265	1,226,655	1.189
Pacific			
Washington	2,104,487	4,061,221	1.029
Oregon	2,584,277	2,288,923	1.067
California	23,441,896	22,640,620	.966
Alaska	2,417,911	1,274,877	1.789
Hawaii	1,411,856	1,229,495	1.062

MRIO 015 -- Nonresidential Buildings

SIC 1541 - Industrial buildings and warehouses

SIC 1542 - Nonresidential construction, n.e.c.

MRIO 016 -- Utilities

SIC 1623 - Water, sewer, and utility lines

SIC 1629 - Heavy construction, n.e.c. (part)

MRIO 017 -- Highways and Streets

SIC 1611 - Highway and Street Construction

SIC 1622 - Bridge, tunnel, and elevated highway construction

MRIO 018 -- Other Nonbuilding Construction

SIC 1629 - Heavy construction, n.e.c.

These matches are of course only approximate since the establishments in each SIC perform work that cuts across the construction types that comprise each MRIO sector.

Data for the special trade contractors (SIC 17) were not used to make these adjustments. Their work is spread among the other SICs and, to a considerable extent, represents maintenance work. There are not sufficient data to distribute the receipts for SIC 17 among the other SICs. In determining the ratio to be applied to MRIO 016, 50 percent of the receipts for SIC 1629 was used.

For purposes of illustration, the methodology will now be applied to the data for Maine. Maine's gross receipts from Table 8 (location of establishment) and Table 9 (location of construction work) are shown below, along with the estimated net receipts by establishment location at the MRIO level. The initial estimates of net receipts by construction location and the scaled estimates of net receipts by construction location, the result of this methodology, are also shown.

	(million \$)					
	Gross Receipts		Net Receipts			
	Estab. Loc.	Const. Loc.	Estab. Loc.	Initial Est. Const. Loc.	Scaled Est. Const. Loc.	
MRIO 014	173.8	181.6	152.7	160.6	145.5	
SIC 1521	117.5	120.1				
SIC 1522	17.2	22.7				
SIC 1531	38.3	38.8				
MRIO 015	110.0	183.5	118.7	198.6	179.9	
SIC 1541	38.7	77.6				
SIC 1542	71.3	105.9				
MRIO 016	51.3	78.5	54.0	82.6	74.8	
SIC 1623	39.2	50.8				
pt. SIC 1629	12.1	27.7				
MRIO 017	87.6	87.5	54.5	54.5	49.4	
SIC 1611	58.9	60.9				
SIC 1622	28.7	26.6				
MRIO 018						
SIC 1629	24.2	55.4	61.4	140.6	127.4	
MRIO 019 (maintenance)			146.1	146.1	146.1	
Totals			587.4	783.0	723.1	

Considering MRIO 014, net receipts by construction location were estimated as follows:

$$\frac{181.6}{173.8} (152.7) = 160.6 \text{ (mil \$)}$$

.... where 181.6 and 173.8 are the sums of gross receipts from SICs 1521, 1522, and 1531, by construction location and establishment location, respectively; and 152.7 is the total net receipts by establishment location, for MRIO 014.

After completing the procedure for each MRIO, the new estimated total of net receipts is \$783 million (MRIO 019, maintenance, is not being adjusted), compared to the previous total of \$587.4 million. Thus, the new total is 1.33 times the previous total. From Exhibit 4-3, it is seen that the ratio of gross receipts by construction location to gross receipts by establishment location is 1.23. This latter ratio for gross receipts is the best estimate available for net receipts. The difference in the final ratios is due to the necessarily imprecise way in which SIC data are imputed to construction types or activities. Therefore, the net receipts for each MRIO (except maintenance) are scaled

so that the total net receipts maintain the same ratio as that for gross receipts (i.e., by location of construction to location of establishment). Since the correct ratio is not determinable, this ratio is allowed to vary in the final scaling described in the last paragraphs of this section.

The total state-level net receipts to which the initial MRIO-level estimates of net receipts were scaled was calculated as follows:

$$\frac{869.0}{705.9} (587.4) = 723.1 \quad (\text{mil } \$)$$

.... where 869.0 and 705.9 are total gross receipts by construction location and establishment location, respectively (see Exhibit 4-3); and 587.4 is total net receipts by establishment location.

The same procedure was used for each of the new construction MRIOs within each state. Then, within each MRIO, the new state-level estimates of net receipts were scaled to reach the national-level MRIO total (which was not affected by the location of establishment versus location of construction problem), providing a final estimate for net receipts at the MRIO level for each state. The ratios of these final estimates to the original estimates (based on establishment location) were then used to adjust payroll, employment, value added, and inputs at the MRIO level for each state.

Force-Account Construction

In 1972, there was about \$28 billion in force-account construction (FAC). It is estimated that \$64.5 billion of FAC was performed in 1977: \$36.5 billion in new FAC; and \$28.0 billion in maintenance FAC. The originating sectors, with their 1972 and 1977 values of FAC, are shown in Exhibit 4-4. In the following sections, the methodologies used to estimate FAC in each of the sectors shown in Exhibit 4-4 will be discussed.

EXHIBIT 4-4:
FORCE-ACCOUNT CONSTRUCTION
(\$ millions)

MRIO Sector	1972 BEA I-O	Sector	1972 FAC	1977 FAC		
				Total	New	Maint.
010,011	8.0000	Petroleum and Gas Exploration	861.5	9,135	9,135	
7-9,12 13	5,6,7,9 10	Mining	482.0	932	932	
055	37.0101	Blast Furnaces and Steel Mills	504.1	0	0	0
085	65.0100	Railroads	1,754.0	3,762	452	3,310
092	66.0000	Communications, excluding Radio & TV	2,740.1	2,950	2,950	
094	68.0100	Electric Services (utilities)	3,071.1	6,732	4,472	2,260
095	68.0200	Gas Production, Distribution (utilities)	905.8	1,595	1,070	525
105	71.0100	Owner-Occupied Dwellings	0	12,633	9,988	2,645
105	71.0200	Real Estate and Rental	1,121.9	6,230	313*	5,917*
094	68.0100	Federal Electric Utilities	443.3	included with private utilities		
094	68.0100	State and Local Electric Utilities	432.0			
119	79.0300	Other State and Local Gov't Enterprises	2,454.9	4,100	849	3,251
154	97.0000	Federal Gov't Purchases, Non-defense	1,198.1	556	556	
155	98.0000	State and Local Gov't Purch., Education	1,804.4	3,399	67	3,332
155	99.1000	State and Local Gov't Purch., Health, Welfare, and Sanitation	189.0	409	20	389
155	99.2000	State and Local Gov't Purch., Safety	85.7	187	0	187
155	99.3000	State and Local Gov't Purch., Other General Government	4,980.0	7,855	1,681	6,174
		Sub-total		60,475	32,485	27,990
		Other (Non-res. bldgs.; farm fac.)		3,982	3,982	0
		Total FAC		64,457	36,467	27,990

*Residential Only

MRIO 010, 011 - Petroleum and Gas Exploration

MRIO 007, 008, 009, 012, 013 - Mining

In estimating force-account construction in the exploration and mining sectors, capitalized values of construction work by type in the revised estimates of the National Income and Product Accounts (NIPA) contained in the July 1979 Survey of Current Business (Source 03501) were used as control totals. In 1977, slightly over \$10 billion was spent on mining exploration, shafts, and wells. Of this total, \$9.135 billion represented capitalized expenditures on petroleum exploration and well drilling. This figure was used as the control total for total construction in MRIO Sectors 010 and 011. After deducting contract construction, the FAC amount was \$9,014 billion. The remainder (\$932 million) was taken to be the FAC control total for all other mining (i.e., nonpetroleum exploration and development). This latter figure would be apportioned among the remaining five MRIO mining sectors.

Of the \$9.135 billion in petroleum mining FAC, it was assumed that most of it represented output of the oil and gas field services, along with some capitalized expenditure on exploration and development by the oil and gas producing SIC (Note: In the estimation of force-account construction, the synthetic split between oil and gas was not attempted.) With total force account construction output established to be \$9.135 billion, estimates of the employment, payroll, cost of materials, and value added associated with this output were calculated based on the ratios of value of shipments (adjusted for inventory change) to employment, payroll, etc., determined from the national level oil and gas field services data.

The \$932 million of other mining FAC was split among the remaining five MRIO mining sectors proportional to the sum of capitalized exploration and development expenditures of the SICs comprising those sectors. For Sectors 008, 009, and 012, this sum included any capitalized exploration and development expenditures by their associated mining services SICs. Again, estimates of employment, payroll, etc. associated with each sector's force account construction were estimated from the ratio of value of shipments (adjusted for inventory) to employment, payroll, etc., determined from the national level mining services data.

Once force account construction values were estimated in this fashion, these values by state were removed from the particular MRIO sector output and employment totals and redefined to the construction sector. (The original data are stored in an Initial Data

File and the adjustments are made in a special Redefinition Data File.) Petroleum sector force account construction output and employment was removed prior to making the synthetic split between oil and gas described below, but after the combined output for Sectors 010 and 011 was adjusted for the output of the natural gas liquids SIC since no force account construction was assumed to be associated with that SIC. (No attempt was made to split total mining force account construction between the three BEA construction I-O sector involved: 11061 - new petroleum and natural gas well drilling, 110602 - new petroleum, natural gas, and solid mineral exploration, and 110603 - new access structures for solid mineral development).

State level oil and gas field service data were scaled to the \$9.014 billion control total to provide estimates of force account construction by state for petroleum and gas exploration. Splitting the mining MRIO sector totals by state was accomplished by using, where available, mining services value of production data by state or by using MRIO sector output totals by state.

MRIO 055 - Blast Furnaces and Steel Mills

Force-account construction was not estimated for blast furnaces and steel mills due to the following:

- The only available data indicated that the amount was relatively small. According to the 1977 Census of Manufactures (Source 03105), Industry Series, Blast Furnaces (33-A-43), Table 9, the payroll for FAC of blast furnaces and steel mills was only \$42.9 million. This indicates the output was only slightly more than \$100 million.
- None of the other manufacturing sectors had significant amounts of FAC.
- It was felt that FAC in this sector is so intimately linked to manufacturing that it should not be redefined to the construction industries.

MRIO 085 - Railroads

According to the, Yearbook of Railroad Facts (Source 22051, 1979, p.56), capital expenditures for roadways and structures amounted to \$751 million. According to NIPA, new construction for railroads amounted to \$737 million. Since the capital expenditures figure given by the Yearbook could include land and/or some equipment

purchases, the NIPA amount will be accepted as a control total. Contract construction of new railroad facilities in 1977 was about \$239 million (Census). An additional \$46 million was spent on architectural and engineering fees. Therefore, by subtraction, new FAC was \$452 million.

In 1977, total railroad maintenance was \$3,460 million (Yearbook of Railroad Facts, p.16). Contract maintenance was only \$150 million (Census). Therefore, maintenance FAC was, by subtraction, \$3,310 million.

The Census does not provide sufficient state-level detail to distribute either new or maintenance contract work among the states. Therefore, no attempt will be made to distribute contract construction and FAC separately. Rather, total new construction (\$737 million) and total maintenance construction (\$3,460 million) will be distributed to the states. These distributions will be made proportionately to the states' total railroad mileage (Yearbook, p.47).

MRIO 092 - Communications, Except Radio and Television

This category is made up of telephone and telegraph facilities. According to NIPA, new construction of such facilities was valued at \$4,278 million in 1977. According to the Census, new contract construction amounted to \$1,067 million. The difference of \$3,268 is assumed to be FAC plus architectural and engineering (A&E) fees. A&E fees have been estimated at \$261 million, meaning that new FAC of telephone and telegraph facilities was about \$2,950 million in 1977.

Since there is no readily available state data on new FAC expenditures, the state distribution of the \$3,007 million was based on the increase in the amount of telephones in use between 1976 and 1977 (Statistical Abstract of the United States (Source 03120), 1978 and 1979, Table 975).

MRIO 094 - Electric Services (Utilities)

To determine FAC for electric utilities, contract construction was deducted from total construction. Total new construction was obtained from NIPA, while total maintenance was estimated. Contract construction was estimated based on Census data.

NIPA reports \$11,199 million in new electric utility construction by the private sector in 1977. In addition, there was an estimated \$1,761 million in new construction by

Federal and state and local governments. Total new construction, then, was \$12,960 million.

Total maintenance was estimated based on 1972 total maintenance as reported by BEA, and on data from Electrical World for 1972 and 1977 (Source 24014). In 1972, BEA reported \$1,385 million, while EW reported \$2,144 million. (The amount reported by EW is high because it includes maintenance of equipment.) In 1977, EW reported \$4,568 million. 1977 maintenance was estimated as follows:

$$(4,568) \frac{1,385}{2,144} = \$2,951 \text{ million}$$

Maintenance for state and local utilities was estimated by applying the ratio 1,385/2,144 to the amount reported by EW for state and local utilities:

$$(413) \frac{1,385}{2,144} = \$267 \text{ million}$$

By subtraction, maintenance of private utilities was \$2,684 million.

Contract construction was derived from the Census. There is a problem, however, in that the Census reports data for two categories: "power plants," which includes only electric generating plants; and "power and communication transmission lines," which includes telephone and telegraph lines as well as the electrical transmission and distribution lines. At this point, there is no way of determining what percentage of the "lines" category should be allocated to the electric utility industry. Therefore, a 50-50 split has been arbitrarily made. The Census data, after converting from gross to net receipts are: construction of utility plant, \$6,166 million; maintenance of utility plant, \$454 million; construction of power lines, \$1,000 million; and maintenance of power lines, \$237 million.

The data presented above are summarized in the table below. In addition, the table shows part of construction NSK, which was redistributed to all activities, and architectural and engineering fees. FAC was derived by subtracting the Census data from the total output.

		(mil. \$)		
		Total	New	Maintenance
Total:	private	13,883	11,199	2,684
	public	2,028	1,761	267
	Total	15,911	12,960	2,951
Census:	utilities	6,620	8,166	454
	lines	1,237	1,000	237
	Sub-total	7,857	7,166	691
	Const., NSK		486	
	A&E Fees		836	
	Total	9,179	8,488	691
	FAC	6,732	4,472	2,260

The state distribution of new FAC for electric utilities was based on the state distribution of the "application of funds to construction and plant expenditures (including land)," as reported in Statistics of Privately Owned Electric Utilities in the United States, 1977 (Source 06103, pp. 300-336). At the national level, the total application of funds to construction was \$20,148 million. However, this figure could not be used directly since it includes land expenditures and non-construction plant expenditures. To correct for these non-construction expenditures, the total new electric utility construction expenditures of \$12,960 million was distributed to the states proportionate to the states' application of funds. In other words, the state data were multiplied by 0.643 (12,960/20,148). The result was an estimate of total new construction, by state.

Next, for each state, the contract construction was subtracted from the total new construction. This yielded an estimate of new electric utility FAC for each state. The contract construction was based on Census data. Two Census categories, power plants and part of power and communication transmission lines, were combined. Fifty percent of the receipts in the transmission lines category was added to the power plant category, to reach a total for new electric utility contract construction.

This procedure led to realistic results for all but seven states, where the estimated FAC was negative. (The total FAC for these seven states was -\$795 million). In these cases, FAC was assumed to be zero, and the FAC in the other states was adjusted

downward, proportionate to the states' estimated FAC, by a total of \$795 million (14 percent of total FAC).

MRIO 095 - Gas Utilities

Force account construction (FAC) of gas utilities was estimated based on payroll for construction workers in the industry. This total was then split between new FAC and maintenance FAC. Total contractor (non force-account) construction is then obtained by subtracting new FAC from total new construction as capitalized in the NIPA accounts. Total contractor construction of gas utilities cannot be derived from Census data because the Census combines gas pipelines and petroleum pipelines in one activity.

In 1977, the construction payroll of gas utilities was \$432 million (1977 Gas Facts, p.182) (Source 22011). This accounts for only part of the FAC; the cost of materials must also be included. An output/payroll ratio was calculated for gas utilities, using data from the Employment and Employee Compensation in the 1972 Input-Output Study (Source 03518). New and maintenance data were combined in the calculation of this ratio, which was then applied to the \$432 million payroll, yielding an estimate of total FAC. The calculation are summarized:

$$\frac{1655 + 414}{353.7 + 206.7} (432) = \$1,595 \text{ million}$$

This amount must be split between new construction and maintenance construction. This process is complicated somewhat by the fact that the Census category including gas utilities also includes petroleum pipelines. For the construction of gas and petroleum pipelines, the Census gives:

New pipelines	1,949
Maintenance	<u>309</u>
Total	\$2,258 (mil \$)

An initial assumption is that all of the contract maintenance is performed on petroleum pipelines, and that any maintenance performed on gas pipelines is FAC. This appears reasonable since gas companies are more likely to employ their own maintenance crews than are petroleum pipeline companies, and, furthermore, the 1972 FAC (BEA I-O table) for petroleum pipelines was only \$90 million, compared to \$905.8 million for gas utilities.

An estimate for total maintenance for gas utilities was obtained by multiplying the 1972 maintenance (as given by BEA) by the ratio of (1977 total plant)/(1972 total plant, as given by 1977 Gas Facts (p. 116 and p. 150, respectively):

$$(414) \frac{56,668}{44,683} = 525 \text{ (mil \$)}$$

Deducting this entire amount from total FAC provides an estimate for new FAC.

Total FAC	1,595
Maint FAC	<u>525</u>
New FAC	1,070 (mil \$)

NIPA reports new private gas utility construction in 1977 as \$1,482 million. State and local government gas utility construction is estimated at \$67 million. Using the information developed above, a table showing total construction, contract construction, and FAC can now be completed.

(mil \$)	New	Maint	Total
Total	1,549	525	2,074
Contract	479	0	479
FAC	1,070	525	1,595

In 1972, FAC made up about 44 percent of total gas utility construction. In 1977, estimated FAC makes up about 77 percent. This indicates that the estimate of \$1,595 million may be too high. Furthermore, the estimate of \$1,070 million for new FAC for gas utilities leaves nothing for FAC for petroleum pipelines. NIPA indicates that new construction of petroleum pipelines amounted to \$1,197 million in 1977. Adding this amount to gas pipelines yields a total for all new pipeline construction of \$2,746 million. The Census indicates that contract construction of all new pipelines was \$1,949 million. Subtracting the Census amount from the total amount yields an estimated \$797 million for new FAC for all pipelines, compared to the estimated \$1,070 million for new FAC for gas pipelines. Examining only the Census data, if the amount of new contract construction for gas (\$741 million) is subtracted from new contract construction for all pipelines (\$1,949 million), \$1,208 million is left for contract construction of petroleum pipelines (compared to \$1,197 million in total new construction reported by NIPA). This analysis provides further evidence that the FAC estimate

for gas utilities may be too high. In any event, FAC for petroleum pipelines is so small that for all practical purposes it can be assumed to be zero.

MRIO 105 - Real Estate

Mr. Alan Blum (Source 03126) has made the following estimates of new residential FAC:

- Single family residential, new: \$4,928 million,
- Single family residential, additions and alterations: \$5,060 million;
- Multifamily residential, additions and alterations: \$313 million.

Blum's estimate regarding single-family residential FAC (new) is difficult to verify. His estimates regarding additions and alterations, however, are subject to verification.

According to Residential Alterations and Repairs, May 1978 C 50-77-5, (Source 03122), a total of \$14,237 million was spent on additions and alterations in 1977. Of this amount, \$12,015 million was spent on jobs costing more than \$25, and \$2,222 million was spent on jobs costing less than \$25. Of the \$12,015 million spent on jobs costing more than \$25, \$4,538 million represented payments for building materials purchased directly by the owner. Thus, of the jobs costing more than \$25, \$4,538 million (37.8%) represents FAC. If this same proportion holds true for jobs costing less than \$25, then there is an additional \$840 million in new FAC ($.378 \times 2222 = 840$). The total FAC, then, according to Residential Alterations and Repairs, is approximately \$5,378 millions. This is extremely close to Blum's estimate of \$5,373 million.

In view of the above verification of Blum's estimate of FAC for additions and alterations, it seems reasonable to accept not only that estimate, but also the one regarding new single-family residential structures. To summarize, total new FAC for single-family structures is \$9,988 million, while for new multifamily structures it is \$313 million.

Since Residential Alterations and Repairs provides no state-level data, the residential FAC will be distributed to states proportionately to the states' net receipts for single-family residential structures and multifamily residential structures, respectively.

The publication Residential Alterations and Repairs can also be used to estimate the amount of maintenance FAC performed on residential structures. This publication can

be used to create the following table:

(mil \$)	Single-family	Multi-family	Total
Repairs	5,707	5,639	11,344
Replacements	4,042	1,657	5,699
TOTAL	9,747	7,296	17,043

FAC may now be estimated. Contract maintenance construction, as reported by the Census, can be subtracted from the total maintenance construction shown above. The result will be FAC. This is shown in the following table:

(mil \$)	Single-family	Multi-family	Total
Total	9,747	7,296	
Contract	7,102	1,379	
FAC	2,645	5,917	8,562

This estimate may be checked against the data in Table 13 of Residential Alterations and Repairs, which shows payments for building materials purchased directly by owner for maintenance jobs of \$25 or more. Table 13 indicates that such purchases amounted to \$1,845 million for repairs and \$776 million for replacements. Thus, FAC for jobs costing more than \$25 amounted to \$2,621 million. For jobs costing less than \$25, repairs accounted for \$5,956 million while replacements accounted for \$1,657 million. The total cost of these small jobs was \$7,613 million. It is difficult, however, to estimate what proportion of such jobs was FAC. If 75 percent of these jobs were performed by the homeowner, or performed by a contractor with materials purchased by the homeowner, then FAC for jobs of less than \$25 amounts to \$5,710 million. Adding \$5,710 million to \$2,621 million gives a total estimated FAC of \$8,331 million. Although slightly lower than the first estimate, it does lend credibility to the first estimate, provided the 75 percent figure is accepted.

The assumption that 75 percent of the jobs costing less than \$25 are performed with materials purchased by owners is arbitrary, but reasonable. These are small jobs, such as repairing broken windows, fixing a light switch, or painting a porch. Indeed, it seems difficult to imagine a contractor doing anything for less than \$25. In view of this rough verification of the original estimate, residential maintenance FAC will be assumed to be \$8,562 million.

FAC for renter-occupied non-residential buildings is difficult to estimate, but is assumed to be relatively insignificant. This assumption is based on the fact that I-O Sector 71.0200 accounted for only \$383.3 million in maintenance of non-residential buildings in 1972 (BEA I-O Tables). Much of this amount, furthermore, was probably contract maintenance.

MRIO 094 - Federal Electric Utilities and State and Local Electric Utilities

In 1972, BEA made individual estimates of FAC of electric utilities for private electric utilities, and State and local electric utilities. For purposes of this study, however, only one estimate, covering FAC of all electric utilities, has been made. New FAC was estimated at \$5794 million and maintenance FAC was estimated at \$2260 million. The methodology used to generate these estimates is discussed above, in the section titled MRIO 094 - Electric Services (Utilities).

MRIO 119 - Other State and Local Government Enterprises

No data were available for FAC for other state and local government enterprises. BEA provided some data on FAC compensation that was used to estimate total FAC for each of the four state and local final demand sectors. These estimates of 1977 FAC and the BEA estimates of 1972 FAC were used to estimate 1977 FAC for other state and local government enterprises.

In 1972, BEA estimated total FAC for the four final demand sectors at \$7,059 million, and for other government enterprises, \$2,455 million. The total estimated FAC for 1977 for the four final demand sectors is \$11,786 million. FAC for other government enterprises for 1977 is then estimated by:

$$\frac{11,786}{7,059} (2,455) = \$4,100 \text{ million}$$

The \$4,100 million must be split between new and maintenance, and then distributed to the individual construction activities. (Since all new construction is part of final demand, the new FAC will be redefined to the appropriate final demand sector.) The distribution was based on the activities remaining in the 1972 I-O tables after eliminating all the activities that are not government enterprises. After isolating the 1972 new construction that originated in the other government enterprises sector and that was redefined to a final demand sector, new FAC was estimated by applying

1972/1977 ratios to total state and local government construction, and by accepting some of Blum's estimates of FAC for state and local governments.

The following table summarizes the results for new FAC.

<u>MRIO</u>	<u>Activity</u>	<u>Description</u>	<u>Government Function</u>	<u>(mil \$) New FAC</u>
015	6	Office Buildings	General Government	38
	12	Other Buildings	General Government	10
	12	Other Buildings	Air & Water Transportation	18
	12	Other Buildings	Other Commercial Activities	18
016	28	Subways	Local Transit	68
	27	Gas Utilities		21
	26	Sewer & Water Mains.	Sewer & Water	473
	33	Sewer & Water Mains.		159
018	35	Other Nonbuilding	Air & Water Transportation	37
	35	Other Nonbuilding	Other Commercial	<u>7</u>
T o t a l				849

Subtracting \$849 million from \$4,100 million leave \$3,251 million for maintenance FAC. This was distributed to construction activities proportionate to 1972 maintenance as reported by BEA for other state and local government enterprises. The results are summarized in the table below.

<u>Activity</u>	<u>Description</u>	<u>(mil \$) FAC</u>
12	Other Nonresidential	134
27	Gas Utilities	19
26	Sewer and Water Mains	2802*
33	Sewer and Water Plants	
14	Highways (tolls)	177
35	Other Nonbuilding	<u>119</u>
T o t a l		3251

*1906 is for water facilities; 896 is for sewer facilities.

Final Demand - Federal Government Purchases, Non-Defense

The estimate for new FAC in the Federal non-defense sector was based on compensation for force-account construction. NIPA Table 5.4 indicates that total public new construction, including FAC compensation, was \$39,455 million; NIPA Table 3.7 B indicates that total public new construction, excluding FAC compensation was \$38,324 million. The difference of \$1131 million is new FAC compensation. Deducting \$884 million for state and local government FAC compensation, leaves \$247 million for Federal new FAC compensation. Rather than making an arbitrary split between defense and non-defense, this entire amount was allocated to the non-defense sector. (In 1972, about 85 percent of all Federal FAC originated in the non-defense sector.)

Total new FAC (compensation plus materials) can be estimated by multiplying the FAC compensation by an appropriate output/compensation ratio. Most of the Federal non-defense construction is conservation and development (62 percent in 1972). Therefore, it seems reasonable that most of the FAC is devoted to conservation and development facilities, and all of it will be so allocated. In 1972, the ratio of output/compensation for new conservation and development facilities was 2.25 (output = 2172; compensation = 965). New FAC is then calculated directly:

$$\text{FAC} = (2.25)(\$247) = \$556 \text{ million}$$

Final Demand - State and Local Government Purchases

The same methodology and data sources were used to estimate force-account construction for all four of the State and Local Government final demand sectors. The basic methodology was to estimate FAC compensation for a particular government function, and then multiply this estimate by an output/compensation ratio for an appropriate construction activity. The product is an estimate of force-account construction by function and activity. The data source for FAC compensation by government function was a printout of unreleased projections by BEA (Source 03516). The Employment and Employee Compensation in the 1972 Input Output Study (Source 03518) was used to calculate output/compensation ratios. After multiplication, the estimates of FAC were aggregated to the final demand sector level.

Exhibit 4-5 shows the estimates of FAC compensation by function for both new construction and maintenance, the output/compensation ratios used for each function, and the FAC estimates. The symbol N/A means that BEA estimates of FAC compensation were not available. A brief discussion of each final demand sector follows.

Education

It was assumed that all new FAC compensation for this sector was for educational buildings, and the output/compensation ratio was based on BEA activity 11.0207 -new educational buildings. All maintenance FAC compensation was assumed to be for buildings, and the output/compensation ratio was based on BEA activity 12.0201 - maintenance and repair of other nonfarm buildings.

Health, Welfare, and Sanitation

New FAC compensation for function five, health, was multiplied by the output/compensation ratio for BEA activity 11.0209 - new other nonfarm buildings. New FAC compensation for function six, hospitals, was multiplied by the output/compensation ratio for BEA activity 11.0208 - new hospitals and institutional buildings. All maintenance FAC compensation was assumed to be for buildings, and the output/compensation ratio was based on BEA activity 12.0201 - maintenance and repair of other nonfarm buildings.

BEA provided no estimates of FAC for functions seven and eight (sewerage and other sanitation). FAC for these functions was estimated separately. See discussion above for MRIO 119 - Other State and Local Government Enterprises.

Safety

According to the BEA projections, there is no new force-account construction in this sector. All the maintenance FAC compensation is assumed to be for buildings, and the output/compensation ratio is based on BEA activity 12.0201 - maintenance and repair of other nonfarm buildings.

EXHIBIT 4-5:
FORCE-ACCOUNT FOR STATE AND LOCAL GOVERNMENTS
(\$ Millions)

Final Demand Sector	Government Function	New FAC Compensation	x	Out/Comp.	=	New FAC	Maint FAC Compensation	Out/Comp.	Maint. FAC
Education	1. Higher Education	5.576		6425/1977.6		18.1	273.582	} 11512.7/4952.2	3331.9
	2. Elementary & Secondary Ed.	14.930				48.5	1124.561		
	3. Libraries	0					15.768		
	4. Other Education	0					19.328		
	Total						66.6		3331.9
Health, Welfare, Sanitation	5. Health	1.347		2907.6/909.3		4.3	29.479	} 11512.7/4952.2	389.0
	6. Hospitals	5.645		4180/1472		16.0	123.567		
	7. Sewerage	N/A					N/A		
	8. Other Sanitation	N/A					N/A		
	9. Welfare	0					14.264	389.0	
Total						20.3		389.0	
Safety	10. Police	0					18.464	} 11512.7/4952.2	187.2
	11. Fire	0					15.598		
	12. Correction	0					46.421		
	Total						0		187.2
Other General Government	13. General Government	26.070		6263/2072		78.8	276.343	} 11512.7/4952.2	642.4
	14. Highways	469.594		10429/3570.4		1371.7	3146.169		
	15. Natural Resources	47.420		2172/964.9		106.7	98.727		
	16. Parks and Recreation	55.037		2172/964.9		123.9	114.585		
	17. Airports	N/A					N/A		
	18. Housing and Urban Renewal	N/A					N/A		
	19. Public Utilities	N/A					N/A		
	20. Other Commercial Activities	N/A					N/A		
Total						1681.1		6174.0	
Total: All State and Local FAC (except government enterprises)						1768.0			10082.1

Other General Government

New FAC compensation for function 13, general government, was assumed to be for office buildings, and the output/compensation ratio was based on BEA activity 11.0202 - new office buildings. New FAC compensation for function 14, highways, was multiplied by the output/compensation ratio for BEA activity 11.0400 - new highways and streets. New FAC compensation for functions 15, natural resources, and for function 16, parks and recreation, was assumed to be for conservation and development. The output/compensation ratio for these two activities was based on BEA activity 11.0506 - new conservation and development facilities.

Maintenance FAC compensation for function 13, general government, was assumed to be for buildings, and the output/compensation ratio was based on BEA activity 12.0201 - maintenance and repair of other nonfarm buildings. Maintenance FAC compensation for function 14, highways, was multiplied by the output/compensation ratio for BEA activity 12.0214 - maintenance and repair of highways and streets. Maintenance FAC compensation for function 15, natural resources, and for function 16, parks and recreation, was assumed to be for BEA activity 12.0213 - maintenance and repair of conservation and development facilities.

BEA provided no estimates of FAC for the following functions in this sector: function 17, airports; function 18, housing and urban renewal; function 19, public utilities (water supply, electric power, gas supply, and local transit); and function 20, other commercial activities (parking lots and liquor stores). FAC for these functions was estimated separately. See discussion of MRIO 119 - Other State and Local Government Enterprises.

Adjustments to Sector Data for Force-Account Construction

The data for output, employment, payroll and value added associated with force-account construction (FAC) will be included in the appropriate MRIO construction sector. Correspondingly, the data for the originating sectors must be adjusted as necessary to exclude data associated with force-account construction.

The estimates for the amount of force-account construction by sector are shown in Exhibit 4-4. The adjustments to the originating sectors differ depending upon how the data were developed initially and for this reason are discussed below under headings

convenient for distinguishing these differences. For a given MRIO sector, the treatment of the data associated with new FAC and maintenance FAC is identical.

Mining Sectors

In estimating force-account construction in the mining sectors, capitalized values of construction work by type in the revised estimates of the National Income and Product Accounts (NIPA) contained in the July 1979 Survey of Current Business (Source 03501) were used. In 1977, slightly over \$10 billion was spent on mining exploration, shafts, and wells. Of this total, \$9,135 billion represented capitalized expenditures on petroleum exploration and well drilling. This figure was assumed to be the control total for total construction in MRIO Sectors 010 and 011. The remainder (\$932 million) was taken to be the control total for all other mining (i.e., nonpetroleum exploration and development) force-account construction. This latter figure would be apportioned among the remaining five MRIO mining sectors.

Of the \$9,135 billion in petroleum mining force-account construction, it was assumed that most of it represented output of the oil and gas field services in 1977 along with some capitalized expenditure on exploration and development by the oil and gas producing SIC. With total force-account construction output established to be \$9,135 billion, estimates of the employment, payroll, cost of materials, and value added associated with this output were calculated based on the ratios of value of shipments (adjusted for inventory change) to employment, payroll, etc., determined from the national level oil and gas field services data. State level oil and gas field service data were also scaled to the \$9.1 billion control total to provide estimates of force-account construction by state.

As indicated above, capitalized force-account construction in the oil and gas extraction industry has been excluded in developing the output, employment, payroll, and value added measures for the oil and gas industries (MRIO 010 and 011). The specific inputs of materials and services were developed excluding inputs to the oil and gas service industries (SIC 138) in which most of the capitalized work is performed, and which in total account for output of approximately the same amount as the capitalized work (actually the service industries do some work on current account and some capitalized work is performed in the operating industries.) Thus, the adjustments necessary are already made in the original data development. (These adjustments were made at that stage of the work in order to simplify the split of the oil and gas industry into two separate sectors.)

No adjustments were made for force-account construction in the other mineral sectors in the original data. However, the capitalized value of the construction was not included in output; only the value of mineral products is included in output. Thus, it is necessary to adjust only the input controls, specific input data, employment, payrolls and value added to exclude the data associated with force-account construction.

The remaining \$932 million of other mining force-account construction was split among the remaining five MRIO sectors proportional to the sum of capitalized exploration and development expenditures of the SICs comprising those sectors. For Sectors 008, 009, and 012, this sum included any capitalized exploration and development expenditures by their associated mining services SICs. Estimates of value added, employment, and payrolls associated with each sector's force-account construction were estimated from ratios determined from the national level mining services data. The value of total intermediate inputs was calculated by subtracting value added associated with FAC from the total value of FAC in each sector. Splitting the national MRIO sector totals was again accomplished by using, where available, mining services value of production data by state or by using MRIO sector output totals by state. The adjustments to each mining sector are as follows:

(mil \$)					
MRIO	Value of FAC	Total In- termediate Inputs	Value Added	Number of Em- ployees	Payroll
007	97.9	30.3	67.6	2000	31.2
008	363.8	106.8	257.0	7600	118.6
009	417.3	104.0	313.3	6800	118.9
012	27.9	8.8	19.1	600	9.9
013	25.1	9.1	16.0	500	8.3

The specific inputs associated with FAC in the mining sectors were estimated by applying the BEA input vector for new access structures for solid mineral development (11.0508) to the value of total intermediate inputs. The BEA input vector was applied to each of the five values of total intermediate inputs, and the resulting vector of inputs was deducted from the inputs of the appropriate mining sector.

Other Sectors

Adjustments to other sectors were limited to the data for employment, payrolls, and value added, except for the Federal government sector (for which adjustments to specific inputs were also necessary). This was the case since none of the output data as developed for these other sectors included the capitalized value of force-account construction, and the specific inputs were based on data that excluded inputs for force-account construction. These adjustments are discussed below.

Employment and Payroll

Two distinct methodologies were used to estimate employment and payroll associated with force-account construction. The first methodology covers the private-sector MRIOs, while the second covers the public-sector MRIOs.

The FAC associated with each of the private sector MRIOs was redefined to a particular construction activity. Employment/output and payroll/output ratios, based on the Census data for each activity, were then applied to the FAC output. This yielded estimates of employment and payroll. These estimated values were deducted from the originating sector, and were added to the appropriate construction activity.

The FAC associated with the public-sector MRIOs was actually estimated by using employee compensation data provided by BEA. This compensation was first adjusted to allow for employee benefits, and was then deducted from the appropriate MRIO payroll data. Relationships from the Census construction data were used to estimate the amount of employment associated with the estimates of FAC payroll. The employment estimates were then deducted from the appropriate MRIO employment data. The payroll and employment estimates were added to the appropriate construction activity.

Value Added

As was the case for employment and payroll, two distinct methodologies were used to estimate value added associated with force-account construction: one for the private-sector MRIOs and one for the public-sector MRIOs.

For the private-sector FAC, value added was estimated by using ratios of value added to output from the 1972 BEA I-O tables. The ratio corresponding to the construction activity to which the FAC was redefined was applied to the FAC output, yielding an estimate of value added. These estimates were deducted from the appropriate private-sector MRIO value added, and were added to the appropriate construction activity value added.

For the public-sector FAC, value added is equivalent to compensation, which is already known. These values were deducted from the public-sector MRIOs and added to the appropriate construction activity.

Specific Inputs to Federal Government

The only force-account construction identified in the Federal government was conservation and development. Specific inputs to the Federal government sector, non-defense, were adjusted to exclude inputs associated with this force-account construction. This was necessary since the inputs to Federal government were based on contract awards data and Census data on shipments to the Federal government (MA 175 survey) which included such inputs. The adjustment was made by subtracting the inputs developed for this segment of force-account construction (in association with the development of inputs to all construction activities) from the inputs originally developed for the Federal government.

Reconciliation of the 1977 Census of Construction Industries and the 1977 Value of New Construction Put In Place Series

The 1977 Census and the 1977 VIP series are the two primary data sources that provide information on the amount of construction activity. The Census data are being used in this project because the Census provides state-level output, employment, and payroll data. The VIP data are being used to establish national control totals. (The VIP data are being used as a control because the BEA control totals and NIPA are based on the VIP series.) Although both the Census and the VIP series provide measures of output by construction activity, the two sets of data are not directly comparable. Therefore, prior to comparing the Census data to the VIP data certain adjustments must be made to take into account the discrepancies discussed below. After these adjustments are made, any remaining differences must be accounted for, and further adjustments to the Census data may be required.

Differences Between the Census and the VIP Series

The Census of Construction Industries is conducted every five years, while the VIP series is a result of monthly surveys. The methodologies and universes covered by these two programs differ significantly, leading to differences in the measures of output. The differences in the two series can be summarized as follows:

- The Census reports actual receipts obtained in 1977 regardless of when the construction took place, while the VIP series reports the value of construction work done in 1977 regardless of when payment was received.
- For individual construction activities, the Census data are given in gross receipts, while the VIP reports the value of construction based on final costs.
- The Census includes data on only those establishments classified in the construction industry (by SIC), while the VIP series reports the value of all new construction work, including force-account construction.
- Architectural and engineering fees are not included in the construction receipts reported by the Census, but are included in the VIP data.
- The gross receipts given in the Census for individual construction activities do not include receipts for approximately 720,000 nonemployer establishments accounting for \$20.2 billion in construction receipts. The VIP series includes the value of new construction performed by such establishments, but not the value of maintenance and repair activities.
- The Census reports \$9.2 billion of gross receipts for "Construction, Not Specified by Kind." There is no similar category in the VIP, because classifications are assigned by analysts.
- Some of the Census building categories, particularly industrial buildings, include the value of a great deal of installed equipment; the VIP series does not.

- There are discrepancies in the two series due to definitional differences and misclassification by respondents. For example, VIP data for buildings often include auxiliary facilities such as parking lots, streets, water and sewer connections, sidewalks, and fences built in conjunction with the buildings. The Census classifications are based on the function of the structure while VIP classifications, as in the example above, are sometimes based on the ownership of the project. Regarding misclassification by respondent, in the Census the respondents select the category of construction from a preprinted list on the questionnaire, and interpretation of these categories could vary among respondents. In the VIP series, most classifications are assigned by analysts based on the project description.

In order to compare the Census with the VIP or NIPA, the data must be adjusted to account for the discrepancies discussed above. These adjustments are discussed in the following section.

The Census data for each activity can be aggregated in either of two ways to reach national totals by construction activity. First, the establishment-level data (Table 5, Industry Series) can be summed across all 27 four-digit SICs. Alternatively, the state-level data (Table 7, Geographic Area Series) can be summed across all states. Although one would expect the results to be identical, this turns out not to be the case. In most cases, the aggregation of national establishment-level data yields higher national totals for individual construction activities than does the aggregation of state-level data. The significant exceptions are the "other residential buildings" and the "other nonbuilding construction" categories, which are much higher if aggregated across states than if aggregated across SICs. These discrepancies result because, at the state level, some of the activities show a very low level of receipts and are included with the "other" categories. The Census data, summed across states, are shown in Exhibit 4-6, Column 1. Adjustments were made to several activities to bring them into accord with the SIC-based totals. These adjustments are shown in Exhibit 4-6, Column 10.

MRIO New Construction Output File and Comparison with NIPA

Exhibit 4-6 summarizes the data that were used to create the new construction output file shows certain adjustments that were made to the basic data presents the MRIO total new construction output file by MRIO sector and construction activity, and compares the MRIO measure of output with the NIPA measure of output.

**EXHIBIT 4-6:
NEW CONSTRUCTION OUTPUT AND COMPARISON WITH NIPA**

MRIO/ Activity	Description	1 Census Net Rcpts	2 Const. NSK	3 A&E Fees	4 Sub- total	5 Equip. Deduct.	6 Est. w/o PR	7 Under Coverage	8 Sub- total	9 FAC	10 Reporting Correction	11 MRIO Total	12 Adj.	13 Adj. Totals	14 NIPA Totals
014	Residential	40,479	2,503	2,282	45,244		5,000	8,460	56,704	10,301		67,005	9,696	76,701	79,787
011	Single	34,201	2,112	1,713	38,026		4,322	5,563	47,931	9,988		57,919	8,361	66,300	66,867
012	Apartment	6,277	391	549	7,217		678	877	6,772	313		9,086	1,315	10,401	13,120
015	Nonresidential	44,216	2,847	2,627	49,690	(9,000)			40,690	2,132		42,822		42,822	41,465
013	Nonhousekeeping	1,711	106	67	1,884				1,684	67		1,951			60
015	Industrial	16,115	1,045	649	17,809	(4,042)			13,767	565		14,352			8,750
016	Office, Bank	7,271	460	582	8,313	(1,944)			6,369	605		6,974			14,860
017	Stores, Garages	5,130	329	410	5,869	(1,351)			4,518	346		4,864			
018	Amusement	530	35	70	635	(228)			407	38		445			
019	Religious	480	77	63	1,320				1,320	62		1,382			1,046
010	Educational	5,174	331	466	5,971				5,971	106		6,077			6,119
011	Hospital	5,727	377	320	6,424	(1,435)			4,989	210		5,199			4,671
012	Other Nonresidential	1,378	87	—	1,465				1,465	113		1,578			5,779
016	Utilities	16,644	1,015	1,908	18,967				16,967	10,953	3,171	32,192	(4,479)	27,713	26,077
025	Communeth Trans Lines	2,154	134	261	2,549				2,549	2,951	(1,259)	4,241			4,278
028	Subways	588	22	61	671				671	66		739			
029	Railroads	—	—	—	—				—	735		735			737
031	Electric	2,790	209	636	3,635				3,635	4,762	4,095	12,693			11,199
027	Petroleum Pipelines	1,650	98	166	1,912				1,912	—	(600)	1,412			1,197
032	Gas Utilities	—	—	—	—				—	905	835	1,740			1,482
026	Sewer, Water Main	6,442	384	394	7,220				7,220	426		7,646	(4,479)	6,153	7,184
033	Sewage, Water Plant	3,420	170	190	2,780				2,780	206		2,986			
017	Highways	12,195	622	730	13,747				13,747	1,374		15,121	(5,217)	9,904	9,360
014	Highways	10,138	657	730	11,523				11,523	1,374		12,697			
019	Bridges, Tunnels	2,089	146	—	2,224				2,224	—		2,224			
018	Other Construction	22,785	(7,156)	782	16,411				16,411	12,677	(3,171)	26,117		26,117	26,622
014	Farm Buildings	478	28	275	781				781	2,100		2,661			6,073
015	Swimming Pools	367	18	—	385				385	—		385			
016	Airports	—	—	—	—				—	—		—			
017	Parking	—	—	—	—				—	—		—			
018	Fencing	43	1	—	44				44	—		44			
021	Dams, Reservoirs	278	17	21	316				316	—		316			
022	Marine Construction	515	26	—	541				541	—		541			
023	Harbors, Ports	69	3	—	72				72	—		72			
024	Const. & Devel.	629	34	214	877				877	767		1,644			3,862
030	Heavy Ind.	6,548	375	—	6,923				6,923	—	(1,404)	5,519			
034	Oilfields	116	5	—	121				121	—		121			
035	Other Nonbuilding	5,724	355	272	6,351				6,351	44	(1,767)	4,628			4,982
037	Const. NSK	6,016	(8,018)	—	—				—	—		—			
039	Drilling	—	—	—	—				—	9,014		9,014			9,135
040	Mining	—	—	—	—				—	932		932			932
	Military Fac.	—	—	—	—				—	—		—			1,638
NATIONAL TOTALS		135,751	—	8,309	144,060	(9,000)	5,000	6,460	146,520	36,737	—	183,257	—	183,257	183,351

Column 1: Net Receipts

Net receipts were derived from the 1977 Census of Construction Industries. The methodology used to convert establishment-based gross receipts to activity-based net receipts is described at the beginning of this chapter.

Column 2: Redistribution of Construction, NSK

The Census reports approximately \$8,018 million in net receipts for construction not specified by kind. This entire amount was redistributed to the other construction activities proportionate to net receipts. This was done because neither BEA nor NIPA have a similar classification.

Column 3: Architectural and Engineering Fees

Architectural and engineering fees were derived from estimates made by Mr. George Roff, for a paper entitled "Comparison of the 1977 Census of Construction Industries and the Value of New Construction Put in Place Series" (Source 03126), prepared by Mr. Alan I. Blum, Construction Statistics Division, Bureau of the Census. Roff estimates \$8,309 million in architectural and engineering fees directly related to new construction activities. The 1977 Census of Service Industries (Source 03103) reports \$10,301 million in architectural and engineering fees (\$7,699 million in receipts for design engineering and \$2,602 million in receipts for architectural services). The difference could represent architectural and engineering fees for maintenance construction and for projects that were not actually constructed.

Column 4: Sub-Total (Net Rcpts + Const, NSK + A&E Fees)

Column four shows the results of adding Census net receipts, the redistributed construction n.s.k., and architectural and engineering fees.

Column 5: Equipment Deduction

In several of the nonresidential building activities, according to Blum, the Census unintentionally included the value of a great deal of installed equipment, leading to inflated receipts. This is especially true for industrial buildings and hospitals, and, to a lesser extent, for commercial buildings. After distributing the NIPA amount for other nonresidential buildings (\$5,770 million) to the individual NIPA nonresidential building activities, the NIPA total for industrial buildings, commercial buildings, and hospitals is just over nine billion dollars more than the MRIO total for the same buildings.

Therefore, nine billion dollars is being deducted from MRIO 015 to adjust for the Census' inclusion of equipment. This amount was deducted from the individual activities proportionate to the totals in column five.

Column 6: Establishments Without Payroll

The Census reports that establishments without payroll collected \$20.1 billion in total business receipts. These are predominantly one-man establishments that seem to fall into one of two categories: those that report more than \$100,000 in receipts, and probably subcontract all the work, therefore accounting for very little net receipts; those that report less than \$100,000 in receipts, and probably perform most of the work themselves, therefore accounting for a substantial amount of net receipts. The establishments reporting more than \$100,000 each account for \$9.4 billion in receipts while those reporting less than \$100,000 each account for \$10.7 billion in receipts. Furthermore, it is thought that these smaller establishments do a good deal of maintenance work as well as new construction.

In view of the above, it has been decided to allocate \$10 billion in net receipts from establishments without payroll, this amount to be split evenly between new construction and maintenance construction.

Column 7: Undercoverage of Residential Buildings

An addition of \$6,460 million was made to MRIO 014 to correct for undercoverage of residential buildings by the Census. This adjustment was required for two reasons. First, it is important that the MRIO grand total for new construction agree with the NIPA grand total for new construction. After the adjustments for equipment and for establishments without payroll, the MRIO total is \$176,891 million, compared to the NIPA total of \$183,351 million. The MRIO total is \$6,460 million less than the NIPA total. Therefore, an addition of \$6,460 must be made to the MRIO grand total. An examination of the MRIO-level totals reveals the greatest discrepancy exists in MRIO 014, residential buildings. (Note: This adjustment was made prior to the location adjustment discussed previously, and some of the totals were changed as a result. This accounts for the remaining difference between MRIO and NIPA of \$94 million.)

Secondly, Blum states that "between December 1976 and December 1977 there was a 19 percent increase in the number of speculatively built houses under construction but not yet sold which would indicate that Census receipts would be at a lower level." For this reason it was decided to add the entire amount of \$6,460 million to MRIO 014.

Column 8: Subtotal (Census Net Rcpts + A&E Fees + Adjustments)

Column eight shows the result of adding the adjustments to Column 4.

Column 9: Force-Account Construction

An estimated \$36,737 million in new FAC was performed in 1977. The methodologies used to estimate \$33,065 million of this amount are described in an earlier section of this chapter. The remaining estimates were based on estimates by Roff and Blum. The largest part of this amount was accounted for by farm facilities (\$2,100 million). Most of the remainder was for nonresidential buildings.

Column 10: Reporting Corrections

The Census data can be summed by activity to the national level in either of two ways: by adding across states or by adding across SICs. The two methods do not yield identical totals. Generally, the activity totals are lower when the totals are taken across states than when taken across SICs; the difference is found in the "heavy industrial construction" and the "other nonbuilding construction" activities. Therefore, it was necessary to transfer a total of \$3,171 million from these two activities to the "electric utility" and "gas utility" activities where most of the shortage occurred. In addition, \$1,259 million was moved from activity 25 (transmission lines) to activity 31 (electric utilities), to make these activities comparable to the corresponding NIPA activities. Also, \$500 million was transferred from activity 27 (oil pipelines) to activity 32 (gas utilities), to make these activities comparable to the corresponding NIPA activities.

Column 11: MRIO Totals

The totals shown in column 11 are the final MRIO output totals. BEA input vectors will be applied to these totals, less value added.

Columns 12 and 13: Adjustments and Adjusted Totals

The adjustments in column 12 and the adjusted totals in column 13 are shown to illustrate how the two data sets may be more nearly reconciled at the MRIO level. These adjustments are implied by the differences in what is included in the Census and NIPA classifications. According to Blum, NIPA "includes privately built streets and utilities in the value of houses, whereas the Census includes this type of work in the nonbuilding category." Therefore, the amount of privately built water and sewer

facilities, as well as highways and streets, may be reallocated to residential buildings. These adjustments were not made to the MRIO as it is necessary to maintain the integrity of the Census detail as far as possible since it is the only comprehensive data available at the state level.

Column 14: NIPA Totals

These totals are shown for comparison purposes.

Note: Exhibit 4-6 shows the MRIO new construction data in its final form. In some cases, the data in Exhibit 4-6 differ from that described in the text due to the following reasons:

- FAC was estimated prior to the "location of construction versus location of establishment" adjustment. This adjustment slightly altered the activity-level totals at the national level.
- For the individual states, the location adjustment was made to the total of Census net receipts, plus architectural and engineering fees, plus the adjustments shown in columns 6, 7, and 8.
- For the purposes of estimating FAC at the national level, the national total of construction NSK was redistributed to the activities, proportionate to net receipts. However, construction NSK was actually redistributed within each state, proportionate to net receipts. The two distributions give slightly different activity totals at the national level.
- The national total of Census' net receipts for a given activity can be found in either of two ways: by summing across SICs or by summing across states. The totals differ because, for some states, activities with a low level of receipts are aggregated or are included with the "other nonbuilding" category.

Data Limitations

All of the data limitations of consequence have been discussed throughout this methodology. For purposes of convenience, they are summarized below.

1. The use of VIP and NIPA data as national output control totals — For the most part, the VIP data are considered to be the most reliable measure of national output. However, several qualifications are necessary. First, it was necessary to add architectural and engineering fees to the Census data. These additions were based on estimates made by Blum and Roff. A comparison of the total estimated addition with the 1977 Census of Service Industries data indicates that the estimates are fairly accurate in total, but gives no information as to the accuracy of the estimates at the MRIO activity level. Since the total additions for architectural and engineering fees represent only 4.8 percent of the total VIP, any error involved would be relatively small.

2. Reconciliation of the Census data with the VIP control totals — The problems encountered in this reconciliation have already been extensively discussed. Discrepancies between the two sets of data led to the following adjustments to the Census data:
 - The residential buildings category (MRIO Sector 014) was increased by \$6.46 billion.

 - The nonresidential buildings category (MRIO Sector 015) was decreased by \$9.0 billion.

In addition, several synthetic adjustments were made to the MRIO data for purposes of comparison. These adjustments were "synthetic" in the sense that they were an attempt to reconcile discrepancies resulting from differences in classification between the Census and NIPA series, and were made only for illustrative purposes. The major such adjustment was to highways and streets. Data from the Department of Transportation indicate that the Census measurement is more accurate than the VIP measurement.

3. Addition of \$5,000 million in receipts from establishments without payroll — This adjustment has already been discussed. This adjustment could be overstated to the extent that there is duplication of receipts due to subcontracting, some of the receipts may be for nonconstruction activities, and some of the receipts may represent maintenance activities. On the other hand, the adjustment may be

understated to the extent that more than 50 percent of the total receipts from establishments without payroll actually represents new construction. (50 percent of the total \$10 million was allocated to new construction).

4. Redistribution of construction NSK — \$8,018 million in net receipts was redistributed from construction, NSK to the other construction activities proportionate to net receipts. To the extent that the actual distribution of such receipts does not follow that pattern, there could be a small error at the MRIO level.
5. Estimation of missing data — At the national SIC level and at the state level, some data were estimated. These data, which were withheld by the Census to avoid disclosure of individual company data, make up a small proportion of the total. Any estimating error is believed to be insignificant.
6. Estimation of net receipts from gross receipts data — The estimating techniques have already been extensively discussed. The methodology assumed that the ratio of (net receipts)/(gross receipts) for a particular activity was similar across all states. Differences between states were, it was further assumed, accounted for when the initial estimates were scaled to reach the state totals. To the extent that the first assumption is in error, then, within individual states, estimates for certain activities could be high while estimates for other activities could be low.
6. Estimation of employment and payroll data — The limitations that apply to the estimation of net receipts apply generally to the estimation of employment and payroll. In estimating "all employment" for example, it was assumed that the ratio of (all employment)/(net receipts) for a particular activity was similar across all states, with differences between states being accounted for by the scaling process. However, if several activities within an individual state had a higher-than-average labor intensity, then the employment estimates for these activities would tend to be too low. The employment estimates for the other activities within the state would then be correspondingly high.

CHAPTER 5

MANUFACTURING

MRIO Sectors:

020 through 084

A complete concordance of manufacturing sectors with BEA I-O sectors and SIC categories appears in Appendix A.

Data Sources and Estimation

Data for output, employment, payroll and value added in all manufacturing sectors were derived from the 1977 Census of Manufactures, Industry Series, Table 2. In this table, the values for number of establishments, employment, payroll, value added and cost of materials were given for each state and four-digit SIC. Since the value added data in Census include cost of services, the sum of value added and cost of materials gives the total output for the state and four-digit SIC. Census, however, suppresses these data whenever it is necessary to avoid disclosure of individual company data, and hence, the suppressed data had to be estimated. To achieve this, a similar list of employment information was obtained from the Bureau of Labor Statistics' Employment and Wages: Monthly Employment and Quarterly Wage Data 1977, Computer Tape No. 120380, Unemployment Insurance (UI) Data, (Source 12110). The employment and payroll data of each four-digit SIC industry in each state contained on the UI tape were used to fill in as much of the Census-suppressed data as possible. (See next section for detailed procedure).

After this was done, there still remained data to be estimated. For these remaining entries, data contained in the 1977 County Business Patterns (CBP, Source 03114) were used.

Procedures Used to Estimate Suppressed Data

Three levels of estimations were used to develop the suppressed employment data in Census.

1. Since Census omits a state in a four-digit SIC industry completely when the total employment in that state for that four-digit industry is less than 150, the first step was to insert into the Census data base these missing states from information provided on the UI data tape.
2. Wherever data were suppressed in Census, the number of employees per establishment reported on the UI tape was multiplied by the number of establishments reported in Census. This computed employment was then checked with the range interval indicated by Census. If the employment value was within the range, the estimation was deemed accurate and no further adjustment would be needed. If it was outside the range, however, the value was replaced by the mid-point of that Census interval. For the last open-ended interval "F" (2500 employees or more), special estimation was needed because of its relatively large size. In addition, for suppressed Census data which were also withheld in UI the mid-points of the intervals except "F" were also substituted.
3. To estimate the "F" suppressed groups in Census, the following estimation procedure was used:
 - If the employment of a certain state was available from CBP and lay within the range indicated by Census, the employment figure was used directly, provided that both CBP and Census had the same number of establishments. If the numbers of establishments in CBP and Census were different, the average employment per establishment was calculated based on CBP data and then multiplied by the number of establishments in Census.
 - If no CBP data were available for a specific four-digit industry, the value was estimated by residual directly from the Census data as follows:
 - a) When an employment figure was given in the Census Geographic Area Series or Industry Series for a three-digit SIC which contains the four-digit suppressed industry, the figures for the other four-digit component industries were subtracted from the three-digit total, leaving as a residual, the suppressed data.

- b) However, when more than one four-digit industry in a three-digit SIC grouping were suppressed, the midpoints were used for the industries having a definite size range (not an open-end) to obtain a residual for the open-end suppressed employment. In cases where the three-digit SIC level employment was not available, the two-digit total was used.

If however, the Census data to be used for estimating the residuals were incomplete and the CBP data gave more accurate indication as to employment sizes, the same procedure was used to estimate by residual from the CBP data instead.

Once all data had been estimated, the values for each state were added and compared with four-digit national total given in Census. If they were different, the entries where mid-points were substituted were then scaled so that the sum would be equal to the national total. In some instances, however, the sum of estimated data except mid-points exceeded the national total. Under such circumstances, all estimated data were scaled.

After the employment for each state was estimated and reconciled with the national totals, the wages and salaries were estimated based on the following procedures:

1. When employment was missing in Census and obtained directly from UI, the corresponding wages and salaries were also obtained from UI and inserted into the Census data base.
2. When employment was withheld in Census but the estimated value based on UI data was within the Census range, the payroll figure obtained from UI adjusted for number of establishments was inserted into the Census data base.
3. When mid-points had to be used for employment, the payroll was based on the national average of that four-digit industry for payroll per employee.
4. The national average was also used for those "F" groups estimated manually as described above.

The payroll figure for each state was then added and compared with the four-digit national total. Any discrepancy was eliminated by distributing it to case (3) values above. If, however, there was no case (3) value then all estimated values were scaled.

The missing value added data in Census were estimated by using the national average dollar of value added per employee and multiplying it by the state employment. The output data were estimated using a similar procedure.

Data Limitations

Two limitations should be noted based on the estimation techniques described above:

1. Due to scaling some of the data values may not be within the range indicated by Census, even though the values before scaling were within the range. They were not re-scaled because it was felt that the discrepancies were small and re-scaling could cause problems in some other values.
2. Since no value added or output data were available from UI, the state figures for these two items were based on national averages and therefore may not be most accurate.

CHAPTER 6

TRANSPORTATION

MRIO Sectors:

- 085: Railroads
- 086: Local passenger transportation and inter-city bus
- 087: Motor freight
- 088: Water transportation
- 089: Air transportation
- 090: Pipelines, except natural gas
- 091: Transportation services

Introduction

The MRIO transportation sectors include all commercial transportation of freight and passengers, with the exception of natural gas transmission, which is included in the gas utilities sector (MRIO 095). As shown in Exhibit 6-1, most of the transportation sectors concord with a single two-digit SIC-coded industry. The exceptions to this involve the assignment of certain activities in SIC 47 to MRIO sectors other than Transportation Services (MRIO 091), as follows. SIC 4784, Fixed Facilities for Handling Motor Vehicle Transportation, n.e.c.,¹ is assigned to MRIO 119, State and Local Government Enterprises, Except Utilities and Local Transit. Within SIC 4789, Transportation Services, n.e.c., "sleeping and dining car operations not performed by railroads" are assigned to MRIO 085, and "stockyards that do not buy, sell or auction livestock" are assigned to MRIO 087. The remaining SIC 4789 activities, "horse drawn cabs" and "independently operated pipeline terminal facilities" are assigned to MRIO 091.

This chapter provides a summary of the sources and methods employed in the development of output, employment, and payroll data by state for the transportation sectors. Data on the hours and wages of nonsupervisory workers by state were not

¹Toll roads, bridges, and tunnels.

EXHIBIT 6-1

MRIO CONCORDANCE WITH 1977 SIC CODES

Sectors 085, 086, 087, 088, 089, 090, 091: Transportation

<u>MRIO Sector</u>	<u>BEA I-O Code</u>	<u>1977 SIC</u>
085: Railroads	650100 Railroads and Related Services	40 Railroad Transportation 474 Rental of Railroad Cars pt. 4789 Transportation Services, N.E.C.
086: Local Passenger Transportation and Intercity Bus	650200 Local and Suburban Transit and Interurban Highway Passenger Transportation 790100 Local Government Passenger Transit	pt. 41 Local and Interurban Passenger Transit pt. 41 Local and Interurban Passenger Transit
087: Motor Freight	650300 Motor Freight Transportation and Warehousing	42 Trucking and Warehousing pt. 4789 Transportation Services, N.E.C.
088: Water Transportation	650400 Water Transportation	44 Water Transportation
089: Air Transportation	650500 Air Transportation	45 Air Transportation
090: Pipelines, Except Natural Gas	650600 Pipelines, Except Natural Gas	46 Pipelines, Except Natural Gas
091: Transportation Services	650701 Freight Forwarders and Other Transportation Services 650702 Arrangement of Passenger Transportation	471 Freight Forwarding 4723 Arrangement of Transportation of Freight and Cargo 4782 Inspection and Weighing Services 4783 Packing and Crating pt. 4789 Transportation Services, N.E.C. 4722 Arrangement of Passenger Transportation

available. The overall approach in developing output, employment and payroll at the state level was as follows.

For all the transportation sectors except Railroads (MRIO 085), data on employment and payroll could be obtained from published sources for all states or a majority of the states. Only employment data were available for railroads at the state level, and these were collected from both published and unpublished sources. Estimates were made for states where employment and payroll data were suppressed. Data on transportation sector output are not available at the state level, with the exception of revenues of publicly owned transit systems, which comprise roughly 20 percent of output for MRIO 086. These data were compiled from the 1977 Census of Governments (Source 03110), "Compendium of Government Finances," Table 47. The remaining output for MRIO 086 (national total), as well as the national output controls for MRIO sectors 089 and 091, were disaggregated to states on the basis of payroll. The national output controls for the freight modes, MRIO sectors 085, 087, 088, and 090, are disaggregated to states on the basis of transportation margins as described in the separate JFA report, The Multiregional Input-Output Accounts, 1977: Interregional Commodity Flows. The transportation margins were developed using revenue per ton-mile factors by mode and commodity at the national level, in conjunction with data on ton-miles by mode, commodity, and origin and destination states. For additional details on the development of transportation margins, see also MRIO Procedures Paper No. 1, "Trade and Transportation Margins in the MRIO Model" (Appendix B.1).

The development of the national output controls is documented in the next section. The documentation of the state employment and payroll data are discussed in the third and final section.

National Output Controls

The national output control for each transportation sector is presented in Exhibit 6-2, along with one or more of the primary revenue components used in its derivation. The sources and methods employed in developing these data are summarized by sector below.

The output control for the railroads sector (MRIO 085) was obtained from the update of the 1972 BEA I-O Table to 1977 by BLS. This source was chosen over the BEA "1977 Analysis Input-Output Control Total Worksheet,"¹ because the BEA worksheets do not

¹ Hereinafter referred to as the "1977 BEA Worksheet(s)."

**EXHIBIT 6-2: NATIONAL OUTPUT CONTROLS AND THEIR PRIMARY REVENUE COMPONENTS
FOR MRIO TRANSPORTATION SECTORS, 1977**
(Millions of Current Dollars)

MRIO SECTOR	OUTPUT CONTROL	PRIMARY REVENUE COMPONENT(S)	
		Description	Revenue
085: Railroads	22,669.2	Class I Line-Haul Railroads	20,429.9
		Class II Line-Haul Railroads	369.8
		Switching & Terminal Companies	455.7
		Total	21,255.4
086: Local passenger transportation and inter-city bus	9,782.3	SIC 4111: Local & Suburban Transit	2,322.7
		SIC 4119: Local Passenger Transportation, n.e.c.	538.5
		SIC 412: Taxicabs	4,454.1
		SIC 413: Intercity Bus	1,268.9
		SIC 414: Charter Bus	98.7
		SIC 415: School Bus	981.9
		SIC 417: Terminal & Service Facilities	97.5
		Total	9,782.3
087: Motor freight	49,684.8	1) Operating revenues for the regulated carriers	31,000.0
		2) Operating revenues of non-regulated carriers plus public warehousing	15,002.3
		Total	46,002.3
088: Water transportation	13,460.7	1) Operating revenues of the regulated carriers, domestic service	1,642.7
		2) Receipts of U.S. carriers for international transportation	5,080.0
		3) Receipts of foreign carriers for carrying U.S. passengers and U.S. imports	4,883.0
		4) Revenues of U.S. nonregulated for-hire and private carriers, domestic service	2,426.9
		Total	14,032.6
089: Air transportation	24,193.1	Revenues of U.S. certificated route and charter air carriers	20,279.3
090: Pipelines, except natural gas	3,346.4	1) Interstate crude oil pipeline revenues	1,654.6
		2) Interstate petroleum products pipeline revenues	1,143.5
		Total	2,798.1
091: Transportation services	4,169.2	1) Motor freight forwarders	615.2
		2) Air freight forwarders	544.7
		3) SIC 4722: Arrangement of passenger transportation	1,727.3
		Total	2,887.2

yet include the portion of SIC 4789 assigned to railroads. Virtually all of MRIO 085 output is accounted for by revenues of Class I and II line-haul railroads, and by switching and terminal companies (Class I and II combined). Class I revenues are from Transport Statistics (Source 16111), 1977, Part 1, Table 3. Revenues for Class II and for switching and terminal companies are from unpublished Interstate Commerce Commission (ICC) data.

The output control for Local Passenger Transportation and Inter-City Bus (MRIO 086) is simply the sum of all the primary revenue components listed to the right. The data sources and methods employed in the development of controls for each of the primary revenue components of MRIO 086 are summarized below.

Revenue for Local and Suburban Transit (SIC 4111) was developed primarily from data published in Transit Fact Book (Source 22081), 1978-1979 Edition, as follows. Total transit operating revenue¹ for the United States plus Puerto Rico was obtained from Table 3 of the above source. Next, two adjustments were made to this revenue figure to obtain the SIC 4111 control. First, Puerto Rico was subtracted out via the following imputation. Using payroll data from Employment and Wages (Source 12109), the Puerto Rico proportion of the total payroll for SIC 41 was computed; this ratio was applied to the total revenues to estimate the revenues for Puerto Rico which was then subtracted out of the total. The second and final adjustment involved the addition of "airport bus or limousine" revenues, from the 1977 Census of Transportation (Source 03107), "Nonregulated Motor Carriers and Public Warehousing," Table 13.

Of the six activities included in SIC 4119, Local Passenger Transportation, N.E.C.², revenue data could only be found for sightseeing buses, from 1977 Census of Transportation, "Nonregulated Motor Carriers and Public Warehousing," Table 13. Revenues for the entire four-digit industry were estimated by expanding the data for sightseeing buses using payroll data from the Employment and Wages computer tape (Source 12110) and the "Nonregulated Motor Carriers and Public Warehousing" report.³ Total U.S. payroll for SIC 4119 was computed from the Employment and Wages computer tape and then this figure was divided by sightseeing bus payroll (from the nonregulated motor-carriers report) to form an expansion ratio. This ratio was then multiplied by sightseeing bus revenues to obtain the estimate of revenue (output) for all of SIC 4119. This estimate is subject to considerable error.

¹ Excluding airport bus and limousine.

² Aerial tramways, ambulance service, auto rental with drivers, cog railways, hearse and limousine rental with drivers, and sightseeing buses.

³ Hereinafter referred to as the "nonregulated motor carriers" report.

Revenue for the taxicab industry (SIC 412) is a very difficult quantity to estimate, due to the fact that there is no routine survey of the industry where response is required by law. However, the results of a voluntary taxicab industry survey, published in a report entitled Taxicab Operating Characteristics (Source 23041), provided operating data¹ on a per taxicab and vehicle mile basis for 1973 and 1975 that could be utilized in estimating 1977 output, as follows. Data on the annual vehicle miles (VM) per taxicab for 1973 and 1975 were extended to 1977 using one half of the compound annual decline rate of 1973 through 1975. Receipts per VM were extended from 1975 to 1977 using the annual average CPI for taxicab fares in 1975 and 1977. The estimates of 1977 VM per taxicab and receipts per VM were multiplied to obtain estimated 1977 receipts per taxicab. This figure was then multiplied by an estimate of the total number of taxicabs (from National Energy Accounts, Source 23011, worksheet data for auto gasoline consumption), yielding the estimate of taxicab industry output.

Revenue for Intercity Bus (SIC 413) was derived from the 1977 BEA Worksheet data for SIC 413, with one small adjustment for the difference between preliminary and final data on nonregulated intercity bus from the nonregulated motor carriers report. The primary revenue subcomponent for this item is Class I motor carrier passenger revenue² (\$969.4 million), from Transport Statistics, 1977, Part 2, Table 22.

Revenues for both School Buses (SIC 415), and Terminal and Service Facilities (SIC 417) were tabulated from 1977 BEA Worksheet data. The primary input data to the BEA analysis of SIC 415 were obtained from the National School Transportation Association on the total cost of pupil transportation at public expense for the 1976-1977 and 1977-1978 school years. The primary input data to the BEA analysis for SIC 417 was "commissions paid to agents for passenger ticket sales and other services," from Transport Statistics, 1977, Part 2, Table 25 (intercity service — \$64.8 million) and Table 35 (local service — \$3.8 million).

Motor Freight (MRIO 087) output was tabulated from the BLS 1977 update of the BEA 1972 I-O Table, as 1977 BEA Worksheet data for this sector were incomplete. Revenues for the regulated carriers were obtained from Transport Economics (Source 16131), Volume VI, Number 1 - 1979, page 8. Revenues for the nonregulated carriers are from the nonregulated motor carriers report, Table 1.

¹In Table S-1.

²Includes "special bus" (charter) revenue.

Water Transportation (MRIO 088) output controls were also tabulated from the BLS 1977 update of the BEA 1972 I-O Table, as there are no 1977 BEA Worksheet data for this sector as yet. Revenues for the regulated portion of the industry are from Transport Statistics, 1977, Part 5, page one. Receipts of U.S. carriers for international transportation, as well as receipts of foreign carriers for carrying U.S. passengers and U.S. imports, are from the Statistical Abstract of the U.S. (Source 03120), 1980, Table 1169 (original source is Survey of Current Business, Source 03501). Revenue of U.S. nonregulated for-hire and private carriers, domestic service, was estimated as follows. The general approach for this component was to collect data on ton-miles (TM) by broad commodity groups¹ for the above carriers and then convert these to revenues using revenue per TM derived for each commodity using data for the regulated carriers. Details are provided below.

With the exception of the "Petroleum and Products" commodity group, regulated TM were subtracted from total TM to obtain TM for the nonregulated for-hire and private carriers. The TM data were taken from Part 5, Section 3, Table 3 of Waterborne Commerce of the United States (Source 04111), 1977. Domestic TM data from this source include traffic to and from Puerto Rico and the Virgin Islands, so a special effort was made to eliminate this traffic from the data for the "Petroleum and Products" group (the largest commodity group in terms of tons or TM). Data on U.S. imports and exports of crude oil and individual petroleum products with Puerto Rico and the Virgin Islands were obtained from Energy Data Reports (Source 06103), "annual petroleum statement," Tables 23 and 26. Next, these data were converted from thousands of barrels to thousands of tons using factors from the Petroleum Measurement Tables (Source 22101). Finally, TM for these imports and exports (combined) were estimated by multiplying the total tonnage by the average coastwise haul² for private carriers of "Petroleum and Products," from Part 5, Section 3, Table 3 of the "Waterborne Commerce" publication (cited above). The import/export TM, along with the TM for regulated carriers, were subtracted from total TM for "Petroleum and Products," yielding the TM for nonregulated for-hire and private carriers in this commodity group.

¹The commodity groups are: a) Petroleum and Products; b) Coal and Coke; c) Iron Ore and Iron and Steel; d) Sand, Gravel, and Stone; e) Grains; f) Logs and Lumber; g) Chemicals and Related Products; h) Shells; and i) All Others.

²Average haul data are expressed in miles per ton.

The next major step was to develop estimates of revenue per TM for each commodity group. This was implemented using the following data and data sources:

- 1977 total tons, TM, and freight revenues of Class A regulated carriers from Revenues and Traffic of Class A and B Water Carriers (Source 16114);
- 1977 total tons and freight revenues by commodity for Class A regulated carriers, from Table 5, Part 5 of Transport Statistics, 1977; and
- Average haul¹ for regulated carriers by commodity group and total commodities from Part 5, Section 3, Table 3 of the "Waterborne Commerce" publication.

Using the cited data from Revenues and Traffic of Class A and B Water Carriers the 1977 average revenue per TM and average haul¹ were computed for Class A regulated carriers. Class A average haul was then compared to the average haul figure for regulated carriers, total commodities, from the "Waterborne Commerce" publication. A scalar was formed by dividing the former by the latter, for the purpose of converting the average haul by commodity group, regulated carriers (from the "Waterborne Commerce" publication), to a Class A carrier basis. The average haul by each commodity group was multiplied by the scalar in order to approximate the average haul by commodity group for Class A carriers. These average haul estimates then made it possible to estimate revenue per TM by commodity group for the Class A carriers, as follows. Using the cited data from Transport Statistics, revenue per ton was estimated for the major commodity groupings used in the "Waterborne Commerce" publication (this typically involved aggregating data for several commodities in Transport Statistics). Class A revenues per ton by major commodity groups were then divided by estimated Class A average haul by major commodity groups, yielding estimates of revenue per TM. Excluded from the above procedure was the "All Others" commodity group; the Class A average revenue per TM, all commodities (computed using cited data from Revenues and Traffic of Class A and B Water Carriers), was used as the approximation of revenue per TM for this major commodity group.

¹Average haul data are expressed in miles per ton.

The final procedure involved the multiplication of estimated TM by commodity group by revenue per TM by commodity group, yielding estimates of revenue by commodity group, which were summed to obtain total revenues for the nonregulated for-hire and private carriers in domestic service.

The Air Transportation (MRIO 089) output control is from the BLS 1977 update of the BEA 1972 I-O Table; 1977 BEA Worksheet data have not yet been prepared. The revenues of U.S. certificated route and charter air carriers, as reported to the Civil Aeronautics Board (CAB) include operating and transport related revenues and exclude subsidies. These data were obtained from the 1979 Supplement to the Handbook of Airline Statistics, (Source 17211), pages 41 and 73.

The output control for Pipelines, Excluding Natural Gas (MRIO 090) is from the 1977 BEA Worksheet for BEA I-O Sector 650600. The bulk of sector output is accounted for by revenues of interstate crude oil and petroleum products pipelines. These data are obtained from the Federal Energy Regulatory Commission Form P, Schedule 310 (Source 06201).

The output control for Transportation Services (MRIO 091) was developed using the 1977 BEA methodology for BEA I-O Sectors 650701 and 650702, as documented on the 1977 BEA worksheets, with the exception that employment data used in the computations for SIC 4723, Arrangement of Transportation of Freight and Cargo, and SIC 478, Miscellaneous Services Incidental to Transportation, were taken from County Business Patterns (Source 03114) instead of from the Employment and Wages computer tape (Source 12110). Motor freight forwarders revenues were derived from data in Transport Statistics, Part 3, Table 1, by subtracting the value of purchased transportation from the sum of total freight forwarder revenue and total incidental revenues. Air freight forwarder revenues were derived from data in the 1977 Trinc's Green Book of Air Freight and Freight Forwarders (Source 24041), pages A1-A11, by subtracting purchased transportation, pickup, and delivery expenses from total operating revenues. Revenues for the arrangement of passenger transportation (SIC 4722) were obtained from Table 1 of the 1977 Census of Service Industries (Source 03103), "Arrangement of Passenger Transportation." Other primary revenue components for this sector (not shown in Exhibit 6-2) are not available from published sources and are estimated using employment and other secondary data.

The State Distribution of Transportation
Employment and Payroll

This section provides documentation of the data sources and imputations employed in the development of employment and payroll by State for the following subsets of the MRIO transportation sectors:

- Railroads: MRIO Sector 085
- Transportation, excluding railroads and transportation services: MRIO Sectors 085 — 090
- Transportation Services: MRIO Sector 091

Railroads: MRIO Sector 085

Data Sources and Estimation

Three different sources of data on railroad sector employment by state were used for this analysis because none of the three provided full coverage of the industry by itself. The sources are listed below.

- Railroad Retirement Board, unpublished tabulation — state distribution of the average number of employees covered by Railroad Retirement and Railroad Unemployment Insurance Acts, calendar years 1977, 1979, and 1980 (Source 16601);
- Yearbook of Railroad Facts (Source 22051);
- Employment and Earnings: States and Areas (Source 12104), 1939-1978 Edition.

The employment data were collected from the three above sources such that the largest number of employees reported for each state was tabulated. After a full set of data was collected in this manner, the data were summed for comparison to a national control total for railroad employment from the Yearbook of Railroad Facts, 1979 Edition. The difference between the two quantities was inconsequential.

Railroad payroll by state was approximated by multiplying the 1977 average annual earnings per railroad employee (\$18,518) from Yearbook of Railroad Facts, 1978 Edition, by 1977 railroad employment by state.

Data Limitations

The payroll estimates by state do not reflect whatever regional variation there is in railroad sector average wages per employee.

Transportation, Excluding Railroads and Transportation Services

MRIO Sectors:

- 086: Local passenger transportation and inter-city bus
- 087: Motor freight
- 088: Water transportation
- 089: Air transportation
- 090: Pipelines, except natural gas

Data Sources and Estimation

Aggregate employment and payroll data for private establishments, by state, were tabulated from Employment and Wages: Annual Averages 1977¹ (Source 12109), for SIC's 41, 42, 44, 45, and 46. No data were available on the portion of SIC 4789 that is assigned to MRIO 087. Additional data on the employment and payroll of publicly-owned transit systems, by state, were tabulated from the 1977 Census of Governments (Source 03110), "Compendium of Public Employment,"² Table 13 (these data provide the remainder of SIC 41). The remaining paragraphs cover the following topics in sequence: 1) estimation of data by SIC for states suppressed in Employment and Wages, 2) expansion of publicly-owned transit system payroll data for October 1977 (from the "Compendium of Public Employment") to an annual basis, and 3) derivation of final data for MRIO 086 (all of SIC 41).

¹Hereinafter referred to as Employment and Wages.

²Hereinafter referred to as the "Compendium of Public Employment."

Employment and payroll data in Employment and Wages were suppressed for two or more states for all of the SIC's in this group except SIC 42. The severity of this problem varied significantly from SIC to SIC. Only two states were suppressed in SIC's 41 and 45, whereas nine states were suppressed in SIC 44, with 17 suppressed states in SIC 46 topping the list. It is important to note the most significant suppression, that of pipeline (SIC 46) employment and payroll for Texas, which ranks first in the nation for both items, accounting for 27 percent of national employment and 28 percent of national payroll (according to our estimates). Estimates were made for the suppressed states in each affected SIC as follows.

A common methodology was used to estimate suppressed states for SIC's 41, 44, and 45. For each of these, preliminary estimates were tabulated or derived from data in County Business Patterns (Source 03114). The next step involved the computation of proportional distributions of the preliminary estimates. The third step was to compute employment and payroll residuals by subtracting the total for the non-suppressed states and also data for Puerto Rico from the grand totals published in Employment and Wages. In the final step, the residual quantities were multiplied by the proportional distributions of the preliminary data sets, yielding final estimates for suppressed states.

As for pipelines (SIC 46), 11 of the states that were suppressed in Employment and Wages were also suppressed in County Business Patterns, so an estimating technique was devised to provide preliminary estimates in addition to those tabulated or derived from County Business Patterns (for six states). For the 11 "double-suppressed" states (and also Puerto Rico), preliminary estimates were made using multiple linear regression equations that captured the relationships between employment and payroll in SIC 46 and employment and payroll in SIC's 13 (Oil and gas extraction) and 29 (Petroleum and coal products), using data from Employment and Wages. Separate equations were estimated for the employment and payroll relationships, with SIC 46 as the dependent variable and SIC's 13 and 29 as the independent or explanatory variables (these industries are explanatory in the sense that they provide the crude oil and petroleum products that are transported by the pipeline industry.) The equations are presented below.

Employment Equation:

$$Y = 10.195 + 0.026X_1 + 0.040X_2$$
$$R^2 = 0.982$$

where:

$$Y = \text{Employment in SIC 46}$$
$$X_1 = \text{Employment in SIC 13}$$
$$X_2 = \text{Employment in SIC 29}$$

Payroll Equation:

$$Y = 218.305 + 0.033X_1 = 0.036X_2$$
$$R^2 = 0.980$$

where

$$Y = \text{Payroll (\$,000) in SIC 46}$$
$$X_1 = \text{Payroll (\$,000) in SIC 13}$$
$$X_2 = \text{Payroll (\$,000) in SIC 29}$$

After all the preliminary estimates were assembled, those that were felt to be overestimated or of low quality were scaled back such that the sum of the data for all 50 states, D.C., and Puerto Rico would equal the grand totals published in Employment and Wages. It is important to note that the totals for the United States are estimates, as they were obtained by subtracting estimates for Puerto Rico from the grand totals. It should be noted that upon examination, data from Employment and Wages for Colorado resulted in an unusually high ratio of payroll-to-employment. As these data were obtained directly from Employment and Wages, these data were assumed to be of unacceptable quality and were replaced with employment and payroll data from County Business Patterns.

The payroll data for publicly-owned transit systems (part SIC 41), obtained from the "Compendium of Public Employment," were only for October of 1977, so these data had to be expanded to an annual basis. This was achieved by dividing the total number of days in the year (365) by the number of days in October (31) to form an expansion ratio which was subsequently multiplied by the October payroll, yielding estimated annual payroll.

The final employment and payroll for MRIO 086 (all of SIC 41) was obtained by adding the final sets of data for private establishments in SIC 41 to the final data sets for publicly-owned transit systems.

Transportation Services: MRIO 091

Data Sources and Estimation

Employment and payroll data were tabulated from County Business Patterns (Source 03114), 1977 Edition, state volumes, for SIC 47 and SIC 474. No data were available for the portion of SIC 4789 that is assigned to this sector. Thus, for each state which had published data for both SIC's 47 and 474, the data for SIC 474 were subtracted from the data for SIC 47, yielding approximate data for MRIO 091.

The national controls on employment and payroll in MRIO 091 were also approximated by subtracting data for SIC 474 from data for SIC 47 (published in County Business Patterns, 1977, United States volume).

Employment and payroll data from County Business Patterns for SIC 47 were suppressed for five states, whereas data for SIC 474 were suppressed in nine states. The estimating procedures used for suppressed states are described below.

Employment and payroll in SIC 474 was estimated for suppressed states in two major steps. The first was to make preliminary estimates for these states; the second was to scale them such that their sum, added to the sum for nonsuppressed states, equaled the national controls (tabulated directly from County Business Patterns, 1977, United States volume). Additional details are provided below.

Preliminary employment by state for SIC 474 was taken to be the mid-point of the employee size class reported in County Business Patterns. Preliminary payroll by state was estimated by multiplying preliminary employment by an estimate of the average annual wage in SIC 474 for the state. The average annual wage by state was estimated by multiplying the national average by relative per capita income ratios (derived from 1977 state and national per capita income data in the August 1978 issue of Survey of Current Business, Source 03501).

Data for SIC 47 were suppressed in County Business Patterns for the following states: Connecticut, New Hampshire, New Jersey, Ohio, and Vermont. However, employment and payroll data for this SIC in these states were available from Employment and Wages. These data were tabulated and employed in the allocation of MRIO 091 residual quantities to the suppressed states. The residuals were computed by subtracting the sum of MRIO 091 data for nonsuppressed states¹ from the national controls for MRIO 091. After subtracting estimates of SIC 474 in Ohio from the SIC 47 data reported for that state in Employment and Wages, the resulting data were assembled with the Employment and Wages data for the other suppressed states, and then proportional distributions were computed from the full sets of data. Finally, the MRIO 091 residuals were multiplied by the above proportional distributions to obtain the final MRIO 091 estimates of employment and payroll for suppressed states.

¹Published data for SIC 47 minus published or estimated data for SIC 474.

CHAPTER 7

COMMUNICATIONS

MRIO Sector:

092: Communications, Except Radio and Television

As shown in Exhibit 7-1, this MRIO sector includes telephone communications (SIC 481), telegraph communications (SIC 482), and miscellaneous communication services (SIC 489). Radio broadcasting and television broadcasting (SIC 483) are excluded. There were no redefinitions or adjustments to coverage within this sector.

Data Sources and Estimation

Output Data

Data on revenues for telegraph companies and for Bell Telephone were available in the 1977 Statistics of Communications Common Carriers (Source 16203). Revenues of independent telephone companies were obtained from the 1980 Independent Telephone Statistics (Source 22041). The data source for cable television revenues was the 1977 Cable Television Revenues (Source 16206). Lacking primary data on revenues for the remainder of this sector, e.g., other telephone communications, radar station operations, etc., output of this sector was augmented based on the ratio of employment for which revenue data were available to total sector employment augmented by non-comparable imports, available from BEA's National Income and Wealth Division (NIWD). Lacking state data for output, national output totals were disaggregated based on employment by state.

Employment and Payroll Data

Two sources were used in developing employment and payrolls data: 1977 County Business Patterns (Source 03114) and 1977 Employment in the Broadcast Industry (Source 16211). State employment and payrolls for SIC 483 (Source 03114) were subtracted from state employment and payrolls for SIC 48 (Source 03114). The remaining quantities are the employment and payrolls of MRIO Sector 092, by state. Where data published in the 1977 County Business Patterns were published in ranges or withheld, data from Source 16211 were used to estimate the suppressed values.

EXHIBIT 7-1

MRIO CONCORDANCE WITH 1977 SIC CODES

Sector 092: Communications, Except Radio and Television

<u>MRIO Sector</u>	<u>BEA I-O Code</u>	<u>1977 SIC</u>
092: Communications, Except Radio and Television	660000 Communications, Except Radio and Television	48 Communication, (Except 483, Radio and Television Broadcasting)

Data Limitations

Several data limitations should be noted based on the estimations described above. These include:

1. Output not available in primary data that was estimated based on output per employee for the rest of the sector may not accurately reflect the output of these activities.
2. Total output by state was distributed based on employment and does not necessarily reflect the actual output by state.
3. Suppressed data that was estimated for employment or payroll may fail to reflect the actual distribution of these data.

CHAPTER 8

RADIO AND TELEVISION BROADCASTING

MRIO Sector:

093: Radio and Television Broadcasting

As shown in Exhibit 8-1, this MRIO sector includes all establishments within SIC group 483, Radio and Television Broadcasting. According to the methodology employed in the BEA I-O tables, the majority of the output of this sector was considered to be secondary to this sector and primary to MRIO Sector 108, Miscellaneous Services and Advertising. This secondary product treatment was not utilized in the MRIO since there is no compelling justification for assuming that purchases of station time for advertising are homogeneous with the miscellaneous and advertising services provided by MRIO Sector 108.

Data Sources and Estimation

Output Data

Revenue data for radio and television were developed from the 1977 AM and FM Broadcast Financial Data (Source 16202) and the 1977 TV Broadcast Financial Data (Source 16201). These sources were supplemented with the 1980 Status Report of Public Broadcasting (Source 20101) and the 1977 Employment in the Broadcasting Industry (Source 16211). To correspond with data available at the state level, it was necessary to split revenues into five sectors; radio stations, television stations, radio and television networks, public radio and public television.

State-level data for radio stations were available for revenues and for time sales (including commissions to agencies). There were two problems. First, revenues were reported by all stations, while time sales were reported only for stations with revenues larger than \$25,000. Time sales for stations with revenues less than \$25,000 were estimated based on time sales of larger stations. Second, commissions to agencies are

EXHIBIT 8-1

MRIO CONCORDANCE WITH 1977 SIC CODES

Sector 093: Radio and Television Broadcasting

MRIO Sector
**093: Radio and Television
Broadcasting**

BEA I-O Code
670000 Radio and Television Broadcasting

1977 SIC
**483 Radio and television
broadcasting**

not included in the output of this sector and therefore had to be deducted from time sales. Commissions on time sales were estimated by subtracting revenues (net of commissions) by state from time sales plus other revenues.

For television stations, commissions were also included in time sales and were deducted in a similar matter. However, state disaggregation was based on data by television markets. State totals were developed in two steps. First, revenues and time sales for markets of three stations or more (accounting for almost all of the television station revenues), were assigned to states based on the location of their stations. For markets with stations in more than one state, revenues and time sales were distributed based on the number of stations in each state. Second, revenues for stations in a market of two stations or less were distributed based on the number of stations (less stations in markets of the three stations or more) in each state. Total revenues by state were the sum of time sales and other revenues in both market sizes.

Revenues and time sales for radio and TV networks from the 1977 AM and FM Broadcast Financial Data (Source 16202) and the 1977 TV Broadcast Financial Data (Source 16201) were disaggregated by state based on employment in broadcasting headquarters from the 1977 Employment in the Broadcasting Industry (Source 16211).

For public television, expenses and depreciation were used as the measure of output. Public radio expenses were disaggregated based on public radio income by state. Public television expenses were disaggregated based on public television income by state. Depreciation was disaggregated based on the sum of public radio and television income.

Employment and Payroll Data

Employment and payroll data were tabulated from the 1977 County Business Patterns (Source 03114). Some employment figures were given as ranges and some payroll data were withheld, both to avoid disclosure of individual company data. These missing quantities were estimated by using broadcasting employment data from the 1977 Employment in the Broadcasting Industry (Source 16211). Data from this source was also used to disaggregate the unallocated portion of national total employment and payrolls to states.

Data Limitations

Several data limitations should be noted based on the estimations described above. These include:

1. For radio stations, time sales and other revenues for stations with less than \$25,000 of revenue were estimated based on the percentage for stations larger than \$25,000 revenue. This may not reflect the actual sales and revenues of these smaller stations.
2. For both radio and television stations the amount of other revenues and commissions were estimated by state from limited data and may not reflect actual values.
3. The process of developing state disaggregated data for television stations from market level data may fail to reflect the actual distribution of these data.
4. The state disaggregation of public radio and television expenses based on income may fail to reflect the actual distribution of these data.
5. The estimated distribution of employment and payrolls may not represent actual employment by state.

CHAPTER 9

ELECTRIC UTILITIES

MRIO Sector:

094: Electric Utilities

As shown in Exhibit 9-1, this MRIO sector includes all of SIC 491, part of SIC 493 and all Federal, state and local government electric utilities.

Data Sources and Estimation

Output Data

Revenue, adjusted to exclude the cost of purchased power and other miscellaneous adjustments, was used to measure output. Data was developed for each individual utility and was then summed by state and by utility type. Data by utility type was subsequently summed to provide state output totals. Data was developed by utility type due to variance in data sources, differences in adjustments to revenue data and discrepancies between fiscal and calendar years. Data were developed by the following utility types:

- Private utilities;
- Municipal utilities;
- Federal Projects; and
- Rural Electrification Administration Cooperatives.

Data for private utilities were from the 1977 Statistics of Privately Owned Electric Utilities in the United States (Source 06103). For each utility output was the total of sales, resales, other operating revenues, credit for steam transferred less purchased power and electric plant leased to others. Utilities were assigned to the state in which they generated power. Output for utilities that generated power in more than one state were split among states based on net generation. Net generation by state and utility were available from the 1977 Electric Generating Plant List (Source 06106), a computer printout available from the Energy Information Administration.

EXHIBIT 9-1

MRIO CONCORDANCE WITH 1977 SIC CODES

Sector 094: Electric Utilities

<u>MRIO Sector</u>	<u>BEA I-O Code</u>	<u>1977 SIC</u>
094: Electric Utilities	680100 Electric Services (Utilities)	pt. 491 Electric Services pt. 493 Combination Electrical and Gas and Other Utility Services*
	780200 Federal Electric Utilities	pt. 491 Electric Services
	790200 State and Local Electric Utilities	pt. 491 Electric Services

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* Electric utility services part of SIC 493.

Data for municipal electric utilities were from the 1977 and 1978 Statistics of Publicly Owned Electric Utilities in the United States (Source 06103). Output, defined as operating revenues less purchased power, was first developed by utility and fiscal years and then fiscal year output was averaged, based on number of months in the calendar year to produce calendar year output figures. The results for each utility were then summed in accordance with the state in which the municipality was located to provide state output totals. In addition, these state output totals were multiplied by a factor of 1.08 to adjust for undercoverage in source 06103. This estimate was based on data for electric power revenues from the 1977 Census of Governments (Source 03110) and Governmental Finances in 1977-1978 (Source 03103).

Data for Federal utilities were from the 1977 and 1978 Statistics of Publicly Owned Electric Utilities in the United States (Source 06103). Fiscal year output for each Federal project was estimated as operating revenue less purchased power and revenue from electric plant leased to others. Calendar year 1977 output was estimated as the sum of 75 percent of fiscal year 1977 output and 25 percent of fiscal year 1978 output. Output for Federal projects which were single plants were assigned to states based on the location of the generating plant. Output for Federal projects that generated in more than one state were disaggregated based on net generation. Net generation data was available from the 1977 Electric Generating Plant List (Source 06106). Output for Federal Projects that marketed power for other Federal projects was disaggregated to states based on the output for those projects they market power for. Output data by utility were summed to provide state output totals for Federal utilities.

Data for Rural Electrification Administration Cooperatives were from the 1977 Annual Statistical Report of Rural Electric Borrowers (Source 02201). Output was defined as operating revenue and patronage capital plus non-operating margins less the cost of purchased power. Data were tabulated by utility for power supply borrowers, distribution systems and for paid-up borrowers. Financial data for paid-up borrowers was not available so these utilities were assigned output equal to the average for all borrowers. Only cooperative paid-up borrowers were included. Those REA borrowers and non-borrowers which were not cooperatives were identified by the Rural Electrification Administration. Each utility was identified by state in the statistical report. Output data was summed by state to provide state output totals for cooperatives.

Employment and Payroll Data

Employment and payroll data were tabulated, by simple addition, from the Bureau of Labor Statistics' Employment and Wages: Monthly and Quarterly Wage Data for 1977, Computer Tape No. 120380, Unemployment Insurance (UI) Data (Source 12110), and from the 1977 Census of Governments (Source 03110). Data for private and Federal utilities were taken from Source 12210. Data for state and local utilities were from Source 03310. Employment and payrolls for electric services in combination utilities were estimated based on the percentage of operating revenue derived by the combination utilities for electric services. Employment and payrolls for combination utilities, by state, were available from Source 12110. Combination utilities and their operating revenues by type of service were available by company in the 1977 Statistics of Privately Owned Electric Utilities (Source 06103). State and local utility payrolls, reported for the month of October, were inflated to yearly payrolls.

Data Limitations

Several data limitations should be noted based on the techniques described above. These include:

1. Data for class C and D private utilities, state and local utilities not covered in Source 06103, and rural non-borrowers were based on output data for the majority of their respective sectors. These estimates may fail to reflect the actual outputs for these utility groups.
2. The averaging of fiscal years for government utilities may fail to reflect the actual amounts of revenue, rental income and purchased power in the calendar year.
3. Employment and payrolls for combination utilities were based on operating revenues by type of service. This estimation technique may not reflect the actual employment and payrolls for electric/gas/water and sanitary service employees.
4. Employment and payrolls for combination utilities were based on operating revenues by type of service. This estimation technique may not reflect the actual employment and payrolls for electric/gas/water and sanitary service employees.

5. State and local government utilities payrolls were based on data available for October and may not reflect actual annual payrolls.

CHAPTER 10

GAS PRODUCTION AND DISTRIBUTION

MRIO Sector:

095: Gas Production and Distribution

As shown in Exhibit 10-1, this MRIO sector includes SIC group 492, part of SIC group 493 and all public gas production and distribution facilities.

Data Sources and Estimation

Output was calculated as the sum of sales, resales, credits from gas for electric generation, miscellaneous revenue and the value of direct sales from the wellhead. Data on sales, resales, and credits from gas for electric generation were available, by state, from the 1977 Gas Facts (Source 22011). Miscellaneous revenues were also available from source 22011 but had to be prorated to states in proportion to the other three items. Direct sales from the wellhead were estimated by scaling the 1972 estimate from the Detailed Input-Output Structure of the U.S. Economy: 1972 (Source 03504) by the change in total value of shipments from 1972 to 1977 for product code 1311532. Distribution of this national control total to states was accomplished by prorating among states in proportion to the value of shipments for product code 1311532. Data on value of shipments for product code 1311532 were from the 1977 Census of Mineral Industries (Source 03504).

Employment and payrolls were tabulated for private and Federal utilities from the Bureau of Labor Statistics' Employment and Wages: Monthly Employment and Quarterly Wage Data for 1977, Computer Tape No. 120380, Unemployment Insurance (UI) Data (Source 12110). Employment and payroll data for state and local government utilities were drawn from the 1977 Census of Governments (Source 03110).

Employment and payrolls for services in combination utilities were estimated based on the percentage of operating revenue derived by the combination utilities for gas services. Employment and payrolls for combination utilities by state were available

EXHIBIT 10-1

MRIO CONCORDANCE WITH 1977 SIC CODES

Sector 095: Gas Production and Distribution

<u>MRIO Sector</u>	<u>BEA I-O Code</u>	<u>1977 SIC</u>
095: Gas Production and Distribution	680200 Gas Production and Distribution (Utilities)	492 Gas Production and Distribution pt. 493 Combination Electric and Gas and Other Utility Services*

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* Gas utility services part of SIC 493.

from source 12110. Combination utilities and their operating revenues by type of service were available by company in the 1977 Statistics of Privately Owned Electric Utilities (Source 06103).

State and local government utility payrolls, reported in the 1977 Census of Governments (Source 03110) for the month of October, were inflated to yearly payrolls.

Data Limitations

Several data limitations should be noted based on the estimation techniques described above. These include:

1. Distribution of output by state is based on location of the source of revenue rather than the location of the actual service. This is a direct result of lack of information with which to associate proportions of revenues generated along the pipeline system.
2. Employment and payrolls for combination utilities were based on operating revenues by type of service. This estimation technique may not reflect the actual employment and payrolls for electric/gas/water and sanitary service employees.
3. State and local utility payrolls were based on October payrolls and may not reflect actual annual payrolls.

CHAPTER 11

WATER AND SANITARY SERVICES

MRIO Sector:

096: Water and Sanitary Services

As shown in Exhibit 11-1, this MRIO sector includes all of SIC groups 494, 495, 496, 497, part of 493 and all government water, sewer, and sanitary services.

Data Sources and Estimation

Output Data

Output for state and local government water, sewer and sanitary services, by state, was tabulated from the 1977 Census of Governments (Source 03110). Output was defined as the larger of revenues or expenditures. Output for private water, sewer, and sanitary establishments were defined as business receipts which were available from the 1976 and 1977 Statistics of Income (Source 15101). Output for private and Federal steam and irrigation enterprises were based on output per employee for private water and sanitary services. Output for all private and Federal establishments were disaggregated by state based on employment.

Employment and Payroll Data

Employment and payrolls for state and local water, sewer and sanitary services were tabulated from the 1977 Census of Governments. Payroll data were for the month of October and were scaled to yield a yearly estimate. Employment and payrolls for private and Federal establishments were gathered from the Bureau of Labor Statistics' Employment and Wages: Monthly Employment and Quarterly Wage Data (Computer Tape No. 120380) for 1977 (Source 12110) and adjusted to reflect yearly averages. Employment and payrolls for water and sanitary services in combination utilities were estimated based on the percentage of operating revenue derived by the combination utilities for water and sanitary services. Employment and payrolls for combination

EXHIBIT 11-1

MRIO CONCORDANCE WITH 1977 SIC CODES

Sector 096: Water and Sanitary Services

<u>MRIO Sector</u>	<u>BEA I-O Code</u>		<u>1977 SIC</u>
096: Water and Sanitary Services	680301	Water Supply and Sewerage Systems	494 Water Supply 4952 Sewerage Systems
	680302	Sanitary Services, Steam Supply, and Irrigation Systems	495 Sanitary Services (excl. 4952) 496 Steam Supply 497 Irrigation Systems pt. 493 Combination Electrical and Gas and Other Utility Services*

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* Water and steam supply, irrigation, and sewerage and other sanitary services part of SIC 493.

utilities by state were available from Source 12110. Combination utilities and their operating revenues by type of service were available by company in the 1977 Statistics of Privately-Owned Electric Utilities (Source 06103).

Data Limitations

Several data limitations should be noted based on the estimations described above. These include:

1. Output for Federal and private steam and irrigation companies were based on estimated output per employee and may fail to reflect actual output for these enterprises.
2. Output for all Federal and private water and sanitary services were disaggregated based on employment and thus may fail to reflect the actual distribution of output.
3. Employment and payrolls for combination utilities were based on operating revenues by type of service. This estimation technique may not reflect the actual employment and payrolls for electric/gas/water and sanitary service employees.
4. State and local payrolls were estimated by inflating payrolls for the month of October and may not reflect actual annual payrolls.

CHAPTER 12

WHOLESALE TRADE

MRIO Sector:

097: Wholesale Trade

The wholesale trade services, identified as MRIO Sector 097, include the activities of 18 SICs as identified in Exhibit 12-1. The services of manufacturers' sales offices are not included in the output of wholesale trade.

Data Sources and Estimation

Subsequent sections explain how data collected in the 1977 Census of Wholesale Trade (Source 03102) at the three-digit SIC (referred to also as kind-of-business) detail are used, where available, to estimate state controls that approximate a measure of services for the establishments within wholesale trade. Where data are lacking at three-digit detail, data that are available at the two-digit level (durable versus nondurable goods) are used to estimate the value of services within wholesale activity, by state.

National Output of Wholesale Establishments

The output of wholesale trade activity is spread among three types of operations within wholesale trade (as distinguished by data collection for the Bureau of Census):

- Merchant Wholesalers
- Manufacturers Sales Offices and Branches
- Agents, Brokers, and Commission Merchants

The output of wholesale trade as developed by BEA I-O convention for each of these operations is defined so as to exclude the cost of a goods purchased by wholesale traders. The output of wholesale traders is thus represented by a measure of the services produced within the sectors. The output of wholesale activity, i.e., the

EXHIBIT 12-1

MRIO CONCORDANCE WITH 1977 SIC CODES

Sectors 097: Wholesale Trade

<u>MRIO Sector</u>	<u>BEA I-O Code</u>	<u>1977 SIC</u>
097: Wholesale Trade	690100 Wholesale Trade	50 Wholesale Trade, Durable Goods*
		501 Motor Vehicles and Automotive Parts and Supplies
		502 Furniture and Home Furnishings
		503 Lumber and Other Construction Materials
		504 Sporting, Recreational, Photographic, and Hobby Goods, Toys, and Supplies
		505 Metals and Minerals, Except Petroleum
		506 Electrical Goods
		507 Hardware, and Plumbing and Heating Equipment and Supplies
		508 Machinery, Equipment, and Supplies
		509 Miscellaneous Durable Goods
		51 Wholesale Trade, Nondurable Goods*
		511 Paper and Paper Products
		512 Drugs, Drug Proprietaries and Druggists' Sundries
		513 Apparel, Piece Goods, and Notions
		514 Groceries and Related Products
		515 Farm-Product Raw Materials
		516 Chemicals and Allied Products
		517 Petroleum and Petroleum Products
		518 Beer, Wine and Distilled Alcoholic Beverages
		519 Miscellaneous Nondurable Goods

* Excluding Manufacturers' Sales Offices.

services produced by the sector, at the national level, is measured by type of operation as follows:

- (1) Merchant Wholesalers' services are equal to the Census measure of gross margin, defined as sales less cost of goods sold (beginning inventory plus purchases minus ending inventory).
- (2) Manufacturers' Sales Branches' services are approximated by the Census data on operating expenses for Sales Branches plus an estimate of profits from IRS data.
- (3) Agents, Brokers, and Commission Merchants' services are measured by an approximation of the commissions received by these operators, developed by adding operating expenses (from Census) to an estimate of profit for agents, brokers, and commission merchants developed from IRS data.

National controls were developed following the above procedures. For purposes of a state-level I-O system, two additional steps were required:

- the national measure of output for each of the three operations must be distributed to each of the 51 states (including Washington, D.C.),
- and
- an accounting system must be established wherein the value of these services may be assigned within the I-O network.

Distributing the data by state involves the use of estimations necessary to overcome statistical inadequacies of data at the state level. Given that state-level data are deficient in many respects there exists numerous trade-offs between utilizing extensive estimating techniques to approximate very detailed treatment versus the use of more aggregated treatment that does not require extensive manipulation but does not provide the same level of detail.

In the accounting framework, there is difficulty in that the data available on wholesale trade activity are not available so as to match completely with the commodities passing through wholesale services, i.e., the data cannot be comprehensively matched with producing sectors nor with the purchasers within consuming sectors. The technique

used for state distribution follows. The assignment of wholesale output with commodity flows is outlined in Appendix B.1 and further explained in the JFA report State Inputs to Industries, 1977.

State Distribution of Wholesale Activity

The data that are available to estimate wholesale services by state are largely confined to the data collected by the Census of Wholesale Trade and related Census' series. The same is not true of data pertaining to employment and payroll, but employment data are not available at a sufficient level of detail in any non-Census source to support adjustment of Census output data by corresponding data on employment. Thus, the following discussion is confined to development of Census data. Because the data items collected and the level of coverage by Census varies by type of wholesale operation, separate procedures are explained by type of wholesale activity.

Merchant Wholesalers, by state

As mentioned previously, the services of Merchant Wholesalers are represented by the concept of gross margin, i.e., sales less cost of goods sold. Data are available from Census for the gross margin of Merchant Wholesalers by major kinds of business, i.e., by three-digit wholesale SIC at the national level only. Thus, for each of the 18 three-digit SICs within wholesale trade, we are able to develop a ratio of gross margin to total sales (including cost of goods sold) at the national level. These data provide a national (total) dollar value of gross margin for Merchant Wholesalers, and a ratio of gross margin to sales at the three-digit level that can be used to estimate wholesale gross margins by state when multiplied by state three-digit sales data for Merchant Wholesalers.

The data that are available at the three-digit state-level for Merchant Wholesalers have some suppressions that necessitate estimation but, for the most part, can be said to reliably support development of three-digit detail at the state level. As explained below, the same cannot be said for the three-digit level of detail in the two remaining types of wholesale trade activity.

Manufacturers' Sales Branches, by State

In the data available for Manufacturers' Sales Branches, two areas of data deficiencies prevent the development of state-level data as efficiently as is true for Merchant Wholesalers. First, except at the national level for all wholesale activity (SIC 50 plus 51), the operating expenses of Manufacturers' Sales Branches (our surrogate for gross margin) are combined with Manufacturers' Sales Offices. Thus, to obtain estimates for branches even at the national level by two- or three-digit SIC, it is necessary to estimate the operating expenses by applying the ratio of total operating expenses of branches to total operating expenses of branches plus offices. Therefore, any estimate of services for branches will be subject to the reliability of the assumption that the ratio of operating expenses (branches) to operating expenses (branches plus offices) is constant across all kinds of business. Clearly, this assumption strongly limits the reliability of estimates, even by kind-of-business at the national level.

The second constraint to developing estimates by state involves the frequency of data suppression at the state level by three-digit kind-of-business. For many states, operating expenses are suppressed for half or more of the 18 three-digit categories. Remember that even the operating expenses provided are not for branches only, but are rather a total of branches and offices.

Because of the severe restrictions imposed by the three-digit data available for branches, margins are estimated for branches at the two-digit level, by state. The imputation for SIC 50 is represented by:

$$\begin{array}{r} \text{SIC 50 + 51: Manufacturers' Sales Branches, Operating Expenses (US)} \\ \text{SIC 50 + 51: Manufacturers' Sales Branches and Offices, Operating Expenses (US)} \\ \hline \text{X} \\ \text{SIC 50, Manufacturers' Sales Branches and Offices, Operating Expenses (by state)} \\ \hline \text{=} \\ \text{SIC 50, Manufacturers' Sales Branches, Operating Expenses (by state)} \end{array}$$

The same procedure would be used to impute SIC 51.

Agents, Brokers, and Commission Merchants by State

While the data on operating expenses for Agents, Brokers, and Commission Merchants do not suffer, from combination with any other activity as was true for the case of

Manufacturers' Sales Branches, the number of suppressed data elements at the three-digit kind-of-business level within states is high. State-level data for Agents, Brokers, and Commission Merchants were therefore developed at the two-digit SIC level only.

Profit, Manufacturers' Sales Branches and Agents, Brokers and Merchants

To compute profit estimates for agents, brokers and commission merchants, U.S. ratios of net income (less deficit) to business receipts, developed from IRS's 1976 Statistics of Income, Business Income Tax Returns, and 1976 Statistics of Income, Source Book of Corporation Income Tax Returns (Source 15101) for two-digit and available three-digit SIC's were applied to Census state sales data. These profit estimates were added to operating expenses to provide a gross margin estimate for Manufacturers' Sales Offices and Agents, Brokers, and Commission Merchants.

Summary

The technique explained to develop state-level data on wholesale trade services is based on the availability and reliability of data as provided from the Bureau of Census. Clearly, the method proposed for Merchant Wholesalers generates relatively more accurate and reliable data than is true for the remaining two operations. Fortunately, Merchant Wholesalers represent the lion's share of wholesale trade: 65.8 percent of total sales within wholesale trade are conducted by Merchant Wholesalers. Accordingly, the weakest data will result from the imputations necessary to develop Manufacturers' Sales Branches representing 21.5 percent of total sales. The somewhat more reliable technique proposed for Agents, Brokers, and Commission Merchants will represent the remaining 12.7 percent of total sales. The total value of services calculated by state are used as a control for the assignment of the use of wholesale activity within the I-O framework as described in the JFA report State Inputs to Industries, 1977.

Employment and Payroll Data

Employment and payroll data were collected for SICs 50 and 51 and summed for total sector employment, by state.

Data Limitations

Several data limitations should be noted based on the estimation techniques described above. These include:

1. The value of services for all types of wholesale activity by state were estimated based on national-level ratios. Thus all state-level data for output are subject to the assumption that the ratio of gross margins to sales are constant across all states. This assumption clearly limits the quality of state level gross margin data.
2. The value of services estimated for manufacturers' sales branches and agents, brokers, and commission merchants is limited further by the level of detail of available data for sales and the estimation technique used for profits (agents, brokers, and commission merchants).
3. The splitting of manufacturers' branches from Census totals for branches and offices may fail to reflect the actual sales, employment and payroll data for these establishments.

CHAPTER 13

EATING AND DRINKING PLACES

MRIO Sector:

098: Eating and Drinking Places

As shown in Exhibit 13-1, MRIO Sector 098 includes all of SIC major group 58, Eating and Drinking Places. Establishments engaged primarily in the sales of prepared foods and drinks for consumption on the premises are included in this sector.

Though within the Standard Industrial Classification, eating and drinking places are included in the retail trade division, within the MRIO framework these establishments are handled apart from the balance of retail trade. Thus, instead of measuring the output of eating and drinking establishments on a margin basis which would exclude the cost of purchased food and beverages as was done for other trade sectors, dining establishments are handled like all non-retail sectors — on a gross basis including the cost of purchased inputs. Since eating and drinking establishments perform a service which changes the nature of the products that it buys, the service rendered approximates more closely the activities of other sectors rather than just the margin function associated with retail trade. Beginning with the 1972 I-O table, BEA also excludes eating and drinking from the retail trade industry.

Though the MRIO measurement of output for eating and drinking places parallels that of BEA, BEA goes one step further in defining their sector on an activity rather than an establishment basis. Thus BEA Sector 74000 includes the output of establishments classified as eating and drinking and additionally includes, as redefinitions, meal and beverage sales made in hotels, motels, boarding schools, bowling alleys, etc. Where these redefinitions are substantial, as in the case of meals and beverages served in hotels and lodging places, the redefined amounts are treated as a by-product by the method described in MRIO Procedures No. 2. No adjustment was made for relatively small redefinition values.

EXHIBIT 13-1
MRIO CONCORDANCE WITH 1977 SIC CODES

Sector 098: Eating and Drinking Places

<u>MRIO Sector</u>	<u>BEA I-O Code</u>	<u>1977 SIC</u>
124 098 Eating and Drinking Places	74000 Eating and Drinking Places*	58 Eating and Drinking Places

* It should be noted that BEA treats the output of Sector 74000 on an activity basis and thus redefines the meals and beverage sales associated with other sectors, e.g., dining in hotels, meals served on airlines, etc., into Eating and Drinking Places. Within the MRIO, substantial values associated with these redefinitions will be treated on a by-product basis.

Data Sources and Estimation

Output (sales), employment and payroll data for SIC 58 were tabulated from the 1977 Census of Retail Trade (Source 03101). All data were taken directly from the Census, except for employment which was computed as an average of the four quarters employment provided in Census' Subject Series, Miscellaneous Subjects (Source 03101).

Data Limitations

Since employment data were represented by an average of the employment in each of four quarters provided in Census, these data may fail to reflect actual annual employment for 1977.

CHAPTER 14

RETAIL TRADE

MRIO Sectors:

- 099: General Merchandise and Apparel Stores
- 100: Food, Drug and Liquor Stores
- 101: Automotive Dealers and Gasoline Service Stations
- 102: Other Retail Stores

As shown in Exhibit 14-1, this group of MRIO sectors includes all of SIC Division G, Retail Trade which includes major groups SICs 52-59, except SIC 58, as well as SIC 7396, Trading Stamp Services.

The output of trade sectors is defined differently from the output of other MRIO sectors, i.e., the output of trade is defined as to exclude the cost of a goods sold by trade establishments. Thus, the I-O definition of trade output represents the value of services provided by trade establishments and does not include the value of commodities following through trade. This treatment is used to preserve the link of commodities between producers and users. If the cost of goods sold were treated as an input to trade and correspondingly included in the output of trade establishments, most purchases would be made from trade establishments rather than from the actual producer of the commodity.

To preserve the producer-user link, the value of services rendered by trade, i.e., margins, are developed by state and kind-of-business and subsequently linked with commodities flowing from producers through trade. In the case of retail trade, most purchases are made within final demand and retail margins will be distributed to the appropriate final demand category as these data are developed.

Data Sources and Estimation

Sales, payroll and employment data for SICs 52-57, and 59 were tabulated from the 1977 Census of Retail Trade (Source 03101). Receipts (expenses), payroll and

EXHIBIT 14-1

MRIO CONCORDANCE WITH 1977 SIC CODES

Sectors 099, 100, 101, 102: Retail Trade

<u>MRIO Sector</u>	<u>BEA I-O Code</u>	<u>1977 SIC</u>
099: General Merchandise and Apparel	690200 (pt.) Retail Trade	531 Department Stores 533 Variety Stores 539 Miscellaneous General Merchandise Stores 561 Men's and Boy's Clothing and Furnishings Stores 562 Women's Ready-To-Wear Stores 563 Women's Accessory and Specialty Stores 564 Children's and Infants' Wear Stores 565 Family Clothing Stores 566 Shoe Stores 568 Furriers and Fur Shops 569 Miscellaneous Apparel and Accessory Stores
100: Food, Drug and Liquor Stores	690200 (pt.) Retail Trade	541 Grocery Stores 542 Meat and Fish (Seafood) Markets, Including Freezer Provisioners 543 Fruit Stores and Vegetable Markets 544 Candy, Nut, and Confectionery Stores 545 Dairy Products Stores 546 Retail Bakeries 549 Miscellaneous Food Stores 591 Drug Stores and Proprietary Stores 592 Liquor Stores

EXHIBIT 14-1 (cont'd)

MRIO CONCORDANCE WITH 1977 SIC CODES

Sectors 099, 100, 101, 102: Retail Trade

<u>MRIO Sector</u>	<u>BEA I-O Code</u>	<u>1977 SIC</u>
101: Automotive Dealers and Gasoline Service Stations	690200 (pt.) Retail Trade	551 Motor Vehicle Dealers (New and Used) 552 Motor Vehicle Dealers (Used Only) 553 Auto and Home Supply Stores 554 Gasoline Service Stations 555 Boat Dealers 556 Recreational and Utility Trailer Dealers 557 Motorcycle Dealers 559 Automotive Dealers, Not Elsewhere Classified
102: Other Retail Stores	690200 (pt.) Retail Trade	521 Lumber and Other Building Material Dealers 523 Paint, Glass, and Wallpaper Stores 525 Hardware Stores 526 Retail Nurseries, Lawn and Garden Supply Stores 527 Mobile Home Dealers 571 Furniture, Home Furnishing, and Equipment Stores, Except Appliances 572 Household Appliance Stores 573 Radio, Television, and Music Stores 593 Used Merchandise Stores 594 Misc. Shopping Goods Stores 596 Nonstore Retailers 598 Fuel and Ice Dealers 599 Retail Stores, Not Elsewhere Classified 7398 Trading Stamp Services

employment data for SIC 7396, Trading Stamp Services were tabulated from the 1977 Census of Service Industries (Source 03103). Data used in computing retail trade gross margins for MRIO sectors 099-102 were based on the Current Business Report "1977 Retail Trade, Annual Sales and Purchases, Year-End Inventories, and Accounts Receivable by Kind of Retail Store" (Source 03119).

The basic data development methodology involved the addition of the three- or four-digit SIC codes for sales, payroll and employment. To develop output from sales data, a national retail trade margin was calculated as sales less purchases plus ending inventories less beginning inventories, at the kind-of-business level. Margins were computed for each state by kind-of-business from the national margins based on state sales by kind-of-business.

To estimate gross margins by state and by sector, first U.S. gross margins were computed for the level of disaggregation available in CBR "1977 Retail Trade" (Source 03119). Gross margins were computed as sales less merchandise purchases plus 1977 merchandise inventories less 1976 merchandise inventories. National gross margin to sales ratios were then computed and applied to state sales data by SIC to obtain state gross margin estimates.

Employment and payroll data were generally gathered for the two-digit SIC level and summed for a MRIO sector total.

Suppressed data by state within Census accounted for less than two percent of sales, employment or payroll within retail trade sectors. Suppressions were estimated based on the number of establishments within affected states.

Data Limitations

Several data limitations should be noted based on the sources and imputations described above. These include:

1. Estimating state gross margins by applying a national gross margin/sales ratio to state sales data may fail to reflect the actual state output distribution.

2. For each sector, suppressed data that was estimated based on the number of establishments, etc. may fail to reflect the actual distribution of these data.
3. Employment estimates within the MRIO do not include establishments with no payroll and self-employment which may be significant for some types of establishments within retail trade.

CHAPTER 15

FINANCE

MRIO Sector:

103: Banking, Credit Agencies and Investment Brokers

As shown in Exhibit 15-1, this sector includes the output of banks and other financial intermediaries. The output of financial establishments is equal to the value of financial services performed, e.g., the output of commercial banks is the total of bank receipts (interest, dividends, and service charges) less the price banks pay for money (interest paid). Alternatively, the output of financial establishments is equal to nonfinancial expenses plus profits. To avoid the somewhat tedious step of estimating the value of bank services furnished without explicit charges, output data were developed based on the nonfinancial-expenses-plus-profits definition. In the following sections, the methods used to develop output based on the nonfinancial-expenses-plus-profits technique are explained and these totals are compared with the estimated national totals available from the BEA "1977 Analysis Input-Output Control Worksheets" which were developed using the bank-receipts-less-interest-paid definition for output.

Data Sources and Estimation

Lacking Census data concerning establishments in this sector, output data was developed by types of establishments from numerous sources as outlined below.

<u>Type of Establishment</u>	<u>Source</u>
Federal Reserve Banks	16401: <u>(1977) Annual Report of the Federal Reserve Board of Governors</u>
Commercial, Stock & Mutual Savings Banks and Trust Companies (FDIC-Insured)	16302: <u>(1977) Bank Operating Statistics</u>
Savings and Loan Associations (FSLIC-Insured)	16802: <u>(1977) Combined Financial Statements FSLIC-Insured Savings and Loan Associations</u>

EXHIBIT 15-1

MRIO CONCORDANCE WITH 1977 SIC CODES

Sector 103: Banking, Credit Agencies and Investment Brokers

<u>MRIO Sector</u>		<u>BEA I-O Code</u>		<u>1977 SIC</u>
103	Banking, Credit Agencies and Investment Brokers	700100	Banking	60 Banking
		700200	Credit Agencies	61 Credit Agencies Other than Banks (Excluding the Commodity Credit Corporation)*
				67 Holding and Other Investment Offices
		700300	Security and Commodity Brokers	62 Security and Commodity Brokers, Dealers, Exchanges and Services

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* PT SIC 613, the Commodity Credit Corporation, BEA Sector 780300, is included in MRIO Sector 118, Federal Government Enterprises, Except Utilities and Local Transit.

Federal-Chartered Credit Unions	17101:	<u>(1977) Annual Report, National Credit Union Administration</u>
State-Chartered Credit Unions	17102:	<u>State-Chartered Credit Unions, 1977 Annual Report</u>
Consumer and Sales Finance Companies	22112:	<u>NCFA Research Report on Finance Companies in 1977</u>
Mortgage Bankers	22121:	<u>Mortgage Banking 1977: Financial Statements and Operating Ratios</u>
Security and Commodity Brokers, Dealers, and Exchanges	16501:	<u>(1979) Annual Report of the Securities and Exchange Commission</u>

Employment and payroll data by state for all establishments except Federal Reserve Banks were tabulated from the Bureau of Labor Statistics' Employment and Wages: Monthly Employment and Quarterly Wage Data 1977, Computer Tape No. 120380 (Source 12110) which included 1977 Unemployment Insurance (UI) Data. Employment and payroll of Federal Reserve Banks was tabulated separately from the 1977 Annual Report of the Board of Governors of the Federal Reserve System (Source 16401).

State Distribution of Output

Output by state was provided in the output sources noted for Federal Reserve Banks, FDIC-Insured Commercial, Stock and Mutual Savings Banks and Trust Companies, FSLIC-Insured Savings and Loan Associations and Federal Chartered Credit Unions. State distribution of the output for remaining establishments was based on payroll as reported on the UI tape (Source 12110). The total employment and payroll from the sources noted above represented 92 percent (based on payroll) of that reported for all financial establishments in the UI data base. The remaining employment and payroll represents the activity of financial establishments for which no output data were available. Output of these establishments was estimated as explained below.

<u>1977 SIC</u>	<u>Estimation of Output</u>
605: Establishments Performing Functions Closely Related to Banking	Based on the ratio of output to payroll for the balance of SIC 60, Banking.

6124: State Savings and Loan Associations, Not Insured, Members of the Federal Home Loan Bank System	Based on the ratio of output to payroll for SIC 6122 and 6123, Savings and Loan Associations that are insured by the FSLIC.
6125: State Savings and Loan Associations, Not Insured, Not Members of the Federal Home Loan Bank System	Based on the ratio of output to payroll for SIC 6122 and 6123, Savings and Loan Associations that are insured by the FSLIC.
6144: Industrial Loan Companies not Engaged in Deposit Banking	Based on a weighted average of output to payroll for SIC 6142 and 6143, Federal and state-chartered credit unions.
6149: Miscellaneous Personal Credit Institutions	Based on a weighted average of output to payroll for SIC 6145, Licensed Small Loan Lenders and SIC 6146, Installment Sales Finance Companies.
622: Commodity Contracts Brokers and Dealers	Based on the ratio of output to payroll for SIC 621 and 623, Security Brokers, Dealers, and Flotation Companies and Security and Commodity Exchanges.
628: Services Allied With the Ex- change of Securities or Com- modities	Based on the ratio of output to payroll for SIC 621 and 623, Security Brokers, Dealers, and Flotation Companies and Security and Commodity Exchanges.
673: Trusts	Based on the ratio of output to payroll as reported in the Federal Reserve Board's <u>Functional Cost Analysis, 1977</u> <u>Average Banks</u> (Source 16402).

Lacking any available data to estimate output for SIC's not covered above, output was considered equal to payroll for these establishments. These establishments represent a very small portion of total banking activity.

These many components of output for the Finance Sector were summed to provide output by state for MRIO 103. As shown in Exhibit 15-1, MRIO 103 is comprised of three BEA sectors: 700100-Banking, 700200-Credit Agencies and 700300-Security and Commodity Brokers. BEA has completed 1977 worksheets that provide national output totals for two of these sectors, Banking and Security and Commodity Brokers. For establishments included in BEA 700100, Banking, the MRIO total national output exceeds the output estimated by BEA by 1.4 percent. For BEA 700300, Security and Commodity Brokers, the MRIO output equals about 95 percent of the output estimated by BEA. The small differences between the output data estimated by BEA versus MRIO can be attributed to the differing definitions used for output and differing data sources used in the MRIO to provide state-level data.

Data Limitations

1. The national output of this sector was developed, as previously explained, from some eight different data sources. As such, these estimates are relatively weaker than other output estimates within the accounts.
2. The state distribution of output within this sector was largely based on available state-level employment data. These estimates may therefore be expected to be less reliable than for sectors where actual state-level data were available.

CHAPTER 16

INSURANCE

MRIO Sector:

104: Insurance

As shown in Exhibit 16-1, this sector includes SIC 63, Insurance and SIC 64, Insurance Agents, Brokers and Service. All types of insurance carriers are included in this sector as well as agents and brokers dealing in insurance and organizations offering services to insurance companies or policyholders.

Output for insurance carriers was measured in three ways. The output of life insurance carriers was measured by operating expenses plus dividends paid to stockholders while the output of all other carriers was measured on a net basis, i.e., premiums received less benefits and dividends paid. The output of insurance agents and brokers and insurance services was measured by operating expenses plus profit.

Data Sources and Estimation

The national output (operating expenses plus dividends paid to stockholders) of life insurance companies was developed from data in the Life Insurance Fact Book (1978, Source 22071). Lacking primary data sources for other types of insurance carriers, national data were drawn from BEA's "1977 Analysis Input-Output Control Worksheets" for:

- Fraternal Life Insurance
- Property and Casualty Insurance
- Accident and Health Insurance
- Mortgage Guarantee Insurance
- Title Insurance
- Income Loss Insurance
- Blue Cross and Blue Shield

EXHIBIT 16-1

MRIO CONCORDANCE WITH 1977 SIC CODES

Sector 104: Insurance

<u>MRIO Sector</u>	<u>BEA I-O Code</u>	<u>1977 SIC</u>
104: Insurance	700400 Insurance Carriers	63 Insurance
	700500 Insurance Agents, Brokers, and Services	64 Insurance Agents, Brokers, and Service

- Independent Accident and Health Plans
- Accidental Death and Dismemberment Insurance
- Private Pension Plans

For SIC 64, Insurance Agents, Brokers and Services, expenses plus profits data, developed from IRS 1977 Statistics of Income, Corporate Income Tax Returns, and 1977 Statistics of Income, Business Income Tax Returns (both preliminary) (Source 15101) were used as a measure of output.

Employment and payroll data for this sector were obtained by 4-digit SIC from the Bureau of Labor Statistics' Employment and Wages: Monthly Employment and Quarterly Wage Data 1977, Computer Tape No. 120380, (Source 12110) which included 1977 Unemployment Insurance (UI) data.

State disaggregation of all components of the insurance sector were based on payroll data from the UI tape. Each component identified above was matched with the most appropriate 4-digit SIC and distributed by state accordingly.

Data Limitations

1. The national values for output for all insurance activities except life insurance were drawn from the BEA 1977 worksheets which are preliminary data. Moreover, lacking published data on a large portion of these data, BEA's data development was based on telephone conversations with cognizant government or industry persons and may fail to accurately measure non-life insurance output.
2. The state disaggregation of the output for this sector was based on payroll data in all cases. This method may fail to accurately reflect insurance output at the state level.

CHAPTER 17

REAL ESTATE AND RENTAL

MRIO Sector:

105: Real Estate and Rental

As shown in Exhibit 17-1, this MRIO sector includes all of SIC groups:

65: Real Estate

66: Combinations of Real Estate, Insurance, Loans, Law Offices

1531 (part): Operative Builders

In addition to the output of these SIC groups, the real estate sector contains rental and royalty payments made within all sectors including imputed rental values for all capital assets whose value is purchased as a part of personal consumption expenditures. These additional components of the real estate sector are not part of any SIC group, and are not counted in the output of any sector except real estate.

Data Sources and Estimation

Output Data

The components of output at the national level for 1977 are shown in Exhibit 17-2. For comparison, the table also includes preliminary control totals from BLS for I-O 71.0100 and 71.0200, which together comprise the activities of MRIO Sector 105. As can be seen in Exhibit 17-2, eighteen components have been identified at the national level.

Output data were developed at the state level using the following component breakdowns:

1. Owner-Occupied Dwellings (non-farm)
2. Tenant-Occupied Dwellings (non-farm)
3. Farm Dwellings (owner occupied and tenant occupied)
4. Permanent Guests of Hotels
5. Non Profit Institutions

EXHIBIT 17-1

MRIO CONCORDANCE WITH 1977 SIC CODES

Sectors 105: Real Estate and Rental

<u>MRIO Sector</u>	<u>BEA I-O Code</u>	<u>1977 SIC</u>
105: Real Estate and Rental	710100 Owner-Occupied Dwellings	Not Applicable
	710200 Real Estate	65 Real Estate
		66 Combinations of Real Estate, Insurance, Loans, Law Offices
		pt. 1531 Operative Builders

EXHIBIT 17-2: NATIONAL TOTALS -- COMPONENTS AND
BLS SECTOR TOTALS

COMPONENT	Billions of Dollars	BLS Sector	Billions of Dollars
Owner Occupied Dwellings			
1. Non Farm	125.4		
2. Farm	5.7		
	131.1	71.0100	129.6
Tenant Occupied Dwellings			
3. Non Farm	47.8		
4. Farm	1.4		
5. Permanent Guests of Hotels, etc.	(by-product)		
6. Non Profit Institutions	6.3		
Business Rent Paid			
7. Corporations	50.0		
8. Partnerships	4.4		
9. Sole Proprietors	10.1		
10. Non-profit	1.1		
11. Government Rent Paid	2.4		
Royalty Receipts (in lieu of payments)			
12. Corporations	6.1		
13. Partnerships	0.4		
14. Persons	2.2		
15. Government	1.3		
Operating Receipts of Real Estate Firms			
16. Corporations	14.4		
17. Partnerships	7.1		
18. Sole Proprietors	9.8		
	164.8	71.0200	149.0
TOTAL	295.9		278.6

6. Rental Payments by Business
7. Royalty Payments by Business
8. Rental Payments by Government
9. Operating Receipts of Real Estate Firms

This sector is comprised largely of financial flows not identified with a "real" industry. The only establishment defined activity included is the sales and management function of the real estate industry. For this reason the data must be compiled from diverse sources in component detail by state and summed to provide state "industry" totals.

Owner-Occupied Dwellings (Non-Farm)

The national total for imputed rental value of owner-occupied non-farm dwellings is taken from the NIPA accounts as published in the Survey of Current Business, National Income and Product Accounts, 1976-79: Special Supplement, July 1981, (Source 03501). The rental value of owner-occupied non-farm dwellings are disaggregated by state based on the total value of owner-occupied dwellings by state. State-level data on the value of owner-occupied dwellings were calculated as the median value of dwellings multiplied by the number of units from the 1970 Census of Housing (Source 03112). These data were scaled to 1977 values using the ratio between 1977 and 1970 median values and units by major Census region from the 1977 Survey of Housing (Source 03115).

Tenant-Occupied Dwellings (Non-Farm)

The imputed rental value of tenant-occupied non-farm dwellings were developed using the same techniques and data sources as for owner-occupied dwellings, substituting total rents paid in place of total value of dwellings. Total rents are the product of median rents paid and number of rental units by states.

Farm Dwellings

The total rental value of owner- and tenant-occupied farm dwellings was based on NIPA data published in Survey of Current Business, NIPA, 1976-79 (Source 03501). State-level data summing to this control total were available in unpublished data from the U.S. Department of Agriculture, Economic Research Service.

Permanent Guests of Hotels

This component was redefined by BEA to be included in the real estate and rental sector. We choose not to redefine this activity due to difficulty in separately identifying the inputs to this component. Therefore, it remains as part of the output of Hotels and Lodging places and will be treated as a by-product of that industry (see MRIO Procedures No. 2).

Non-Profit Institutions

The imputed rental value of buildings and equipment owned and used by non-profit institutions serving individuals was developed as a control total from NIPA data published in Survey of Current Business, NIPA, 1976-79 (Source 03501) and disaggregated based on the state output of non-profit institutions (MRIO Sector 116).

Rental Payments by Business

As shown in Exhibit 17-2, rental payments by business are the total of rents paid by corporations, partnerships and sole proprietorships. These data are collected from the 1977 Statistics of Income (Source 15101) at the national level by industry. Data on rental payments by industry are not available at the state level. Therefore, the IRS industry totals were converted to totals by MRIO sector and distributed to states based on the output measures for each sector. This procedure simultaneously provides state totals and detailed state industry distribution for this component of the rental sector. A number of secondary sources were used to allocate the IRS industry totals to MRIO sector totals. These sources included the 1977 Census of Agriculture (Source 03109), the 1977 Census of Mineral Industries (Source 03108), the 1977 Census of Construction (Source 03104), the 1977 Census of Manufactures (Source 03105), and the 1977 Census of Service Industries (Source 03103).

Data on rent paid by non-profit businesses were not included in the IRS data and were obtained from the National Income and Wealth Division of the Bureau of Economic Analysis.

Royalty Payments

Lacking sufficient data on royalty payments, the national control totals for royalties shown in Exhibit 17-2 were based on receipts. Total royalty receipts were calculated as the sum of receipts by persons, corporations, partnerships and government. All receipts

data except for government were taken from the 1977 Statistics of Income (Source 15101). Government receipts were available in the Budget of the U.S. Government (Source 01101).

Receipts for royalty payments were distributed by industry based on the methods used in the 1972 BEA I-O study. Royalties paid by book publishing, phonograph records, miscellaneous publishing, newspapers, periodicals, greeting card publishing, producers of theater, symphony and dance groups, motion picture producers, and advertising were developed by scaling estimates from the 1972 BEA I-O study by the change in output of the various sectors between 1972 and 1977. Royalty payments by radio and television broadcasting were based on statistics published in T.V. Broadcast Financial Data 1977 (Source 16201) and the AM and FM Broadcast Financial Data 1977 (Source 16202). Royalty payments by mining sectors were based on data from the 1967 Census of Mineral Industries (Source 03106). These data were updated by scaling by the change in output from 1967 to 1977. The remaining unallocated royalties were allocated to manufacturing sectors in proportion to their royalty receipts based on the assumption that these receipts consisted of intra-sector payments for patent rights.

Rental Payments by Government

Figures on rental payments by government were taken directly from the data developed as part of final demand. (See Volume IV).

Operating Receipts of Real Estate Firms

The receipts of real estate firms were available at the national level from the 1977 Statistics of Income (Source 15101). These figures had to be adjusted to exclude rents received which were already accounted for in the analysis of rents paid for tenant-occupied dwellings and rental payments by business (see above). This was accomplished by excluding business receipts for operators and lessors of buildings.

The national level control total was then split into two parts. The first part, broker's commissions on sales of structures was available in the NIPA accounts as published in the Survey of Current Business, National Income and Product Accounts, 1976-79: Special Supplement, July 1981, (Source 03501). The second part, receipts of real estate firms for property management, was the residual of the national control total after broker's commissions were subtracted.

Broker's commissions were prorated to states in proportion to aggregate sales price, by state, from the 1977 Census of Governments (Source 03110). Management fees were prorated to states in proportion to payrolls for the real estate sector (see below).

Employment and Payroll Data

Employment and payroll data are tabulated only for the real estate sector because there is no employment and payroll corresponding to rental, royalty and imputed rental outputs. Payroll and employment data for real estate were gathered from the Bureau of Labor Statistics' Employment and Wages: Monthly Employment and Quarterly Wage Data (Computer Tape No. 120380) for 1977 (Source 12110) and adjusted to reflect yearly averages.

Data Limitations

The lack of data for many components of output within this sector places many limitations on these data, including:

1. The imputed rental value of owner-occupied dwellings are based on NIPA data distributed by state based on the total value of housing by state and may fail to reflect the actual distribution of implicit rental values by state.
2. The amounts used from NIPA for rents paid by tenants for dwellings were estimated based on contract rents less an adjustment for utilities included in rent and are thus subject to an error factor. The state distributions of rents paid by tenants is based on total contract rents by state and thus may fail to reflect the actual distribution of total rents paid.
3. The imputed rental value of owner-occupied farm dwellings and rents paid for tenant-occupied farm dwelling are USDA estimates and may not reflect either the actual amounts or distributions of these quantities.
4. The national imputed value of rental for buildings and equipment owned and used by nonprofit institutions is based on NIPA data disaggregated by state based on output of all nonprofit institutions. The final values may not reflect the actual national rental payments and/or state distributions of these values.

5. Royalty payments are distributed to sectors based on a variety of estimating techniques and may fail to reflect the actual distributions of these payments.
6. The receipts of real estate firms are distributed by states based on payroll and may fail to represent the actual distribution of receipts.

CHAPTER 18

MISCELLANEOUS SERVICES

MRIO Sectors:

- 106: Hotels and Lodging Places
- 107: Personal and Repair Services, Except Auto
- 108: Miscellaneous Services and Advertising
- 109: Miscellaneous Professional Services
- 110: Auto Rental, Repair, and Maintenance
- 111: Amusements

As shown in Exhibit 18-1, this group of MRIO sectors include the following SIC major groups:

- 70: Hotels, Rooming Houses, Camps and Other Lodging Places
- 72: Personal Services
- 73: Business Services (except SIC 7396 , Trading Stamp Services)
- 75: Automotive Repair, Services, and Garages
- 76: Miscellaneous Repair Services
- 78: Motion Pictures
- 79: Amusement and Recreation Services, Except Motion Pictures
- 81: Legal Services
- 89: Miscellaneous Services (Except SIC 892, Noncommercial Educational, Scientific, and Research Organizations)

Establishments in MRIO Sectors 106-111 provide various types of services including: lodging, personal, business, legal, automotive, amusement and recreation and other miscellaneous services.

Services not covered in this chapter: health, educational and social services, membership and noncommercial educational, scientific and research organizations, and museums, art galleries, botanical and zoological gardens, are discussed in other chapters of this report.

EXHIBIT 18-1

MRIO CONCORDANCE WITH 1977 SIC CODES

Sectors 106-111: Miscellaneous Service Sectors

<u>MRIO Sector</u>	<u>BEA I-O Code</u>	<u>1977 SIC</u>
106: Hotels and Lodging Places	720100 Hotels and Lodging Places (excluding dining*)	70 Hotels, Rooming Houses, Camps, and Other Lodging Places
107: Personal and Repair Services, Except Auto	720201 Laundry, Cleaning, Garment Services and Shoe Repair	721 Laundry, Cleaning, and Garment Services
	720202 Funeral Service and Crematories	725 Shoe Repair Shops, Shoe Shine Parlors, and Hat Cleaning Shops
	720203 Portrait, Photographic Studios, and Miscellaneous Personal Services	726 Funeral Service and Crematories
	720204 Electrical Repair Shops	722 Photographic Studios, Portrait
	720205 Watch, Clock, Jewelry and Furniture Repair	729 Miscellaneous Personal Servs.
		762 Electrical Repair Shops
		763 Watch, Clock, and Jewelry Repair
		764 Reupholstery and Furniture Repair
	720300 Beauty and Barber Shops	723 Beauty Shops
		724 Barber Shops

* BEA considers sales of meals and beverages on an activity basis and therefore redefines these sales to BEA Sector 74000. Within the MRIO, sales of meals and beverages will be treated on a by-product basis.

EXHIBIT 18-1 (cont'd)

MRIO CONCORDANCE WITH 1977 SIC CODES

Sectors 106-111: Miscellaneous Service Sectors

<u>MRIO Sector</u>	<u>BEA I-O Code</u>	<u>1977 SIC</u>		
108: Miscellaneous Services and Advertising	730101	Miscellaneous Repair Shops	769	Miscellaneous Repair Shops and Related Services
	730102	Services to Dwellings and Other Buildings	734	Services to Dwellings and Other Buildings
	730103	Personnel Supply Services	736	Personnel Supply Services
	730104	Computer and Data Processing Services	737	Computer and Data Processing Services
	730105	Management and Consulting Services, Testing and Research Laboratories	7391	Research and Development Laboratories
			7392	Management, Consulting, and Public Relations Services
			7397	Commercial Testing Labs
			7393	Detective Agencies and Protective Services
			7394	Equipment Rental and Leasing Services
			7332	Blueprinting and Photocopying Services
			7333	Commercial Photography, Art and Graphics
			7395	Photofinishing Laboratories
			732	Consumer Credit Reporting Agencies, Mercantile Reporting Agencies, and Adjustment and Collection Agencies
			7331	Direct Mail Advertising Servs
		7339	Stenographic Services; and Reproduction Services, N.E.C.	
		735	News Syndicates	
		7399	Business Services, N.E.C.	
	730200	Advertising	731	Advertising

EXHIBIT 18-1 (cont'd)

MRIO CONCORDANCE WITH 1977 SIC CODES

Sectors 106-111: Miscellaneous Service Sectors

<u>MRIO Sector</u>	<u>BEA I-O Code</u>	<u>1977 SIC</u>
109: Miscellaneous Professional	730301 Legal Services	811 Legal Services
	730302 Engineering, Architectural, and Surveying Services	891 Engineering, Architectural, and Surveying Services
	730303 Accounting, Auditing and Bookkeeping, and Miscellaneous Services, N.E.C.	893 Accounting, Auditing, and Bookkeeping Services 899 Services, Not Elsewhere Classified
110: Auto Rental, Repair and Maintenance	750001 Auto Rental and Leasing, Without Drivers	751 Automotive Rental and Leasing, Without Drivers
	750002 Automotive Repair Shops and Services	753 Automotive Repair Shops 7549 Automotive Services, Except Repair and Car Washes
	750003 Automobile Parking and Car Washes	752 Automobile Parking 7542 Car Washes

EXHIBIT 18-1 (cont'd)

MRIO CONCORDANCE WITH 1977 SIC CODES

Sectors 106-111: Miscellaneous Service Sectors

<u>MRIO Sector</u>	<u>BEA I-O Code</u>	<u>1977 SIC</u>
111: Amusements	760100 Motion Pictures	78 Motion Pictures
	760201 Theatrical Producers (Except Motion Pictures), Bands, and Entertainers	792 Theatrical Producers (Except Motion Pictures), Bands, Orchestras and Entertainers
	760202 Bowling Alleys, Billiard and Pool Establishments	793 Bowling Alleys and Billiard and Pool Establishments
	760203 Commercial Sports Except Racing	7941 Professional Sports Clubs and Promoters
	760204 Racing (Including Track Operation)	7948 Racing, Including Track Operation
	760205 Membership Sports and Recreation Clubs	7997 Membership Sports and Recreation Clubs
	760206 Other Amusement and Recreation Services	791 Dance Halls, Studios, and Schools 7992 Public Golf Courses 7993 Coin-Operated Amusement Devices 7996 Amusement Parks 7999 Amusement and Recreation Services, N.E.C.

Data Sources and Estimation

Data for all SICs were tabulated from the 1977 Census of Service Industries (Source 03103). For MRIO Sectors 106-111 the basic data development methodology involved the addition of two- or three-digit SIC components. For Sector 106, this included both taxable and tax-exempt establishment data. For Sector 108, SIC 7396 data were subtracted from the sum of SIC 73 and SIC 769 data.

The Subject Series, Hotels, Motels and Other Lodging Places and the Geographic Area Series, Other Service Industries (Source 03103) were divided into two sections, taxable and tax-exempt establishments. The Geographic Area Series, Alabama - United States (Source 03103) includes data only for taxable establishments. Data for taxable establishments' output were defined as receipts while for tax-exempt establishments output was defined as expenses. Data for tax-exempt industries cover only establishments with payroll. Employment includes only paid employees.

State-level suppression of output, employment and payroll within Census data accounted for approximately one percent or less of national totals for these sectors. Suppressions were estimated based on the number of establishments within affected states. In addition, for Sectors 107 and 108, suppressions of SIC 763 and 769 data (where combined data for these two SICs were provided) were estimated by using national ratios from BEA's "1977 Analysis Input-Output Control Total Worksheet." For Sector 106, output was obtained by summing the receipts of all taxable establishments and the expenses of tax-exempt establishments of the component SICs.

Adjustments to Coverage and Redefinition

In 1972, BEA made more than 40 redefinitions to these miscellaneous sectors. In the MRIO, only substantial redefinitions were considered and these will be treated in accordance with the methods described in MRIO Procedures No. 2. Many of the BEA redefinitions are minor and no adjustments will be made for these values.

Data Limitations

Several data limitations should be noted based on the sources and techniques described above. These include:

1. Suppressed data that were estimated may fail to reflect the actual distribution of the state output, employment and payroll data.
2. For Sector 106, Census employment and output data for tax-exempt establishments do not include establishments without payrolls and self-employment may be significant.

CHAPTER 19

HEALTH CARE SERVICES

MRIO Sectors:

- 112: Doctors and Dentists, Including Outpatient Care Facilities
- 113: Hospitals and Nursing
- 114: Other Medical and Health Services

As shown in Exhibit 19-1, this group of MRIO sectors includes all of SIC major group 80, Health Services as well as SIC 074, Veterinary Services.

Data Sources and Estimation

Census-based data were used to develop output and employment estimates for the health care sectors. Data for SIC 80, Health Services were tabulated from the 1977 Census of Service Industries (Source: 03103) while data for Veterinary Services (SIC 074) were taken from the 1978 Census of Agriculture (Source: 03109).

The basic data development methodology for each of these sectors was a straight-forward addition of the three-digit SIC codes for output, employment and payroll. There were no redefinitions, reclassifications, or secondary products.

Data on output, employment, and payrolls as available in the Census of Service Industries were divided into two sections, taxable and non-taxable establishments. Data for taxable establishments' output was defined as gross receipts while for non-taxable establishments output was defined as expenses. Employment includes only paid employment, volunteer employment is not reported. In addition, establishments that are owned by a government entity but operated by a private organization are included while those owned and operated by a government entity are not.

Four data estimation techniques were used to adjust for inadequate data within health services sectors. In the first instance, the reporting level of detail for data on receipts for taxable establishments without payroll was a combined total of SIC's 808, 809

EXHIBIT 19-1

MRIO CONCORDANCE WITH 1977 SIC CODES

Sectors 112, 113, 114: Health Care Services

<u>MRIO Sector</u>	<u>BEA I-O Code</u>	<u>1977 SIC</u>
112 Doctors and dentists, including outpatient care facilities	pt. 770100 Doctors and Dentists	801 Offices of Physicians 802 Offices of Dentists 803 Offices of Osteopathic Physicians
	pt. 770300 Other Medical and Health Services	808 Outpatient Care Facilities
113: Hospitals and Nursing	pt. 770300 Other Medical and Health Services	805 Nursing and Personal Care Facilities
	770200 Hospitals	806 Hospitals
114: Other medical and health services	pt. 770300 Other Medical and Health Services	874 Veterinary Services 804 Offices of Other Health Practitioners (excluding 8041)
		807 Medical and Dental Laboratories
		809 Health and Allied Services, Not Elsewhere Classified
	pt. 770100 Doctors and Dentists	8041 Offices of Chiropractors

and 8049. However, receipts were reported separately for these SIC's for establishments with payroll. Therefore, receipts for establishments without payroll were estimated based on data for establishments with payroll. In the second case, a minor portion of output, employment, and payrolls for non-taxable establishments were included in an "other" category. These data were divided among three-digit SIC codes based on the ratio of output, employment, or payrolls for these SIC codes for taxable establishments. Third, data withheld to avoid disclosure of individual company data were estimated based on each state's unsuppressed output, employment, or payroll, by sector. This procedure was applied separately to taxable and non-taxable establishments. Finally, lacking Census state-level data for employment in veterinary services, total (national) employment for SIC 074 was disaggregated by state based on state gross receipts data for veterinary services.

Data Limitations

Several data limitations should be noted based on the estimations described above. These include:

1. The distribution of total output for without-payroll establishments by SIC was made based on the relative distribution of output in payroll establishments and does not necessarily reflect the actual output by these establishments in MRIO Sectors 112 and 114.
2. Data for SIC codes 801-804, 807 and 809 for non-taxable establishments were reported only as a total, by state. These data were divided among three-digit SIC codes based on the ratio for these SIC codes for taxable establishments, and may fail to reflect the actual distribution of these data.
3. For each sector, suppressed data that was estimated based on output, employment or payroll may fail to reflect the actual distribution of these data.
4. Within Sector 114, the estimated state distribution of employment by gross receipts for SIC 074 may not represent the actual employment by state for veterinary services.

CHAPTER 20

EDUCATIONAL SERVICES

MRIO Sector:

115: Educational Services

As shown in Exhibit 20-1, MRIO Sector 115 includes all of SIC major group 82, Educational Services. The activities covered within this sector include all educational services in the private economy.

Data Sources and Estimation

Data for SIC 82, Educational Services were tabulated from the 1977 Census of Service Industries (Source 03103) which covered all educational services, excluding schools operated by religious organizations. Data for schools operated by religious organizations were developed from data provided in Catholic High Schools and Their Finances (Source 22061), Basic Financial Data on Catholic Elementary Schools (Source 22062) (both published in 1978), Digest of Education Statistics 1977-78 and 1979 (Source 08101), and unpublished data from the National Catholic Educational Association and the National Center for Education Statistics.

The basic data development methodology involved the addition of taxable and tax-exempt SIC 82 data from Census and estimated religious school data for output, employment and payroll.

Census data (Source 03103), Geographic Area Series, Other Service Industries and Subject Series, Miscellaneous Subjects, were divided into two sections, taxable and tax-exempt establishments. Data for taxable establishments' output was defined as receipts while for tax-exempt establishments output was defined as expenses or revenue. Data for tax-exempt industries cover only establishments with payroll. Employment includes only paid employees. Census data covers the fiscal year ending in 1977.

Census data suppressions at the state level accounted for about one percent of the national totals for output, employment and payroll. Suppressions within data for

EXHIBIT 20-1

MRIO CONCORDANCE WITH 1977 SIC CODES

Sector 115: Educational Services

<u>MRIO Sector</u>	<u>BEA I-O Code</u>	<u>1977 SIC</u>
115: Educational Services	770401 Elementary and Secondary Schools	821 Elementary and Secondary Schools
	770402 Colleges, Universities, and Professional Schools	822 Colleges, Universities, Professional Schools, and Junior Colleges
	770403 Libraries, correspondence and Vocational Schools, and Educational Services, N.E.C.	823 Libraries and Information Centers 824 Correspondence Schools and Vocational Schools 829 Schools and Educational Services, Not Elsewhere Classified

taxable establishments were estimated based on the receipts for components not suppressed within a state. Suppressions for tax-exempt establishments were estimated based on the number of establishments within a state.

Lacking Census data on educational services provided by religious organizations, it was necessary to estimate these data from several different sources. Output for Catholic schools, defined as expenses, was estimated as the sum of Catholic elementary and Catholic high school expenses. While these data were available by state for Catholic elementary schools (Source 22062), the national total for Catholic high school expenses (Source 22061) was distributed based on unpublished National Center for Education Statistics (NCES) data on number of teachers in Catholic elementary and secondary schools for fall 1978, by state. Output for religious schools other than Catholic was estimated by applying state ratios of current expenditures per public elementary and secondary school teacher (Source 08101) to unpublished NCES state data on number of teachers in church affiliated, other than Catholic, elementary and secondary schools. Output of schools operated by religious organizations was the sum of the estimated output of Catholic schools and the estimated output of religious schools other than Catholic.

Employment for elementary and secondary schools operated by religious organizations was estimated by adjusting unpublished NCES state data on number of teachers for fall 1978 by NCES national data on number of teachers for fall 1976. Payroll for Catholic schools was estimated as 75 percent of computed expenses, by state.¹ Payroll for religious schools other than Catholic was estimated based on the average annual salary of instructional staff in public elementary schools for 1977-78, by state. Payroll for schools operated by religious organizations was the sum of the estimated payroll of Catholic schools and the estimated payroll of religious schools other than Catholic.

Adjustments to Coverage and Redefinitions

Revenues of private schools from housing and board are redefined by BEA to Sectors 7201, Hotels and Lodging Places and Sector 7400, Eating and Drinking Places, respectively. These redefined amounts will be handled within the MRIO by the by-

¹ Approximately three-fourths of all operating expenses in Catholic high schools are salaries and fringe benefits, from Catholic Schools and Their Finances (Source 22061).

product method described in MRIO Procedures No. 2. The BEA redefinition for sale of merchandise will be allocated as an intra-sector flow with no adjustment to output (see also Procedures No. 2 paper). No adjustment will be made for the small quantity BEA redefines representing admission fees to athletic events.

Data Limitations

Several data limitations should be noted based on the sources and estimations described above. These include:

1. The data used to estimate Catholic school services were weak and the estimates developed may not reflect the actual value of Catholic educational services.
2. Limited data were available to estimate educational services provided by religious organizations, other than Catholic schools and estimates for these services are also very weak.
3. Census revenue, expenses and employment data for tax-exempt establishments and employment data for taxable establishments does not cover establishments without payroll.
4. Suppressed Census data that was imputed based on receipts of all establishments and national proportions may fail to reflect the actual distribution of the output, employment or payroll data.

CHAPTER 21

NONPROFIT ORGANIZATIONS

MRIO Sector:

116: Nonprofit Organizations

As shown in Exhibit 21-1, this MRIO sector includes all of SIC major groups 84, Museums, Art Galleries, Botanical and Zoological Gardens and 86, Membership Organizations, as well as SIC 892, Noncommercial Educational, Scientific, and Research Organizations.

Data Sources and Estimation

The 1977 Census of Service Industries (Source 03103) included data for all components of this sector except SIC 866, Religious Organizations. Output of SIC 866 was estimated at the national level based on the estimate of personal consumption expenditures for religion by BEA's National Income and Wealth Division (NIWD). The output was distributed by state based on employment for SIC 866 as reported in County Business Patterns 1977 (Source 03114). Payroll and employment data for SIC 866 were also tabulated from County Business Patterns 1977.

The basic data development methodology involved the addition of taxable and tax-exempt SIC 84, 86 (excluding 866) and 892 data from Census and SIC 866 actual and estimated data from County Business Patterns 1977 and BEA's National Income and Wealth Division.

Census data (Source 03103), Geographic Area Series, Other Service Industries and Subject Series, Miscellaneous Subjects, were divided into two sections, taxable and tax-exempt establishments. Data for taxable establishments' output was defined as receipts while for tax-exempt establishments output was defined as expenses. Census data for nonprofit organizations, except religious were provided for tax-exempt establishments only, except for SIC 892. Data for tax-exempt industries cover only establishments with payroll. Taxable SIC 892 data were published only for establishments with payroll,

EXHIBIT 21-1

MRIO CONCORDANCE WITH 1977 SIC CODES

Sectors 118: Nonprofit Organizations

<u>MRIO Sector</u>	<u>BEA I-O Code</u>	<u>1977 SIC</u>
118: Nonprofit Organizations	770501	861 Business Associations 862 Professional Membership Organizations
	770502	863 Labor Unions and Similar Organizations 864 Civic, Social, and Fraternal Associations
	770503	866 Religious Organizations
	770504	841 Museums and Art Galleries 842 Arboreta, Botanical and Zoological Gardens 865 Political Organizations 869 Membership Organizations, Not Elsewhere Classified 892 Noncommercial Educational, Scientific, and Research Organizations

though data for establishments with no payroll were included in combination with SIC's 83 and 899. Receipts for taxable establishments without payroll were estimated based on output data for establishments with payroll.

Suppressed data elements at the state level amounted to less than one percent of total sector output, employment and payroll data. Where state data were suppressed, estimates were made based on the number of establishments within the state.

Adjustments to Coverage and Redefinitions

Following preliminary estimation of output, payroll and employment for this sector, redefinitions were estimated to adjust the total sector controls. Sectors whose output is augmented by redefinitions from nonprofit organizations include:

- 102: Other Retail Stores
- 098: Eating and Drinking Places

State-level data on the redefined amounts for Eating and Drinking Places and Other Retail Stores were imputed from Census of Service Industries (Source 03103) data. These redefined amounts were then deducted from nonprofit organizations expenses and added to the receipts of the appropriate sectors, by state.

Data Limitations

Several data limitations should be noted based on the sources and estimations described above. These include:

1. The use of NIWD data on personal consumption expenditures for religion distributed by County Business Patterns employment may fail to reflect the actual state distribution of religious organizations' output data.
2. Suppressed Census data estimated based on the number of establishments or national proportions may fail to reflect the actual distribution of the state output, payroll, and employment data.
3. Census data for expenses and employment of tax-exempt establishments does not cover establishments with no payroll.

CHAPTER 22

OTHER SOCIAL SERVICES

MRIO Sector:

117: Other Social Services

As shown in Exhibit 22-1, MRIO Sector 117 includes all of SIC major group 83, Social Services. Services offered by establishments in this sector include private sector social and rehabilitation services to the general public as well as social services directed toward the disadvantaged or handicapped.

Data Sources and Estimation

Data for SIC 83, Social Services were tabulated from 1977 Census of Service Industries (Source 03103). The basic data were developed by straightforward addition of taxable and tax-exempt SIC 83 output, payroll and employment data. There were no redefinitions, reclassifications, or secondary products.

Census data (Source 03103), Geographic Area Series, Other Service Industries were divided into two sections, taxable and tax-exempt establishments. Output data for taxable establishments were measured by receipts while for tax-exempt establishments expenses are used to measure output. Data for tax-exempt establishments are only available for establishments with payroll. Taxable SIC 83 establishment data were available from Census for establishments with payroll, but data for establishments with no payroll were included in combination with SIC 892 and 899 (not included in this sector), by state. The output for taxable establishments without payroll was estimated based on receipts for establishments with payroll. Output for SIC 83 was the sum of the taxable receipts and the tax-exempt expenses.

At the state level, suppressed data elements accounted for less than one percent of the national totals for output, employment and payroll. These suppressions were estimated based on the number of establishments within affected states.

EXHIBIT 22-1

MRIO CONCORDANCE WITH 1977 SIC CODES

Sector 117: Other Social Services

<u>MRIO Sector</u>	<u>BEA I-O Code</u>	<u>1977 SIC</u>
117: Other Social Services	770600 Job Training and Related Services	833 Job Training and Vocational Rehabilitation Services
	770700 Child Day Care Services	835 Child Day Care Services
	770800 Residential Care	836 Residential Care
	770900 Social Services, N.E.C.	832 Individual and Family Social Services
		839 Social Services, Not Elsewhere Classified

Data Limitations

Several data limitations should be noted based on the sources and imputations described above. These include:

1. Employment data for this sector represent only the employment of establishments with payroll. Since establishments with payroll generate only about half of the total sector receipts, self-employment for this sector is very significant.
2. Census receipts for establishments without payroll were broken out by state, based on receipts for establishments with payroll and may not represent the actual receipts, by state.
3. Suppressed state data that was imputed based on national proportions may fail to reflect the actual distribution of the output, payroll and employment data.

CHAPTER 23

FEDERAL GOVERNMENT ENTERPRISES

MRIO Sector:

118: Federal Government Enterprises, Except Utilities and Local Transit

A Federal government activity is classified as an enterprise if the "operating costs are at least to a substantial extent covered by the sale of goods and services, in contrast to the general activities of government which are financed mainly by tax revenues and debt creation."¹ BEA has refined this definition to include activities wherein (1) at least 50 percent of costs are covered by sales of goods and services, (2) sales are equal to \$10 million or more, and (3) if there is any capital stock, most of the capital stock is held by a government corporation or agency. Within this definition, Federal government enterprises may be divided into four components:

1. U.S. Postal Service
2. Federal utilities
3. Commodity Credit Corporation
4. Other Federal government enterprises

Of these four components, the output of only two is included in MRIO Sector 118: the Postal Service and other Federal government enterprises. The outputs of Federal utilities are considered to be the same commodity produced by their private sector equivalent (MRIO Sector 094: Electric Utilities, Sector 095: Gas Production and Distribution or Sector 096: Water and Sanitary Services). It is therefore added to the commodity output of the corresponding private sector and not included in this sector. The Commodity Credit Corporation has inputs but no output and thus does not contribute to the output of Sector 118. In general, the output of Federal enterprises is measured by the value of revenues (if the enterprise is not subsidized) or the operating expenses (a surrogate for revenues plus subsidy) if the activity is subsidized.

¹ National Income, 1954 Edition, A Supplement to the Survey of Current Business.

On an SIC basis as shown in Exhibit 23-1, this MRIO sector includes all of SIC 4311, the U.S. Postal Service, part of SIC 613, the Commodity Credit Corporation, and numerous other Federal enterprises, as listed below:

- Alaska Railroad
- Panama Canal Company
- Metropolitan Washington Airports
- Military exchanges
- Federal restaurants
- Government Printing Office
- Federal Savings and Loan Insurance Corporation
- Federal Housing Administration Fund
- Home Loan Bank Board Revolving Fund
- Overseas Private Investment Corporation
- National Credit Union Administration
- Federal Deposit Insurance Corporation
- Pension Benefit Guaranty Corporation

Data Sources and Estimation

Quantifying the activities of Federal government enterprises required the use of a wide variety of data sources and a range of techniques to distribute these data on a per-state basis. This diversified approach was necessary because (1) most available data sources were collected on a fiscal rather than calendar basis and (2) few of the sources used offered data disaggregated on a state-by-state basis. The following data sources were used, as described below, to develop output and employment estimates for Federal government enterprises.

Source:

- 16902: Postmaster Accounts, Government Fiscal Year Revenue List 1977 (6/7/78)
(unpublished data)
- 16901: Distribution of Federal Payrolls Paid During CY 1977 in the United States by State of Residence December 31, 1977 (unpublished data from employees' payroll withholding tax forms (W-2's))

EXHIBIT 23-1

MRIO CONCORDANCE WITH 1977 SIC CODES

Sector 118: Federal Government Enterprises

<u>MRIO Sector</u>	<u>BEA I-O Code</u>	<u>1977 SIC</u>
118: Federal Government Enterprises, Except Utilities and Local Transit	780100 U. S. Postal Service	4311 U.S. Postal Service
	780300 Commodity Credit Corporation	pt. 613 (Commodity Credit Corp.)
	780400 Other Federal Government Enterprises	— Other Federal Entities Classified as Enterprises

- 16903: Outlays by Appropriation and Program for Community Services Administration (Federal Information Exchange System Printout 9/30/77)
- 01102: Budget of the U.S. Government, FY 77, Appendix.
- 15002: Treasury Bulletin
- 14302: Metropolitan Washington Airports Combined Statement of Revenue and Expense
- 04001: Army and Air Force Exchange Service Annual Report to the Secretaries
- 16701: Annual Report of the Panama Canal Company and Canal Zone Government, 1977
- 17001: Federal Civilian Work Force Statistics

The U.S. Postal Service

1977 Fiscal Year data, by state, for the U.S. Postal Service were available for receipts, employment, and payroll from sources 16902, 16901 and 16903, respectively. These data were unpublished. The control total used for output was BEA's "1977 Analysis Input-Output Control Total Worksheet" national total for the postal services. Receipts were not adjusted for supplemental appropriations. Control totals for employment and payrolls were from the Budget of the U.S. Government — Appendix, (Source 01102). These totals were developed by averaging fiscal years.

Other Federal Enterprises, National Totals

National output control totals for the other enterprises were developed following methods utilized on BEA's 1977 worksheet output controls for Federal enterprises. In most cases this meant 75 percent of fiscal year 1977 revenues and 25 percent of fiscal year 1978 revenues. Small adjustments were made to adjust revenue data such as the deduction of the cost of goods sold or income from interest. The data sources utilized included: Budget of the U.S. Government — Appendix, (Source 01102), The Treasury Bulletin (Source 15002), Metropolitan Washington Airports — Combined Statement of Revenues and Expense (Source 14302), Army and Airforce Exchange Service Annual Report to the Secretaries, (Source 04001), Panama Canal Company and Canal Zone Government Annual Report (Source 16701).

National employment and payroll control totals for all enterprises except Military exchanges were taken from The Budget of the U.S. Government — Appendix (Source

01102). As with output, these data were developed by averaging fiscal years. Employment and payrolls for military exchanges were developed from the Army and Air Force Exchange Service Annual Report to Report to the Secretaries (Source 04001) and scaled by output to reflect employment and payrolls in military exchanges outside the Army and Air Force.

State Distribution of Federal Enterprise Data

All data were developed first at the national level, and then disaggregated by state. Postal Service control totals were disaggregated using state-level series for fiscal year 1977. Lacking state output data for other Federal enterprises, output was distributed by employment and payroll by state based on available employment data. Output, employment and payroll for the second largest group of covered Federal enterprises, military exchanges, were disaggregated based on Department of Defense total civilian employment, by state. Alaska Railroad control totals were assigned to Alaska. All data for metropolitan Washington Airports were assigned to the Washington, D.C. metropolitan area based on employment. Output, employment and payroll of the Panama Canal Company within the U.S. was based in part on employment statistics for Panama Canal Company employment in the Washington, D.C. metropolitan area with the remainder disaggregated to states based on total Federal employment from Federal Civilian Workforce Statistics (Source 17001). Data on employment in the Washington, D.C. metropolitan area were also available for the Government Printing Office, the Federal Savings and Loan Insurance Corporation, the Home Loan Bank Board Revolving Fund, the overseas Private Investment Corporation, the National Credit Union Association, and the Federal Deposit Insurance Corporation. Output data for these establishments were divided among the District, Maryland and Virginia based on Federal employment in those areas. The remaining output was distributed to the other states based on total Federal employment (Source 17001). Output, employment and payroll for Federal Restaurants, the Pension Benefit Guaranty Corporation and the Commodity Credit Corporation (employment and payroll only) were also disaggregated based on total Federal employment by state.

Adjustments to Coverage and Redefinitions

The only redefinitions involved Federal utilities (principal electric utilities and small amounts for gas and water and sanitary operations), which were combined with the respective private utility sectors, and the Alaskan Railroad, which was included with the private railroad sector.

The output of federally-operated restaurants serving civilians will be treated as a secondary product and handled by the method described in MRIO Procedures No. 2, which essentially is to treat it as a by-product of Federal enterprises. Other output that might have been redefined include minor amounts of banking and other financial services, insurance, water transport, airport operations and retail sales in the Government Printing Office and military exchanges. No redefinitions were made for these minor items.

Data Limitations

Two data limitations in the estimation techniques described above should be noted:

1. State-level data for enterprises other than the postal service were developed through the use of proxy data, and may not represent actual the state patterns for these enterprises.
2. Control totals for each Federal government entity were based on an averaging of fiscal years and may not accurately measure the output, employment or payroll for these entities in calendar year 1977.

CHAPTER 24

STATE AND LOCAL GOVERNMENT ENTERPRISES

MRIO Sector:

119: State and Local Government Enterprises, Except Utilities and Local Transit

As shown in Exhibit 24-1, this MRIO sector includes government enterprises which are not included in a specific SIC grouping. Paralleling the definition of Federal government enterprises (see Chapter 23), this sector includes state and local activities that are financed mainly by the sale of goods and services in lieu of financing by tax revenues or debt creation.

Data Sources and Estimation

Output data for this sector were tabulated from the 1977 Census of Governments (Source 03110) and the 1978 Highway Statistics (Source 14401). For activities included in the Census of Governments the larger of revenues or expenditures was recorded. These activities include airports, parking facilities, water transportation and terminals, housing and urban renewal and liquor stores. Receipts for road, bridge and ferry tolls were drawn from Highway Statistics. Output is calculated as a simple sum of these activities. State and local utilities are included in their respective utility sectors (094, 095, and 096), and thus are not included in this tabulation. No data were available on miscellaneous state and local enterprises such as city markets and thus these activities were not included in government enterprises.

Adjustments to Coverage and Redefinitions

Following the preliminary estimation of output for this sector, redefinitions were estimated to adjust the total sector controls. Following BEA's methodology, Sector 100: Food, Drug and Liquor stores will be augmented by reclassifications from state and local government enterprises in the amount of \$2,554.3 million. State-level data on the reclassified amount were available from the 1977 Census of Governments (Source 03110).

EXHIBIT 24-1

MRIO CONCORDANCE WITH 1977 SIC CODES

Sectors 119: State and Local Government Enterprises, Except
Utilities and Local Transit

<u>MRIO Sector</u>		<u>BEA I-O Code</u>	<u>1977 SIC</u>
119: State and Local Government Enterprises, Except Utilities and Local Transit	790300	Other State and Local Government Enterprises	State and local government classified as government enterprises but not included within any SIC

Employment and payrolls were also tabulated from the 1977 Census of Governments. Data were available for airports, water transportation and terminals, housing and urban revenue and liquor stores. No data were available for employment in parking facilities or toll collection. State payroll and employment data were given for the month of October and were scaled to provide a 1977 total.

Data Limitations

Several data limitations should be noted based on the estimations described above. These include:

1. Revenues, employment and payrolls were unavailable for several state and local governments activities and thus these quantities do not reflect the revenues, employment and payrolls for all state and local government enterprises.
2. Yearly payrolls were based on payrolls for the month of October and thus may not reflect actual payrolls.

Concordance of MRIO, BEA I-O and SIC Codes

April, 1982

MRIO Code	Sector Name	1977 BEA I-O Code	Sector Name	1977 SIC
<u>Agriculture, forestry and fisheries</u>				
001	Dairy farm products	10100	Dairy farm products -----	0241, pt. 0191, pt. 0259, pt. 0291
002	Livestock and poultry	10200	Poultry and eggs -----	025 (excl. pt. 0259), pt. 0191, pt. 0219, pt. 0291
		10301	Meat animals -----	021 (excl. pt. 0219), pt. 0191, pt. 0259, pt. 0291
		10302	Miscellaneous livestock -	027 pt. 0191, pt. 0219, pt. 0259, pt. 0291
003	Cotton, grain and tobacco	20100	Cotton -----	0131, pt. 0191, pt. 0219, pt. 0259, pt. 0291
		20201	Food grains -----	pt. 011, pt. 0191, pt. 0219, pt. 0259, pt. 0291
		20202	Feed grains -----	pt. 011, pt. 0139, pt. 0191, pt. 0219, pt. 0259, pt. 0291
		20203	Grass seeds -----	pt. 0139, pt. 0191, pt. 0219, pt. 0259, pt. 0291
		20300	Tobacco -----	0132, pt. 0191, pt. 0219, pt. 0259, pt. 0291
004	Fruits, nuts, vegetables, and misc. crops and services	20401	Fruits -----	pt. 017, pt. 0191, pt. 0219, pt. 0259, pt. 0291
		20402	Tree nuts -----	0173, pt. 0179, pt. 0191, pt. 0219, pt. 0259, pt. 0291

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MRIO Code	Sector Name	1977 BEA I-O Code	Sector Name	1977 SIC
<u>Agriculture, cont'd</u>				
004	Fruits, nuts, vegetables, and misc. crops and services	20501	Vegetables -----	0134, 0161, pt. 0119, pt. 0139, pt. 0191, pt. 0219, pt. 0259, pt. 0291
		20502	Sugar crops -----	0133, pt. 0191, pt. 0219, pt. 0259, pt. 0291
		20503	Miscellaneous crops -----	pt. 0119, pt. 0139, pt. 0191, pt. 0219, pt. 0259, pt. 0291
		20600	Oil bearing crops -----	0116, pt. 0119, pt. 013, pt. 0173, pt. 0219, pt. 0259, pt. 0291
		20701	Forest products -----	pt. 018, pt. 0191, pt. 0219, pt. 0259, pt. 0291
005	Forestry products			pt. 018, pt. 0191, pt. 0219, pt. 0259, pt. 0291, 07* (excl. 074)
006	Commercial fishing and trapping			08
				00
<u>Mining</u>				
007	Iron and ferroalloy ores	50000	Iron and ferroalloy ores mining -----	101, 106
008	Nonferrous ores	60100	Copper ore mining -----	102
		60200	Nonferrous metal ores mining, except copper	103-5, pt. 108, 109
009	Coal	70000	Coal mining -----	1111, pt. 1112, 1211, pt. 1213

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Concordance of MRIO, BEA I-O and SIC Codes

MRIO Code	Sector Name	1977 BEA I-O Code	Sector Name	1977 SIC
<u>Mining cont'd</u>				
010	Crude petroleum			pt. 131, pt. 132, pt. 138
011	Natural gas and liquids			pt. 131, pt. 132, pt. 138
012	Stone, clay, sand and gravel	90001	Dimension, crushed and broken stone mining and quarrying -----	141-2
		90002	Sand and gravel mining --	144
		90003	Clay, ceramic, and refractory minerals mining -----	145
		90004	Nonmetallic mineral services and miscellaneous minerals mining and quarrying -----	pt. 148, 149
013	Chemical and fertilizer minerals	100000	Chemical and fertilizer mineral mining -----	147
<u>Construction</u>				
014	Residential building construction	110101	New residential 1-unit structures, nonfarm ---	pt. 15, pt. 17
		110102	New residential 2-4 unit structures, nonfarm ---	pt. 15-17
		110103	New residential garden apartments. -----	pt. 15-17
		110104	New residential high-rise apartments -----	pt. 15-17
		110105	New residential additions and alterations, nonfarm -----	pt. 15-17

(cont'd)

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Concordance of MRIO, BEA I-O and SIC Codes

MRIO Code	Sector Name	1977 BEA I-O Code	Sector Name	1977 SIC
<u>Construction cont'd</u>				
015	Nonresidential building construction	110106	New hotels and motels ---	pt. 15-17
		110107	New dormitories and other group housing ---	pt. 15-17
		110201	New industrial buildings-	pt. 15-17
		110202	New office buildings ----	pt. 15-17
		110203	New warehouses -----	pt. 15-17
		110204	New garages and service stations -----	pt. 15-17
		110205	New stores and restaurants -----	pt. 15-17
		110206	New religious buildings-	pt. 15-17
		110207	New educational buildings -----	pt. 15-17
		110231	New hospitals -----	pt. 15-17
		110232	New residential institutions and other health facilities ---	pt. 15-17
		110241	New amusement and recreation buildings -	pt. 15-17
		110250	Other nonfarm buildings -----	pt. 15-17
		016	Public utility construction	110301
110302	New railroads -----			pt. 16-17
110303	New electric utility facilities -----			pt. 16-17
110304	New gas utility facilities -----			pt. 16-17
110305	New petroleum pipelines-			pt. 16-17
110306	New water supply facilities -----			pt. 16-17
110307	New sewer system facilities -----			pt. 16-17
110308	New local transit facilities -----			pt. 16-17

(cont'd)

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Concordance of MRIO, BEA I-O and SIC Codes

MRIO Code	Sector Name	1977 BEA I-O Code	Sector Name	1977 SIC
<u>Construction cont'd</u>				
017	Highways and Streets	110400	New highways and streets -----	pt. 16-17
018	Other Construction	110501	New farm housing units and additions and alterations -----	pt. 15, pt. 17
		110502	New farm service facilities -----	pt. 15, pt. 17
		110601	New petroleum and natural gas well drilling -----	pt. 130
		110602	New petroleum, natural gas, and solid mineral exploration ---	pt. 100, pt. 1112, pt. 1213, pt. 130, pt. 148
		110603	New access structures for solid mineral development -----	pt. 100, pt. 1112, pt. 1213, pt. 148
		110701	New military facilities -	pt. 15-17
		110702	New dams and reservoirs -	pt. 15-17
		110703	Other new conservation and development facilities -----	pt. 16-17
		110704	Other new nonbuilding facilities -----	pt. 15-17
019	Maintenance construction	120100	Maintenance and repair, residential -----	pt. 15, pt. 17
		120201	Maintenance and repair of other nonfarm buildings -----	pt. 15-17
		120202	Maintenance and repair of farm residential buildings -----	pt. 15, pt. 17

(cont'd)

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Revised 10/1/77
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Concordance of MRIO, BEA I-O and SIC Codes

MRIO Code	Sector Name	1977 BEA I-O Code	Sector Name	1977 SIC
	<u>Construction cont'd</u>			
010	Maintenance construction	120203	Maintenance and repair of farm service facilities -----	pt. 15, pt. 17
		120204	Maintenance and repair of telephone and telegraph facilities -----	pt. 16-17
		120205	Maintenance and repair of railroads -----	pt. 16-17
		120206	Maintenance and repair of electric utility facilities -----	pt. 16-17
		120207	Maintenance and repair of gas utility facilities -----	pt. 16-17
		120208	Maintenance and repair of petroleum pipelines-----	pt. 16-17
		120209	Maintenance and repair of water supply facilities -----	pt. 16-17
		120210	Maintenance and repair of sewer facilities -----	pt. 16-17
		120211	Maintenance and repair of local transit facilities -----	pt. 16-17
		120212	Maintenance and repair of military facilities -----	pt. 15-17
		120213	Maintenance and repair of conservation and development facilities -----	pt. 15-17
		120214	Maintenance and repair of highways and streets -----	pt. 16-17

(cont'd)

Concordance of MRIO, BEA I-O and SIC Codes

MRIO Code	Sector Name	1977 BEA I-O Code	Sector Name	1977 SIC
<u>Construction cont'd</u>				
019	Maintenance construction	120215	Maintenance and repair of petroleum and natural gas wells ----	pt. 130
		120216	Maintenance and repair of other nonbuilding facilities -----	pt. 15-17
<u>Manufacturing</u>				
020	Ordnance	130200	Ammunition, except for small arms, n.e.c. --	3483
		130300	Tanks and tank components -----	3795
		130500	Small arms -----	3484
		130600	Small arms ammunition -	3482
		130700	Other ordnance and accessories -----	3489
021	Meat products	140101	Meat packing plants ----	2011
		140102	Sausages and other prepared meats -----	2013
		140103	Poultry dressing plants-	2016
		140104	Poultry and egg processing -----	2017
022	Dairy products	140200	Creamery butter -----	2021
		140300	Cheese, natural and processed -----	2022
		140400	Condensed and evaporated milk -----	2023
		140500	Ice cream and frozen desserts -----	2024
		140600	Fluid milk -----	2026

(cont'd)

Concordance of MRIO, BEA I-O and SIC Codes

MRIO Code	Sector Name	1977 BEA I-O Code	Sector Name	1977 SIC		
<u>Manufacturing cont'd</u>						
023	Canned and frozen foods	140700	Canned and cured sea foods -----	2091		
		140800	Canned specialties -----	2032		
		140900	Canned fruits and vegetables -----	2033		
		141000	Dehydrated food products -----	2034		
		141100	Pickles, sauces, and salad dressings -----	2035		
		141200	Fresh or frozen packaged fish -----	2092		
		141301	Frozen fruits, fruit juices and vegetables -----	2037		
		141302	Frozen specialties -----	2038		
		024	Grain mill products	141401	Flour and other grain mill products -----	2041
				141402	Cereal breakfast foods -	2043
				141403	Blended and prepared flour -----	2045
				141503	Dog, cat, and other pet food -----	2047
				141502	Prepared feeds, R.R.C. -	2048 ^a
				141600	Rice milling -----	2044
141700	Wet corn milling -----			2046		
025	Bakery products	141801	Bread, cake, and related products -----	2051		
		141802	Cookies and crackers ----	2052		
026	Sugar and confectionery products	141900	Sugar -----	2061-3		
		142001	Confectionery products --	2065		
		142002	Chocolate and cocoa products -----	2066		
		142003	Chewing gum -----	2067		

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Concordance of MRAU, BEA I-O and SIC Codes

MRAU Code	Sector Name	1977 BEA		1977 SIC
		I-O Code	Sector Name	
	<u>Manufacturing cont'd</u>			
027	Beverages, extracts, and sirups	142101	Malt beverages -----	2082
		142102	Malt -----	2083
		142103	Wines, brandy, and brandy spirits -----	2084
		142104	Distilled liquor, except brandy -----	2085
		142200	Bottled and canned soft drinks -----	2086
		142300	Flavoring extracts and sirups, n.e.c. -----	2087
		028	Other food products	142400
142500	Soybean oil mills -----			2075
142600	Vegetable oil mills, n.e.c. -----			2076
142700	Animal and marine fats and oils -----			2077
142800	Roasted coffee -----			2095
142900	Shortening and cooking oils -----			2079
143000	Manufactured ice -----			2097
143100	Macaroni and spaghetti ---			2098
143200	Food preparations, n.e.c. -			2099
029	Tobacco products			150101
		150102	Cigars -----	212
		150103	Chewing and smoking tobacco -----	213
		150200	Tobacco stemming and redrying -----	214
030	Fabric, yarn and thread mills	160100	Broadwoven fabric mills and fabric finishing plants -----	221-3, 2261-2
		160200	Narrow fabric mills ----	224

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Concordance of MRIO, BEA I-O and SIC Codes

MRIO Code	Sector Name	1977 BEA		1977
		I-O Code	Sector Name	SIC
	<u>Manufacturing cont'd</u>			
830	Fabric, yarn and thread mills	160300	Yarn mills and finishing of textiles, n.e.c. -----	2269, 2281-3 ^a
		160400	Thread mills -----	2284
831	Floor coverings and misc. textile products	170100	Floor coverings -----	227
		170200	Felt goods, n.e.c. -----	2291
		170300	Lace goods -----	2292
		170400	Padding and upholstery filling -----	2293
		170500	Processed textile waste -----	2294
		170600	Coated fabrics, not rubberized -----	2295
		170700	Tire cord and fabric --	2296
		170900	Cordage and twine -----	2298
		171001	Nonwoven fabrics -----	2297
		171002	Textile goods, n.e.c. --	2299
832	Hosiery and knit goods	180101	Women's hosiery, except socks -----	2251
		180102	Hosiery, n.e.c. -----	2252
		180300	Knit fabric mills -----	2257-8
833	Apparel	180400	Apparel made from purchased materials --	231-8 ^a , 3999 ^b
		180201	Knit outerwear mills --	2253
		180202	Knit underwear mills --	2254
834	Other fabricated textile products	190203	Knitting mills, n.e.c. -	2259
		190100	Curtains and draperies -	2391
		190200	Housefurnishings, n.e.c. -----	2392 ^a
		190301	Textile bags -----	2393
		190302	Canvas and related products -----	2394

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Concordance of MRIO, BEA I-O and SIC Codes

MRIO Code	Sector Name	1977 BEA		1977 SIC
		I-O Code	Sector Name	
	Manufacturing cont'd			
634	Other fabricated textile products	190303	Pleating and stitching -	2395
		190304	Automotive and apparel trimmings -----	2396
		190305	Schiffli machine embroideries -----	2397
		190306	Fabricated textile products, n.e.c. -----	2399
635	Logging and lumber	200100	Logging camps and logging contractors -----	2411
		200200	Sawmills and planing mills, general -----	2421
		200300	Hardwood dimension and flooring mills -----	2426
		200400	Special product sawmills, n.e.c. -----	2429
636	Wood products	200501	Millwork -----	2431
		200502	Wood kitchen cabinets -----	2434
		200600	Veneer and plywood -----	2435-6
		200701	Structural wood members, n.e.c. -----	2439
		200800	Wood preserving -----	2491
		200901	Wood pallets and skids -----	2448
		200902	Particleboard -----	2492*
		200903	Wood products, n.e.c. -----	2499
		210000	Wood containers -----	2441, 2449
		637	Pre-fabricated buildings and mobile homes	200702
610602	Mobile homes -----			2451
638	Household furniture	220101	Wood household furniture -----	2511
		220102	Household furniture, n.e.c. -----	2519
		220103	Wood TV and radio cabinets -----	2517

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Concordance of MRIO, BEA I-O and SIC Codes

MRIO Code	Sector Name	1977 BEA		1977 SIC		
		I-O Code	Sector Name			
	<u>Manufacturing cont'd</u>					
038	Household furniture	220200	Upholstered household furniture -----	2512		
		220300	Metal household furniture -----	2514		
		220400	Mattresses and bedsprings -----	2515		
039	Other furniture and fixtures	230100	Wood office furniture -----	2521		
		230200	Metal office furniture -----	2522		
		230300	Public building furniture -----	2531*		
		230400	Wood partitions and fixtures -----	2541*		
		230500	Metal partitions and fixtures -----	2542		
		230600	Drapery hardware and blinds and shades -----	2591		
		230700	Furniture and fixtures, n.e.c. -----	2599		
		040	Paper and allied products	240100	Pulp mills -----	261*
				240200	Paper mills, except building paper -----	262
				240300	Paperboard mills -----	263
240400	Envelopes -----			2642		
240500	Sanitary paper products -----			2647		
240602	Building paper and board mills -----			266*		
240701	Paper coating and glazing -----			2641		
240702	Bags, except textile -----			2643		
240703	Die-cut paper and board -----			2645		
240704	Pressed and molded pulp goods -----			2646		
240705	Stationery products -----			2648		
240706	Converted paper products, n.e.c. -----			2649*		
041	Paperboard containers and boxes			250000	Paperboard containers and boxes -----	265

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Concordance of MRIO, BEA I-O and SIC Codes

MRIO Code	Sector Name	1977 BEA		1977 SIC
		I-O Code	Sector Name	
	<u>Manufacturing cont'd</u>			
043	Newspapers, periodicals and other printing and publishing	260100	Newspapers -----	271
		260200	Periodicals -----	272
		260301	Book publishing -----	2731
		260302	Book printing -----	2732
		260400	Miscellaneous publishing -----	274*
		260501	Commercial printing -----	2751-2, 2754
		260502	Lithographic plate-making and services --	2795
		260601	Manifold business forms --	276
		260602	Blankbooks and loose-leaf binders -----	2782
		260700	Greeting card publishing	277
		260801	Engraving and plate printing -----	2753
		260802	Bookbinding and related work -----	2789
		260803	Typesetting -----	2791
		260804	Photoengraving -----	2793
		260805	Electrotyping and stereotyping -----	2794
		270100	Industrial inorganic and organic chemicals ----	281* (excl. 28195), 2865, 2869*
		044	Agricultural chemicals	270201
270202	Fertilizers, mixing only			2875
270300	Agricultural chemicals, R.E.C. -----			2879
045	Other chemical products	270401	Gum and wood chemicals	2861
		270402	Adhesives and sealants	2891
		270403	Explosives -----	2892

Concordance of MRIO, BEA I-O and SIC Codes

MRIO Code	Sector Name	1977 BEA I-O Code	Sector Name	1977 SIC
<u>Manufacturing cont'd</u>				
045	Other chemical products	270404	Printing ink -----	2893
		270405	Carbon black -----	2895
		270406	Chemical preparations, n.e.c. -----	2899
048	Plastics and synthetics	280100	Plastics materials and resins -----	2821
		280200	Synthetic rubber -----	2822*
		280300	Cellulosic man-made fibers -----	2823*
		280400	Organic fibers, non-cellulosic -----	2824*
047	Drugs	290100	Drugs -----	283*
048	Cosmetics and cleaning products	290201	Soap and other detergents-----	2841
		290202	Polishes and sanitation goods -----	2842
		290203	Surface active agents -----	2843
		290300	Toilet preparations -----	2844
049	Paint and allied products	300000	Paints and allied products -----	285
050	Petroleum refining and allied products	310101	Petroleum refining ----	291
		310102	Lubricating oils and greases -----	292
		310103	Products of petroleum and coal, n.e.c. ----	2999
		310200	Paving mixtures and blocks -----	2951
		310300	Asphalt felts and coatings -----	2952
051	Rubber and misc. plastics	320100	Tires and inner tubes -	301
		320200	Rubber and plastics footwear -----	302

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Concordance of MRIO, BEA I-O and SIC Codes

MRIO Code	Sector Name	1977 BEA I-O Code	Sector Name	1977 SIC
<u>Manufacturing, cont'd</u>				
051	Rubber and miscellaneous plastics	320301	Reclaimed rubber -----	303
		320302	Fabricated rubber products, n.e.c. ----	306*
		320400	Miscellaneous plastics products -----	307
		320500	Rubber and plastics hose and belting ----	304
052	Leather and leather products	330001	Leather tanning and finishing -----	311
		340100	Boot and shoe cut stock and findings --	313
		340201	Shoes, except rubber --	3143-9
		340202	House slippers -----	3142
		340301	Leather gloves and mittens -----	315
		340302	Luggage -----	316
		340303	Women's handbags and purses -----	3171
		340304	Personal leather goods-	3172
		340305	Leather goods, n.e.c. -	319
053	Glass and glass products	350100	Glass and glass products, except containers -----	321, 3229, 323
		350200	Glass containers -----	3221
054	Stone and clay products	360100	Cement, hydraulic -----	324
		360200	Brick and structural clay tile -----	3251
		360300	Ceramic wall and floor tile -----	3253
		360400	Clay refractories -----	3255
		360500	Structural clay products, n.e.c. -----	3299

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Concordance of MRIO, BEA I-O and SIC Codes

MRIO Code	Sector Name	1977 BEA		1977 SIC
		I-O Code	Sector Name	
	<u>Manufacturing, cont'd</u>			
054	Stone and clay products	360600	Vitreous plumbing fixtures -----	3261
		360701	Vitreous china food utensils -----	3262
		360702	Fine earthenware food utensils -----	3263
		360800	Porcelain electrical supplies -----	3264
		360900	Pottery products, n.e.c. -	3269
		360100	Concrete block and brick -	3271
		361100	Concrete products, n.e.c. -	3272
		361200	Ready-mixed concrete -----	3273
		361300	Lime -----	3274
		361400	Gypsum products -----	3275
		361500	Cutstone and stone products -----	328
		361600	Abrasive products -----	3291
		361700	Asbestos products -----	3292
		361800	Gaskets, packing and sealing devices -----	3293
		361900	Minerals, ground or treated -----	3295 ^a
		362000	Mineral wool -----	3296
		362100	Nonclay refractories -----	3297
		362200	Nonmetallic mineral products, n.e.c. -----	3299
		370101	Blast furnaces and steel mills -----	3312
		370102	Electrometallurgical products -----	3313 ^a
		370104	Cold finishing of steel shapes -----	3316
		370105	Steel pipe and tubes --	3317

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Concordance of MRIO, BEA I-O and SIC Codes

MRIO Code	Sector Name	1977 BEA		1977 SIC
		I-O Code	Sector Name	
	Manufacturing, cont'd			
055	Iron and steel mills and forging	370300	Iron and steel forgings -----	3462*
		370401	Metal heat treating ---	3398
		370402	Primary metal products, n.e.c. -----	3399
056	Iron and steel foundries	370200	Iron and steel foundries -----	332
057	Primary nonferrous metals and products	380100	Primary copper -----	3331
		380200	Primary lead -----	3332
		380300	Primary zinc -----	3333
		380400	Primary aluminum -----	3334, 28195
		380500	Primary nonferrous metals, n.e.c. -----	3339
		380600	Secondary nonferrous metals -----	334
		380700	Copper rolling and drawing -----	3351
		380800	Aluminum rolling and drawing -----	3353-8
		380900	Nonferrous rolling and drawing, n.e.c. -----	3356
		381000	Nonferrous wire drawing and insulating -----	3357
		381100	Aluminum castings -----	3361
		381200	Brass, bronze, and copper castings -----	3362
		381300	Nonferrous castings, n.e.c. -----	3369
		381400	Nonferrous forgings ---	3463*
		058	Metal containers and misc. metal products	370103
390100	Metal cans -----			3411
390200	Metal barrels, drums, and pails -----			3419

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Concordance of MRIO, BEA I-O and SIC Codes

MRIO Code	Sector Name	1977 BEA		1977		
		I-O Code	Sector Name	SIC		
	Manufacturing, cont'd					
058	Metal containers and misc. metal products	420100	Cutlery -----	3421		
		420201	Hand and edge tools, n.e.c. -----	3423		
		420202	Hand saws and saw blades -	3425		
		420300	Hardware, n.e.c. -----	3429		
		420401	Plating and polishing ----	3471		
		420402	Metal coating and allied services -----	3479		
		420500	Miscellaneous fabricated wire products -----	3495-6		
		420700	Steel springs, except wire -----	3493		
		420800	Pipe, valves, and pipe fittings -----	3494, 3498		
		421000	Metal foil and leaf ----	3497		
		421100	Fabricated metal products, n.e.c. -----	3499		
		058	Structural metal products	400100	Metal sanitary ware -----	3431
				400200	Plumbing fixture fittings and trim -----	3432
				400300	Heating equipment, except electric -----	3433
				400400	Fabricated structural metal -----	3441
400500	Metal doors, sash, and trim -----			3442		
400600	Fabricated plate work (boiler shops) -----			3443		
400700	Sheet metal work -----			3444		
400800	Architectural metal work -			3446		
400901	Prefabricated metal buildings -----			3448		
400902	Miscellaneous metal work -			3449		

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Concordance of MRIO, BEA I-O and SIC Codes

MRIO Code	Sector Name	1977 BEA		1977 SIC
		I-O Code	Sector Name	
	<u>Manufacturing, cont'd</u>			
000	Screw machine products and metal stampings	410100	Screw machine products and bolts, nuts, rivets and washers -----	345
		410201	Automotive stampings -----	3465
		410202	Crowns and closures -----	3466
		410203	Metal stampings, n.e.c. -----	3469*
001	Engines and turbines	430100	Turbines and turbine generator sets -----	3511
		430200	Internal combustion engines, n.e.c. -----	3519
002	Farm and lawn equipment	440001	Farm machinery and equipment -----	3523*
		440002	Lawn and garden equipment -----	3524
003	Construction and mining equipment	450100	Construction machinery and equipment -----	3531*
		450200	Mining machinery, except oil field -----	3532
		450300	Oil field machinery -----	3533
004	Materials handling equipment	460100	Elevators and moving stairways -----	3534
		460200	Conveyors and conveying equipment -----	3535
		460300	Hoists, cranes, and monorails -----	3536*
		460400	Industrial trucks and tractors -----	3537*
005	Metalworking equipment	470100	Machine tools, metal cutting types -----	3541
		470200	Machine tools, metal forming types -----	3542

(cont'd)

CONVERSION OF MRIO, PER TO SIC CODES

MRIO Code	Sector Name	1977 BEA I-O Code	Sector Name	1977 SIC
<u>Manufacturing, cont'd</u>				
065	Metalworking equipment	470300	Special dies and tools and machine tool accessories -----	3544-8*
		470401	Power driven hand tools-----	3546
		470402	Rolling mill machinery -	3547
		470403	Metalworking machinery, n.e.c. -----	3549
066	Special industry machinery and equipment	480100	Food products machinery -	3551
		480200	Textile machinery -----	3552
		480300	Woodworking machinery ---	3553
		480400	Paper industries machinery -----	3554
		480500	Printing trades machinery -----	3555
		480600	Special industry machinery, n.e.c. -----	3559*
067	General industrial and other non-electrical machinery and equipment	490100	Pumps and compressors ---	3561, 3563
		490200	Ball and roller bearings-----	3562
		490300	Blowers and fans -----	3564*
		490400	Industrial patterns -----	3565
		490500	Power transmission equipment -----	3566*, 3568*
		490600	Industrial furnaces and ovens -----	3567
		490700	General industrial machinery, n.e.c. -----	3569
		500001	Carburetors, pistons, rings, valves -----	3592
		500002	Machinery, except electrical, n.e.c. ---	3599
068	Office and computing equipment	510101	Electronic computing equipment -----	3573
		510102	Calculating and accounting machines -----	3574

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Concordance of MRIO, BEA I-O and SIC Codes

MRIO Code	Sector Name	1977 BEA		1977 SIC
		I-O Code	Sector Name	
	<u>Manufacturing, cont'd</u>			
008	Office and computing equipment	510200	Typewriters -----	3572
		510300	Scales and balances ---	3576
		510400	Office machines, n.e.c.	3579
069	Service industry machinery and equipment	520100	Automatic merchandising machines -----	3581
		520200	Commercial laundry equipment -----	3582
		520300	Refrigeration and heating equipment -----	3585
		520400	Measuring and dispensing pumps -----	3586
		520500	Service industry machines, n.e.c. ---	3589*
070	Electric transmission and electrical industrial equipment	530100	Instruments to measure electricity -	3625
		530200	Transformers -----	3612
		530300	Switchgear and switchboard apparatus ---	3613
		530400	Motors and generators -	3621
		530500	Industrial controls ---	3622
		530600	Welding apparatus, electric -----	3623
		530700	Carbon and graphite products -----	3624
		530800	Electrical industrial apparatus, n.e.c. ---	3629
071	Household appliances	540100	Household cooking equipment -----	3631*
		540200	Household refrigerators and freezers ---	3632
		540300	Household laundry equipment -----	3633

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Concordance of MRO, BEA I-O and SIC Codes

MRO Code	Sector Name	1977 BEA I-O Code	Sector Name	1977 SIC
<u>Manufacturing, Cont'd</u>				
071	Household appliances	540400	Electric housewares and fans -----	3634*
		540500	Household vacuum cleaners -----	3635
		540600	Sewing machines -----	3636
		540700	Household appliances, n.e.c. -----	3639
072	Electric lighting and wiring equipment	550100	Electric lamps -----	3641
		550200	Lighting fixtures and equipment -----	3645-8
		550300	Wiring devices -----	3643-4
073	Receiving sets, records and tapes	560100	Radio and TV receiving sets -----	3651
		560200	Phonograph records and tapes -----	3652
074	Communications equipment	560300	Telephone and telegraph apparatus -----	3661
		560400	Radio and TV communication equipment --	3662
075	Electronic components	570100	Electron tubes -----	3671-3
		570200	Semiconductors and related devices -----	3674
		570300	Electronic components, n.e.c. -----	3675-9
076	Other electrical equipment	580100	Storage batteries -----	3691
		580200	Primary batteries, dry and wet -----	3692
		580300	X-ray apparatus and tubes -----	3693
		580400	Engine electrical equipment -----	3694
		580500	Electrical equipment and supplies, n.e.c. -----	3699*

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Concordance of MRIO, BEA I-O and SIC Codes

MRIO Code	Sector Name	1977 BEA I-O Code	Sector Name	1977 SIC
<u>Manufacturing, Cont'd</u>				
977	Motor vehicles and parts	590100	Truck and bus bodies -----	3713 ^a
		590200	Truck trailers -----	3715
		590301	Motor vehicles and car bodies -----	3711
		590302	Motor vehicle parts and accessories -----	3714
978	Aircraft and parts			3721, 3728
979	Missiles, spacecraft and parts			3761, 3769
980	Aircraft, missile and spacecraft propulsion units			3724, 3764
981	Other transportation equipment	610100	Ship building and repairing -----	3731
		610200	Boat building and repairing -----	3732
		610300	Railroad equipment -----	374
		610500	Motorcycles, bicycles, and parts -----	375
		610601	Travel trailers and campers -----	3792 ^a
		610603	Motor homes (made from purchased materials)-	3716
		610700	Transportation equipment, n.e.c. -----	3799
982	Scientific and photographic equipment, watches and clocks -	620100	Engineering and scientific instruments -----	3811
		620200	Mechanical measuring devices -----	3823-4, 3829

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Concordance of MRIO, BEA I-O and SIC Codes

MRIO Code	Sector Name	1977 BEA I-O Code	Sector Name	1977 SIC
	<u>Manufacturing, Cont'd</u>			
002	Scientific and photographic equipment, watches and clocks	620300	Environmental controls-	3822
		620700	Watches, clocks, and parts -----	387
		630300	Photographic equipment and supplies -----	386
003	Medical, Dental and Optical equipment	620400	Surgical and medical instruments -----	3841
		620500	Surgical appliances and supplies -----	3842
		620600	Dental equipment and supplies -----	3843
		630100	Optical instruments and lenses -----	383
		630200	Ophthalmic goods -----	385
004	Other manufactured products	640101	Jewelry, precious metal -----	3911
		640102	Jewelers' materials and lapidary work ---	3915
		640104	Silverware and plated ware -----	3914
		640105	Costume jewelry -----	3961
		640200	Musical instruments ---	393
		640301	Games, toys, and children's vehicles -	3944
		640302	Dolls -----	3942
		640400	Sporting and athletic goods, n.e.c. -----	3949
		640501	Pens and mechanical pencils -----	3951
		640502	Lead pencils and art goods -----	3952
		640503	Marking devices -----	3953
		640504	Carbon paper and inked ribbons -----	3955
			(cont'd)	

Concordance of MRIO, BEA I-O and SIC Codes

MRIO Code	Sector Name	1977 BEA I-O Code	Sector Name	1977 SIC
<u>Manufacturing, Cont'd</u>				
004	Other manufactured products	640600	Artificial trees and flowers -----	3962
		640701	Buttons -----	3963
		640702	Needles, pins, and fasteners -----	3964
		640800	Brooms and brushes -----	3991
		640900	Hard surface floor coverings -----	3996
		641000	Burial caskets and vaults -----	3995
		641100	Signs and advertising displays -----	3993
		641200	Manufacturing industries, n.e.c. -----	3999 (encl. 3999C)
<u>Transportation</u>				
005	Railroads	650100	Railroads and related services -----	40*, 474, pt. 4789
006	Local passenger transportation and inter-city bus	650200	Local and suburban transit and interurban highways passenger transportation -----	41
		790100	Local government passenger transit ---	pt. 41
007	Motor freight	650300	Motor freight transportation and warehousing -	42*, pt. 4789
008	Water transportation	650400	Water transportation -----	44
009	Air transportation	650500	Air transportation -----	45
010	Pipelines, except natural gas	650600	Pipe lines, except natural gas -----	46
011	Transportation services	650701	Freight forwarders and other transportation services -----	471, 4723, pt. 478
		650702	Arrangement of passenger transportation -----	4722

Concordance of MRIO, BEA I-O and SIC Codes

MRIO Code	Sector Name	1977 BEA I-O Code	Sector Name	1977 SIC
<u>Communications</u>				
092	Communications, except radio and TV	660000	Communications, except radio and TV -----	48 (excl. 483)
093	Radio and TV broadcasting	670000	Radio and TV broadcasting -----	483
<u>Electric, gas, and sanitary services</u>				
094	Electric utilities (private and public)	680100	Electric services (utilities) -----	pt. 491, pt. 493
		780200	Federal electric utilities -----	pt. 491
		790200	State and local electric utilities	pt. 491
095	Gas transmission and distribution (private and public)	680200	Gas production and distribution (utilities) -----	492*, pt. 493
			(Includes pt. 790300 Other state and local government enterprises)	
096	Water and sanitary services (private and public)	680301	Water supply and sewerage systems -----	494, 4952
		680302	Sanitary services, steam supply, and irrigation systems ---	495 (excl. 4952), 496-7, pt. 493
			(Includes pt. 790300 Other state and local government enterprises)	
<u>Trade and services</u>				
097	Wholesale trade	690100	Wholesale trade -----	50*, 51* (excl. manufacturers' sales offices)

(cont'd)

Concordance of MRIO, BEA I-O and SIC Codes

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MRIO Code	Sector Name	I-O Code	Sector Name	1977 SIC
<u>Trade and services, cont'd</u>				
090	Eating and drinking places	740000	Eating and drinking places -----	58, pt. 70
099	General merchandise and apparel stores	}	690200 Retail trade (MRIO code 100 also includes liquor stores, pt. BEA code 790300, Other state and local government enterprises)	52, 54
100	Food, drug and liquor stores (includes state and local government liquor stores)			54, 591, 592
101	Automotive dealers and gasoline service stations			58
102	Other retail stores			52, 57, 592-599, 7390
103	Banking, credit agencies and investment brokers	700100	Banking -----	60
		700200	Credit agencies -----	61* (encl. pt. 613), 67*
		700300	Security and commodity brokers -----	62


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(cont'd)

Concordance of MRIO, BEA I-O and SIC Codes

MRIO Code	Sector Name	1977 BEA I-O Code	Sector Name	1977 SIC
	<u>Trade and services, cont'd</u>			
104	Insurance	700400	Insurance carriers -----	63 ⁰
		700500	Insurance agents, brokers, and services ---	64 ⁰
105	Real estate and rental	710100	Owner-occupied dwellings	not applicable
		710200	Real estate -----	65-6 ⁰ , pt. 1531
106	Hotels and lodging places	720100	Hotels and lodging places -----	70 ⁰ (excl. dining)
107	Personal and repair services, except auto	720201	Laundry, cleaning, garment services and shoe repair -----	721, 725
		720202	Funeral service and crematories -----	726
		720203	Portrait, photographic studios, and miscellaneous personal services -----	722, 72 ⁰⁰
		720204	Electrical repair shops =	762
		720205	Watch, clock, jewelry and furniture repair =	763-4
		720300	Beauty and barber shops =	723-4 ⁰
108	Misc. services and advertising	730101	Miscellaneous repair shops -----	769
		730102	Services to dwellings and other buildings =	734

(cont'd)

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Concordance of MRIO, BEA I-O and SIC Codes

MRIO Code	Sector Name	1977 BEA		1977 SIC
		I-O Code	Sector Name	
	<u>Trade and services, cont'd</u>			
100	Misc. services and advertising	730103	Personnel supply services -----	736
		730104	Computer and data processing services ---	737
		730105	Management and consulting services, testing and research labs -----	7391-2, 7397
		730106	Protective services -----	7393
		730107	Equipment rental and leasing -----	7394
		730108	Photofinishing labs, photocopy, and com- mercial photography ---	7332-3, 7395
		730109	Other business services -----	732, 7331, 7339, 735, 7399*
		730200	Advertising -----	731
109	Misc. professional services	730301	Legal services -----	811
		730302	Engineering, architec- tural, and surveying services -----	8911
		730303	Accounting, auditing and bookkeeping, and miscellaneous ser- vices, n.e.c. -----	893*, 899
110	Auto rental, repair and maintenance	750001	Automotive rental and leasing, without drivers -----	751
		750002	Automotive repair shops and services -----	753, 7549
		750003	Automobile parking and car washes -----	752, 7542

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(cont'd)

Concordance of MRIO, BEA I-O and SIC Codes

MRIO Code	Sector Name	1977 BEA I-O Code	Sector Name	1977 SIC
<u>Trade and Services, cont'd</u>				
111	Amusements	760100	Motion pictures -----	78
		760201	Theatrical producers (except motion pictures), bands, and entertainers ----	792
		760202	Bowling alleys, billiard and pool establishments -----	793
		760203	Commercial sports except racing -----	7941
		760204	Racing (including track operation) ----	7948*
		760205	Membership sports and recreation clubs ----	7997
		760206	Other amusement and recreation services -	791, 799* (incl. 7997)
112	Doctors and dentists, inc. outpatient care facilities			801-3, 808, 8041
113	Hospitals and nursing	770200	Hospitals -----	806
		770301	Nursing and personal care facilities -----	805
114	Other medical and health services			874, 804 except 8041, 807, 809
115	Educational services	770401	Elementary and secondary schools -----	821
		770402	Colleges, universities, and professional schools -----	822
		770403	Libraries, correspondence and vocational schools, and educational services, n.e.c. -----	823-9

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Concordance of MRIO, BEA I-O and SIC Codes

MRIO Code	Sector Name	1977 BEA I-O Code	Sector Name	1977 SIC
<u>Trade and Services cont'd</u>				
116	Nonprofit organizations	770501	Business associations and professional membership organizations -----	861-2
		770502	Labor organizations and civic, social, and fraternal associations -	863-4
		770503	Religious organizations --	866
		770504	Other membership organizations -----	84, 865, 869, 892
117	Other social services	770600	Job training and related services -----	8331
		770700	Child day care services --	8351
		770000	Residential care -----	8361
		770900	Social services, n.e.c. --	8321 ⁰ , 8399
<u>Government enterprises</u>				
118	Federal government enterprises, except utilities and local transit	780100	U.S. Postal Service -----	4311
		780300	Commodity Credit Corporation -----	pt. 613
		780400	Other Federal Government enterprises ----	several
119	State and local government enterprises, except utilities and local transit	790300	Other State and local government enterprises -----	several
<u>Special industries</u>				
120	Directly allocated imports	800000	Noncomparable imports	
131	Scrap	810001	Scrap -----	

(cont'd)

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Concordance of MRIO, BEA I-O and SIC Codes

MRIO		1977 BEA	
Code	Sector Name	I-O Code	Sector Name
<u>Special industries cont'd</u>			
123	Government industry	820000	Government industry ---
123	Household industry	840000	Household industry ----
Added (124	Rest of World		
<u>Final Demand</u>			
150	Personal consumption expenditures		
151	Gross private fixed capital formation		
152	Net inventory change		
153	Gross exports		
154	Federal gov't capital expenditures, (except defense)		
155	State and local gov't capital expenditures		
156	Federal defense expenditures (current and capital)		
157	Federal gov't current expenditures (except defense)		
158	State and local gov't current expenditures		
159	Foreign imports		

* Indicates those industries in which there was a change in composition between the 1972 and 1977 SIC's.

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APPENDIX B

MRIO PROCEDURES PAPERS

TRADE AND TRANSPORTATION MARGINS IN THE MRIO MODEL

The treatment of trade and transportation margins in input-output tables has always posed special problems. In the national input-output tables these margins are allocated to consuming industries in association with the flow of inputs to which they apply. Thus the flow of steel to automobiles carries with it the cost of transporting the steel from the steel production plant to the automobile plant. In practice it is calculated as the revenue collected by each transportation mode for hauling steel prorated over the consumers of steel. In lieu of data on the specific modal mix and distance-of-haul for each consumer, each consumer is allocated a portion of the revenues from each mode proportionate to its value of steel consumed, reflecting the national average modal-mix and distance-of-haul.

When these allocations are completed for the flows of all commodities, each consuming industry has been assigned transportation costs for each of its inputs. This set of allocations, one for each transportation mode, is referred to as a transportation margin matrix; each column records the transportation costs (for a specific mode) on each of the inputs to a specific industry. The sum of each column represents the total transportation costs to the industry for a transportation mode. These totals are then entered as a row in the main I-O table, representing the allocation of transportation freight costs (revenues) for each mode to each industry. The commodity flows are expressed in producers' values and the transportation margin inputs (together with wholesale trade and other margins) account for the difference between producers and delivered values.

In the national table this procedure can be simplified by allocating the transportation margins to the producing industries. As long as transportation costs are allocated to consuming industries proportionate to transactions values, the exact same results will be obtained in model solutions by allocating the margins as a total to producing industries. The commodity flows then represent producers' values plus the cost of transportation.

Wholesale trade margins are handled in an identical fashion to transportation margins in the national I-O table. These margins also can be allocated to producing industries, eliminating the need for the wholesale trade margin matrix. In this case, the transactions flows in the main I-O table would be expressed in producers' values plus transportation and wholesale trade margins. Thus the intermediate transactions data could be expressed in values very close to delivered or purchasers' values, the exceptions being retail trade margins, of which 90% are allocated to final demand, and minor margins for insurance. (Excise and sales taxes are now allocated in the national I-O table either to producing industries or to wholesale or retail trade as a total for each type of tax -- the effect is the same as that suggested for transportation and wholesale trade above.)

Note: It is not contended that transportation and trade margins are always allocated to consuming industries proportionate to transactions in the national I-O table; rather this is the case in an overwhelming majority of the flows and an assumption of proportionality is a close approximation of what is now the case. This follows from the simple fact that information on how these margins apply to specific consuming industries is simply not available.

The assignment of transportation and wholesale trade margins to producing sectors eliminates two arduous procedures which are cumbersome and frustrating in both the development and updating of I-O tables, and lead to considerable complexity in exposition and interpretation of the tables:

1. The margin matrix procedure explained above. This procedure is cumbersome to perform, subject to tedious revision in every case of revision to transactions in the course of balancing the table, and equally tedious in updating the table.
2. The "unpeeling" of margins from purchasers' value to obtain the producers' values in which the transactions data are finally stated. Much of the data on materials and services purchased by each industry is available only in purchasers' or delivered values; adjusting these values to producers' values is a tedious task, subject to much error, adjustments that must be revised continually to be consistent with changes as they are made to the

transactions data. These adjustments are voluminous and are difficult to track, making it extremely difficult to maintain an audit trail from the original data. In the end, much time and effort is spent on maintaining specious detail which provides no additional information over a less elaborate procedure.

Transportation and Wholesale Margins at the Regional Level

The difficulties in allocating margins to consuming industries are compounded at the state level because of the manyfold increase in the volume of the data. Instead, it is proposed to allocate the transportation freight margins and wholesale trade margins to special distribution sectors established for this purpose. A further special treatment of retail trade margins will be employed.

There are a number of complications due to the existence of inter-state trade. Thus the transportation freight margins should be associated with the movement of interstate freight, as well as intra-state shipments. It is also difficult to identify the specific state impacts or incidence of inter-state transportation: How much for the originating state? How much for the terminating state? How much for the states that are traversed?

There is a further complication with the assignment of wholesale margins by state to producing industries. The best presumption is that wholesale trade activity is associated with consumption in each state which does not generally agree with amounts produced by each industry. If wholesale trade margins were allocated to producing industries in each state, shipments out of the state would implicitly be assigned wholesale trade activity that should properly be assigned by the receiving state. This kind of distortion on the wholesale trade inputs generated by the model must be avoided.

Fortunately, the solution to these complications is rather straightforward. The procedure requires the establishment of a separate distribution sector for each industry in each state, for each sector producing commodities (or services) subject to either transportation margins or wholesale trade margins. This presents no problem and requires no additional information; the work required is simply to segregate certain flows in the accounting conventions in the model. With current computer capacities for computation and data storage, no computational constraints need be a concern.

The flows are illustrated in matrix form in Figure 1. Production in each state is represented in the diagonal matrices; the off-diagonal matrices represent the trade flows (in the diagonal cells). Production sectors are labelled P and "sell" only to a state distribution sector, P', to distribution sectors in other states and to foreign exports (see for example, line A). The distribution sector, P', sells only to consuming industries and final demand within the state. All production inputs appear in the P column. State wholesale trade margins, for each commodity (MRIO group) are allocated wholly to the state distribution sectors, P's (lines B & E). In this way wholesale trade margins are allocated only to consumption within the state.

Transportation margin assignments are slightly more complex. Freight revenues will first be calculated for each commodity for each state-to-state link for each freight mode. There will be a large number of data items but they will be calculated by computer and stored for use, based on national revenue per ton-mile (converted to flows in dollar values), using a formula for each mode which reflects fixed terminal costs at origins and destinations and line-haul costs as a function of distance between state centroids (nodes). Intra-state freight revenues per dollar of flow for each commodity will also be calculated as an integral part of the inter-state flow procedure.

These revenues by origin-destination (O-D) link will be assigned, by a formula to be worked out, partly to the originating state and partly to the terminating state (revenues for intra-state shipments are allocated to the one state).¹ It is assumed that freight costs are paid for by consumers in the receiving state. Thus freight revenues will be allocated along with the trade flows to the distribution sector in the receiving state. For example, in Figure 1, railroad freight in state 1 is allocated to the shipment of glass products to state 2 (line C), in the column for P' in state 2. (Some railroad freight in state 1 is also allocated to P' in state 1 -- for intra-state shipments of glass products.) Some railroad freight from state 2 is allocated to this shipment also (line F), also in the column for P' in state 2. Thus freight costs become part of the value in state 2's distribution sector which is allocated to consuming industries and final demand in state 2. Thus the appropriate rail freight costs are always allocated to the customers in the receiving state, costs that reflect the distance of haul and the specific mode by which transported. (Other modal freight costs are allocated in similar rows, one for each mode -- to the same P' vectors as appropriate).

¹The assignment of freight transportation activity by state is necessarily a somewhat arbitrary procedure. These assignments must be calibrated with the mechanism that generates the demand for freight transportation in the model. Thus, the base-year output measures for freight transportation by state, will be developed as a fallout from the revenue assignment procedure.

State	Industry	1			2			3			Final Demand			
		State Industry	Class Products	Wholesale Trade	Railroads	State Industry	Class Products	Wholesale Trade	Railroads	State Industry	Class Products	Wholesale Trade	Railroads	Imports
1		Production Matrix			Trade Flows			Trade Flows						
		Production Inputs												
		P	•				•							
A. Class Products		P	•••••	•										
B. Wholesale Trade		P		•										
C. Railroad Freight		P		•										
2		Trade Flows			Production Matrix			Trade Flows						
		Production Inputs												
		P					•							
D. Class Products		P			•••••			•••••••••						
E. Wholesale Trade		P				•								
F. Railroad Freight		P				•								
3		Trade Flows			Trade Flows			Production Matrix						
		Production Inputs												
		P												

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FIGURE 1: ALLOCATION OF TRANSPORTATION AND WHOLESALE TRADE MARGINS

Fortunately this procedure for handling transportation and wholesale margins is not as complex as it sounds -- it is simple straightforward accounting. It insures that margins in the correct amounts are assigned to the appropriate consumers within each state -- thus insuring that requirements for transportation and wholesale trade activity are "driven" by the appropriate demand wherever located by state. Updating is relatively simple since the margins are identified with specific flows and are shown as explicit data cells in the matrix.

Retail Trade Margins and Excise and Sales Taxes

Retail trade margins and excise and sales taxes also account for part of the difference between producers' values and purchasers' values of transactions. Since retail trade margins apply only selectively to consumers of each commodity, it is not appropriate to assign these to producing sectors (P), or to state distribution sectors (P'). Since they are allocated about 90% to personal consumption expenditures (PCE), they can be handled with few exceptions as extra detail carried in PCE, stipulated in final demand. For this purpose, several columns would be set up in final demand to record the margins on each commodity as illustrated in Figure 2. This will facilitate keeping track of the margins and taxes in stipulating final demand in model applications. Purchasers' values will be stipulated in each state and retail trade margins and excise taxes "pulled off" to derive producers' value including wholesale and transportation margins. This procedure will also facilitate the introduction of changes in excise taxes (in model applications), a topic of timely interest.

Retail margins to intermediate industries and other final demand account for only about 10% of total retail margins. These will be treated in the traditional way, i.e., allocated to sectors that consume the commodities to which the margins apply. However, the appropriate coefficients for this purpose will be estimated based on national coefficients without any precise tracking of such margins via a margin matrix.

Manufacturers' excise taxes will be allocated to the state distribution sectors discussed earlier, the P's, to avoid allocating these taxes to foreign exports. Wholesale excise taxes, either state or federal, will be allocated to these distribution sectors; this procedure allows state wholesale excise taxes to be allocated in a state-specific manner. Retail excise taxes will be handled exactly as retail margins are handled.

I-O Codes	Personal Consumption Expenditures				
	Producers' Value including Whole- sale and Trade Margins	Retail Trade Margin	Retail Excise Taxes	Retail Sales Taxes	Purchasers' Value
Totals		+	+	+	

FIGURE 2: RETAIL TRADE MARGINS AND RETAIL TAXES IN PCE

APPENDIX B.2

MRIO Procedures: No. 2

November 18, 1981

REDEFINITIONS AND SECONDARY PRODUCTS IN THE MRIO MODEL

Redefinitions in input-output tables are generally made to adjust for secondary products made in establishments, products that are principally made in other industries. It is necessary to assimilate the total output of each product into a single row for distribution to consuming industries since the industry of origin is not distinguished in the consumption data.

In a few cases it is desirable to separate data for products that have been grouped together in a single Standard Industrial Classification industry that are not in fact made in the same establishment, e.g., aluminum combined with other chemicals, -- this is not strictly a redefinition of establishment data but a separation of the statistics. The distinction is important since the first involves separating data for the basic reporting unit, the establishment, whereas the latter is simply a function of the establishment classification system. In many such cases, separate data are available for the activities involved. For example, in government enterprises certain activities are redefined to their private sector counterparts: electric and gas utilities and transit systems, among others; in these cases the data are simply compiled under the appropriate sector classification code and no separation of reported data is generally necessary. Thus, redefinitions of establishments within SIC codes are covered by the sector classification system and are not dealt with in this paper. The concern here is with redefinitions of products or services within the basic reporting unit, i.e., the establishment -- to adjust the establishment data to move these products to other establishment industry classifications.

In addition to redefinitions, other adjustments to industry data as collected are necessary due to undercoverage of the activities for whatever reason.

For purposes of discussion it is convenient to group redefinitions and adjustments in the MRIO model as follows:

1. Adjustments to establishment data to redefine the production process to a product or activity basis, eliminating the production of secondary products in each industry.

2. Adjustments to output measures (and transactions) to augment the observed measures for undercoverage due to:
 - a. Work done on a contract basis for which contract fees are reported, understating the full value of the product flow. Examples: ores mined or refined on a contract basis, stumpage cut and logged on a contract basis, fabrics finished on a contract basis.
 - b. Services rendered for which explicit payments are not made: banking services in lieu of interest payments, implicit rental services to owner-occupied homes. Most of these cases represent implicit economic flows recognized in the National Income and Product (NIPA) accounts as imputations.

3. Adjustments to establishment data for products that are primary to more than one SIC industry -- to redefine this production to the SIC in which it is primarily produced. These cases to some extent involve products that are produced as joint products or by-products in industries other than the principal industry of production. Examples: natural gas liquids produced as joint products in natural gas processing plants, produced as primary products in petroleum refining; processed and bottled milk produced on the farm, a primary product of the processed milk industry in manufacturing; wire rope and strand produced in wire drawing mills, a primary product of the wire product industry that makes its products from purchased wire. This category is a special case of category 1 above. Products in this latter category reflect integrated operations in which the raw materials for the products are made in the same industry and, to an extent the products are either by-products or joint products of producing the basic materials.

Categories 1 and 3 above involve the conflict between the classification of production activities on an establishment basis and on a product base. The conflict arises because input data on materials, fuels and labor are generally available for

establishments -- and not for products, whereas consumption data are available on a product basis and the specific industries of production are not distinguished. Thus, it is convenient to have the I-O table defined on an establishment basis for input definition (the columns) and on a product basis for the distribution of output (the rows).

ESTABLISHMENT/PRODUCT CLASSIFICATION BRIDGES

There are at least three ways to bridge the establishment/product classification problem.

Method 1

In the first input-output tables produced by BLS and BEA, the secondary products of an industry were transferred to the industry to which they are primary via a synthetic flow. In this case, demand for the product is always satisfied by production from the primary industry and from other industries in fixed proportions. This is mathematically convenient, but it is hard to find any plausible combination of circumstances that would require such stability of market shares.

In conjunction with this method, certain industries were also defined on a product basis, principally agriculture and construction. In the case of agriculture, the redefinition was limited to the agricultural industries -- sectors were simply defined by product groupings, and agricultural activity in other industries, which was of a limited nature in any event, was ignored. In the case of construction, a large amount of construction carried on in other industries, referred to as force-account construction, was redefined to the construction industries, defined on a product basis.

In addition to these two major redefinitions, a few other activities were redefined. These included manufacturing performed in trade and service establishments, retail trade carried on in service industries, services carried on in the trade industries, and selected services were redefined among the services industries. These redefinitions required appropriate adjustments to the establishment output measures and input data for these industries.

Method 2

The second method is to redefine all activities to a product basis by adjusting their establishment-based output to include all production of products primary to the industry and to exclude all secondary production; inputs are adjusted similarly to reflect primary product production only. This method avoids the "clumsy" transfer procedure of Method 1 but results in the distortion of the establishment based data beyond recognition. The inability to "track" the model results with establishment-based data is a serious drawback in interpreting model results and in updating the data in the model. This method is extremely tedious to implement even at the national level since information on the separation of inputs between primary and secondary production is lacking. Inevitably most of the input adjustments are made by "scaling" the inputs of the industry of primary production by the ratio between outputs as secondary and primary production. This is a dubious procedure in many cases. The problems of adjustment are compounded at the regional level; thousands of "scalings" would be necessary without substantial justification.

Method 3

This method is designed to maintain the input data on an establishment basis as far as possible while distributing each product, regardless of where made, in a single row. This assumes that outputs of the same product in different industries are substitutable to a large extent and requires no stability of market shares. It avoids the general adjustment of the establishment input data of Method 2. It also avoids the introduction of synthetic transfers and the augmentation (duplication) of establishment output of Method 1.

The basic approach is to treat secondary products as joint products of the industries producing them, with the output flows of these secondary products shown as negative inputs from the industry row to which they are primary. In this way primary products are always distributed in a single row, with negative offsets in the row for the amounts produced as secondary products in other industries. It assumes that, if two products are produced in the same establishment, it is usually because producing more of one of the products tends to reduce the input increments needed to produce more of the other. This tends to control output proportions.

The mechanics of this treatment in the matrix are illustrated in Figure 1. The flows for several products produced in some amounts as a secondary product in another industry are illustrated. The first example is milk, processed and bottled on the farm, and sold to final consumers (via wholesale and/or retail trade). This product is primary to milk processing, a manufacturing industry. A negative flow is shown in the Milk processing row, Agriculture column, to account for this production. The other entries in the Milk processing row account for the consumption of all processed milk produced, including that produced and sold from the farm. The sum of the product output is obtained by adding all the positive numbers and ignoring the negative number. The industry output for Milk processing (the control total for its column) is the algebraic sum of its row (including the negative number). If it produced any secondary products, the value of these secondary products would be included in deriving its column sum. Thus, in the case of Agriculture, its output is obtained as the algebraic sum of its row plus the value of processed milk shown in its column.

The next example is that of natural gas liquids produced in gas processing plants which consist of gasoline and other products that are the same as products produced in Petroleum refining, the principal producing industry. (This is a case where the Standard Industrial Classification recognizes products as primary to more than one industry -- they are a joint product, in a truer sense a by-product, of gas extraction and processing). The flow is shown as a negative amount in the Petroleum refining row, in the column for Natural gas wells and processing plants.

The two other examples involve the Wholesale trade and the Meat processing industries. These examples are typical of a large number of cases in which wholesale trade has some manufacturing operations and, conversely, manufacturing plants perform their own distribution and sales functions. In the first example, cattle slaughtering, a primary function of the Meat processing industry, is performed in wholesale trade establishments. In the second example, Meat processing plants sell and distribute their products to retailers, a function of the Wholesale trade industry.

These examples illustrate the general case in which secondary products are treated as negative allocations in the row that distributes these products, in the column of the industry that produces them. The algebraic sums of each row and corresponding column

Producing Industry \ Consuming Industry	Agriculture	Milk Processing	Natural Gas Wells and Processing Plants	Petroleum Refining	Meat Processing	Wholesale Trade	Other Industries	Final Demand	Total Product Output
Agriculture (agriculture products)		40			60			200	300
Milk Processing (processed milk)	-10							120	120
Natural Gas Wells and Processing Plants (natural gas)	5	5		10	5	5	45	50	125
Petroleum Refining (petroleum products)	10	5	-10		5	10	60	40	130
Meat Processing (meat products)						-20		140	140
Wholesale Trade (wholesale trade margins)	10	5		10	-5		40	55	130
Other Industries (other products)	50	5	95	20	5	50		150	375
Value Added	235	50	40	80	50	70	230	755	
Total Industry Output including Secondary Products	310	110	135	120	125	135	375		1,310

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FIGURE 1: TREATMENT OF SECONDARY PRODUCTS IN THE MRIO MATRIX (ILLUSTRATIVE)

are equal; the sums of the product distributions and the inputs to the industry (the sums of the positive numbers in the row and in the corresponding column) differ by the amount of product output and industry output. Thus, the control total for the column is establishment output and all the inputs are establishment-based; the control total for the row is product output wherever produced. Thus the accounting system provides an easy transition from the establishment-based input data to the product output data.

This treatment of secondary products assumes that the secondary products are always produced in fixed proportions to the primary product. Although this assumption is certainly not completely true, it is believed to be acceptable in view of the limitations of the alternative methods of handling secondary products in the model. These limitations were discussed above under Methods 1 and 2.

PLANS FOR THE MRIO MODEL

It is planned to adopt Method 3 as described above wherever feasible in handling secondary products (and products primary to more than one industry) in the MRIO model. Several redefinitions will be made, principally in force account construction (in a redefinition both output and inputs are adjusted in moving the activity from one sector to another). Finally, a number of adjustments will be made to coverage where the Census data understate the full value of output of specified activities.

There are a number of adjustments that affect a large number of industries. These will be discussed first below and then, the specific industry adjustments will be discussed.

Force-Account Construction

New and maintenance construction performed by employees of the establishment (rather than contracted for from the construction industry) is important in a number of industries. Adjustments will be made to specific industries that account for about 80 percent of this activity (in the 1972 BEA table) as listed in Exhibit 1. The initial data file records the data on an establishment basis but does not include the capitalized value of new construction in the output measures (maintenance construction is a cost that would not be included in the output measure in any event). The cost of materials control, value added, employment and payroll data will be adjusted in a special

Redefinition File that will permit these adjustments to be tracked back to the Initial Data File. The adjustments will be based on input patterns developed in the construction analysis. The Redefinition File will serve also to add these data to the appropriate construction sector file. Data for specific material inputs from central sources, e.g., fuels consumed, will also be adjusted for in the Redefinition File; other inputs will simply be developed to exclude any inputs for construction activity.

Manufacturers Resales

Goods bought and sold in the same form constitute a wholesale trade function. Some sales of this nature occur in most all manufacturing industries but is generally of minor significance. It is not appropriate to treat these receipts as secondary products and accord them the Method 3 treatment since the purchase value of the goods is not relevant to the wholesale trade industry (only the markup or margin on such sales is relevant). Thus to make the adjustment it is necessary to eliminate the value of the sales from output and the cost of the goods from cost of materials, and then compute the component costs of the margin (materials and labor) and move it to the wholesale trade sector. When this is completed, minor adjustments have been made to many data items without having added much to essential information provided by the model (wholesale trade is augmented in a relatively small way by an activity that is somewhat extraneous to it and the establishment data are distorted).

In view of all this, it is deemed more appropriate to keep the establishment data intact and to simply make a "wash" transaction to account for these sales that are included in the output measure for each industry. This is accomplished by allocating these sales to the industry itself on the main diagonal, i.e., an intra-sector transaction. This procedure maintains the integrity of the establishment data while "immunizing" the flow in terms of balancing output and input in the matrix.

Rental Receipts

All rental receipts, real or imputed will be redefined into the Real estate and rental sector, following the BEA convention. Since this is only a financial flow to property type income, no significant inputs are associated with it and therefore no adjustment will be made to establishment-based input data. Rental receipts have been excluded

from the output data (they are not included in the Census output measures and have been excluded in developing the data for other sectors). The development of the data on real and imputed rents is described in the chapter for the Real estate and rental sector in the report on output, employment and payrolls.

Electric Energy Sales

Sales of electric energy by non-utility plants will be handled by Method 3 for secondary products, as described in this paper, to the extent they can be identified by industry and state.

Specific Adjustments, Redefinitions and Secondary Products

The specific treatment of coverage adjustments and redefinitions made by BEA in 1972 national input-output table are noted in the reproduced pages from Definitions and Conventions of the 1972 Input-Output Study, BEA Staff Paper, July 1980, attached as Exhibit 2. Only items of \$200 million or greater value in 1972 have been considered. The planned treatment of each is noted by the following symbols:

- R - redefine; move output and inputs to appropriate industry. This is for cases where the input requirements for primary and secondary outputs are independent.
- A - adjust; generally made to increase Census flows for undercoverage.
- B - treatment of secondary products by Method 3 procedures. This is for cases where cost complementarities between primary and secondary products tend to fix the output proportions.
- I - no adjustment to output; allocate flow as intra-sector.
- X - no adjustment; either not deemed significant, it affects an intermediate flow not of interest, or a reclassification does not seem appropriate
- ? - not yet resolved.

Other Secondary Products

It is planned to make only a few adjustments for other secondary products. Generally, establishment output will be considered to be product output. In cases where the difference between industry output (establishment-based) and product output in the

national totals is minor (at the MRIO level of industry aggregation), no adjustments will be made. In cases where the difference is significant, secondary product flows will be introduced in appropriate rows to approximately balance out these differences. These flows will be introduced in accordance with the Method 3 treatment of secondary products.

EXHIBIT 1

FORCE-ACCOUNT CONSTRUCTION REDEFINITIONS

Force-account construction refers to construction work performed by the work force of the consuming industry or final demand sector. Both new construction and maintenance construction is included. In 1972, force-account construction totaled nearly \$28 billion. About 80 percent of the force-account construction activity took place in 13 sectors. These sectors, and their 1972 value of force-account construction, are:

<u>MRPIS Sector</u>	<u>1972 BEA I-O</u>	<u>Sector</u>	<u>1972 Value FAC (mil \$)</u>	<u>1972 % of Total FAC</u>
010,011	8.0000	Petroleum and Gas Exploration	\$ 861.5	3.1
055	37.0101	Blast Furnaces and Steel Mills	504.1	1.8
085	65.0100	Railroads	1,754.0	6.3
092	66.0000	Communications, ex Radio & TV	2,740.1	9.8
094	68.0100	Electric Services (utilities)	3,071.1	11.0
095	68.0200	Gas Production, Distribution (utilities)	905.8	3.2
105	71.0200	Real Estate	1,121.9	4.0
094	68.0100	Federal Electric Utilities	443.3	1.6
094	68.0100	State and Local Electric Utilities	432.0	1.5
119	79.0300	Other State and Local Gov't Enterprises	2,454.9	8.8
Final Demand	97.0000	Federal Gov't Purchases, Nondefense	1,198.1	4.3
	98.0000	State and Local Gov't Purch., Education	1,804.4	6.4
	99.300	State and Local Gov't Purch., Other General Government	4,980.0	17.8
		Total	\$22,271.2	79.6%

Estimates of 1977 force-account construction will be made for each of these 13 sectors separately for new construction and maintenance construction. The Initial Data File will then be adjusted to include these estimates in the MRIO construction sectors and exclude them from the appropriate MRIO nonconstruction sector. Employment, payroll, cost of materials, and value added will also be added to the construction sectors and deducted from the other sectors. All adjustments will initially be made at the national level. These adjustments will be made to the state data using the best estimates available of the state distribution of this work.

EXHIBIT 2

**SPECIFIC ADJUSTMENTS, REDEFINITIONS
AND SECONDARY PRODUCTS**

- Legend:**
- R -** redefine; move output and inputs to appropriate industry. This is for cases where the input requirements for primary and secondary outputs are independent.
 - A -** adjust; generally made to increase Census flows for undercoverage.
 - B -** treatment of secondary products by Method 3 procedures. This is for cases where cost complementarities between primary and secondary products tend to fix the output proportions.
 - I -** no adjustment to output; allocate flow as intra-sector.
 - X -** no adjustment; either not deemed significant, it affects an intermediate flow not of interest, or a reclassification does not seem appropriate.
 - ? -** not yet resolved.

Table A.--Specific Redefinitions and Coverage
Adjustments in the 1972 I-0 Table
(Millions of dollars)

From or to (-) 1/	Affected industry	Amount
I-0 4.0000 Agriculture, forestry, and fishery services		
14.0101	Receipts for custom slaughtering -----	-13.0
65.0300	Receipts from others for the transportation of farm workers for the benefit of the others -----	-2.8
69.0100	Receipts from the resale of agriculture supplies, e.g., fertilizers, feeds -----	-9.5
69.0200	Receipts from resale of animals, nursery products, etc. --	-22.5
73.0300	Receipts for accounting services performed for others ----	-0.9
11.0000	Receipts for landscaping -----	200.0 X
69.0100	Crop and livestock services performed in wholesale trade establishments -----	256.6 B
	Net (increase) -----	407.9
I-0 8.0000 Crude petroleum and natural gas		
11.0000	Receipts for installation of oil well machinery -----	67.4
	Net (increase) -----	67.4
I-0 11 and 12 Construction 2/		
4.0000	Receipts from landscaping -----	-200.0 X
8.0000	Receipts for installation of oil well machinery -----	-67.4
66.0000	Installation of central switching equipment -----	-700.2 X
69.0100	Receipts from the sale of machinery and equipment -----	-81.6
69.0200	Receipts from sale of construction materials and household appliances not considered part of the value of put-in-place construction -----	-183.8
71.0200	Real estate activity of operative builders -----	1,633.7 X
72.0200	Receipts for installation of refrigeration equipment ----	-383.0 X
73.0100	Receipts from rental of equipment -----	-1,130.0 X
40.0400	Installation receipts -----	59.2
40.0500	Installation receipts -----	22.3
40.0600	Installation receipts -----	46.2
40.0700	Installation receipts -----	42.6
40.0800	Installation receipts -----	11.7
40.0901	Installation receipts -----	5.7
40.0902	Installation receipts -----	24.0
46.0100	Installation receipts -----	50.0
46.0200	Installation receipts -----	9.1
49.0100	Installation receipts -----	9.9

1/ See last page of table A.

2/ Includes new construction (I-0 11) and maintenance and repair construction (I-0 12).

Table A.--Specific Redefinitions and Coverage
Adjustments in the 1972 I-0 Table
(Millions of dollars)
- continued -

From or to (-) 1/	Affected industry	Amount
I-0 11 and 12 Construction 2/ (con.)		
49.0700	Installation receipts -----	2.2
52.0300	Installation receipts -----	3.4
62.0100	Installation receipts -----	6.6
62.0200	Installation receipts -----	57.5
69.0100	Receipts for installing and repairing plumbing and heating equipment -----	24.5
69.0200	Receipts for oil and gas burner installation and services by fuel oil dealers -----	176.9
69.0200	Receipts for installing and repairing glass and screens by retailers -----	137.4
72.0200	Receipts for repair of central air conditioning -----	50.3
73.0100	Receipts for septic tank and furnace cleaning -----	185.5
	Net (decrease) -----	-3,454.7
14.0101 Meat packing plants		
4.0000	Receipts for custom slaughtering -----	13.0
69.0100	Receipts for cutting and selling purchased carcasses ----	2,406.9
	Net (increase) -----	2,419.9
14.0102 Sausages and other prepared meats		
69.0100	Receipts for meats prepared in manufacturers' sales branches -----	222.0
	Net (increase) -----	222.0
14.0103 Poultry dressing plants		
69.0100	Receipts for poultry dressing performed in wholesale trade establishments -----	420.4
	Net (increase) -----	420.4

Table A.--Specific Redefinitions and Coverage
Adjustments in the 1972 I-O Table
(Millions of dollars)
- continued -

From or to (-) 1/	Affected industry	Amount
14.1502 Prepared feeds, n.e.c.		
69.0100	Receipts by grain elevators and farm supply stores for custom-prepared feed -----	<u>1,248.6</u> B
	Net (increase) -----	1,248.6
14.1801 Bread, cake, and related products		
69.0200	Receipts for the sale of bakery products produced on the same premises by retail bakeries -----	<u>1,340.0</u> B
	Net (increase) -----	1,340.0
15.0200 Tobacco stemming and redrying		
69.0100	Receipts for stemming and drying tobacco at wholesale establishments -----	957.5 B
-----	Computed value for Census undercoverage of stemming and drying receipts -----	<u>437.2</u> X
	Net (increase) -----	1,394.7
16.0100 Broadwoven fabric mills and fabric finishing plants		
69.0100	Receipts for "converters" who buy goods in the grey, have them finished on contract, and sell at wholesale -----	2,307.7 A
-----	Receipts of central administrative offices for fabrics finished on contract for them -----	<u>2,694.9</u> A
	Net (increase) -----	5,002.6
17.1002 Textile goods, n.e.c.		
69.0100	Receipts for "converters" who buy wool, have it combed and converted to tops on contract, and sell at wholesale -----	<u>66.3</u>
	Net (increase) -----	66.3

**Table A.--Specific Redefinitions and Coverage
Adjustments in the 1972 I-O Table
(Millions of dollars)
- continued -**

From or to (-) 1/	Affected Industry	Amount
18.0400 Apparel made from purchased materials		
64.1200	Receipts for apparel sales from establishments primarily engaged in dressing and dyeing of furs -----	42.6
69.0200	Receipts for custom tailoring, dressmaking, and fur goods production by retailers -----	<u>201.4</u> X
	Net (increase) -----	244.0
20.0100 Logging camps and logging contractors		
-----	Conversion of purchased stumpage to logs and bolts shipments -----	880.0 A
-----	Computed value for undercoverage of Census of logs and bolts -----	<u>1,105.2</u> A
	Net (increase) -----	1,985.2
27.0100 Industrial inorganic and organic chemicals		
38.0400	Receipts from establishments primarily producing alumina -----	<u>-487.1</u> R
	Net (decrease) -----	-487.1
27.0403 Explosives		
-----	Computed value for shipments of explosives from government-owned, contractor-operated plants -----	<u>153.1</u>
	Net (increase) -----	153.1
38.0100 Primary copper		
-----	Computed value for Census undercoverage of primary copper refined on contract (toll processed) -----	<u>461.3</u> A
	Net (increase) -----	461.3

**Table A.--Specific Redefinitions and Coverage
Adjustments in the 1972 I-O Table
(Millions of dollars)
- continued -**

From or to (-) 1/	Affected industry	Amount
38.0400 Primary aluminum		
27.0100	Receipts from establishments primarily producing alumina -----	<u>487.1</u> R
	Net (increase) -----	487.1
I-O 40.0400 Fabricated structural metal		
11.0000	Installation receipts -----	<u>-59.2</u>
	Net (decrease) -----	-59.2
I-O 40.0500 Metal doors, sash, and trim		
11.0000	Installation receipts -----	<u>-22.3</u>
	Net (decrease) -----	-22.3
I-O 40.0600 Fabricated plate work (boiler shops)		
11.0000	Installation receipts -----	<u>-46.2</u>
	Net (decrease) -----	-46.2
I-O 40.0700 Sheet metal work		
11.0000	Installation receipts -----	<u>-42.6</u>
	Net (decrease) -----	-42.6
I-O 40.0800 Architectural metal work		
11.0000	Installation receipts -----	<u>-11.7</u>
	Net (decrease) -----	-11.7

**Table A.--Specific Redefinitions and Coverage
Adjustments in the 1972 I-O Table
(Millions of dollars)
- continued -**

From or to (-) 1/	Affected industry..	Amount
I-O 40.0901 Prefabricated metal buildings		
11.0000	Installation receipts -----	<u>-5.7</u>
	Net (decrease) -----	-5.7
I-O 40.0902 Miscellaneous metal work		
11.0000	Installation receipts -----	<u>-24.0</u>
	Net (decrease) -----	-24.0
I-O 46.0100 Elevators and moving stairways		
11.0000	Installation receipts -----	<u>-50.0</u>
	Net (decrease) -----	-50.0
I-O 46.0200 Conveyors and conveying equipment		
11.0000	Installation receipts -----	<u>-9.1</u>
	Net (decrease) -----	-9.1
I-O 49.0100 Pumps and compressors		
11.0000	Installation receipts -----	<u>-9.9</u>
	Net (decrease) -----	-9.9
I-O 49.0700 General industrial machinery, n.e.c.		
11.0000	Installation receipts -----	<u>-2.2</u>
	Net (decrease) -----	-2.2

Table A.--Specific Redefinitions and Coverage
Adjustments in the 1972 I-O Table
(Millions of dollars)
- continued -

From or to (-) 1/	Affected industry	Amount
I-0 50.0001 Carburetors, pistons, rings, valves		
69.0100	Receipts for rebuilt carburetors produced in wholesale trade -----	<u>69.9</u>
	Net (increase) -----	69.9
I-0 51.0101 Electronic computing equipment		
-----	Revaluation of computers purchased by a subsidiary or used by the manufacturer in a leasing operation from a "commercial" or "market" value to a cost basis --	<u>-433.5</u> X
	Net (decrease) -----	-433.5
I-0 52.0300 Refrigeration and heating equipment		
11.0000	Installation receipts -----	<u>-3.4</u>
	Net (decrease) -----	-3.4
I-0 59.0302 Motor vehicle parts and accessories		
69.0100	Receipts for rebuilt motor vehicle parts (excluding) carburetors) produced in wholesale trade: -----	<u>1,086.2</u> B
	Net (increase) -----	1,086.2
I-0 61.0100 Ship building and repair		
-----	Construction differential subsidy paid by the Federal Government to the shipyard and included by Census in receipts -----	<u>-144.4</u> ?
	Net (decrease) -----	-144.4

Table A.--Specific Redefinitions and Coverage
Adjustments in the 1972 I-O Table
(Millions of dollars)
- continued -

From or to (-) 1/	Affected Industry	Amount
I-O 61.0200 Boat building and repairing		
69.0200	Receipts by boat dealers for boat repairs -----	<u>78.7</u>
65.0400	Receipts by marinas for boat repairs -----	<u>114.5</u>
	Net (increase) -----	193.2
I-O 61.0300 Railroad equipment		
65.0100	Rebuilding, building, and repairing of locomotives and cars on their own account in repair shops owned and operated by railroads -----	<u>127.3</u>
	Net (increase) -----	127.3
I-O 62.0100 Engineering and scientific instruments		
11.0000	Installation receipts -----	<u>-6.6</u>
	Net (decrease) -----	-6.6
I-O 62.0200 Mechanical measuring devices		
11.0000	Installation receipts -----	<u>-57.5</u>
	Net (decrease) -----	-57.5
I-O 64.0102 Jewelers materials and lapidary work		
69.0100	Receipts for lapidary work performed in wholesale trade establishments -----	<u>345.2</u> B
	Net (increase) -----	345.2
I-O 64.1200 Manufacturing industries, n.e.c.		
18.0400	Receipts for apparel sales from establishments primarily engaged in dressing and dyeing of furs -----	<u>-42.6</u>
	Net (decrease) -----	-42.6

**Table A.--Specific Redefinitions and Coverage
Adjustments in the 1972 I-O Table
(Millions of dollars)
- continued -**

From or to (-) 1/	Affected industry	Amount
I-O 65.0100 Railroads and related services		
61.0300	Rebuilding, building, and repairing of locomotives and cars on their own account in repair shops owned and operated by railroads -----	-127.3
74.0000	Receipts from the sale of food and beverages -----	<u>-15.6</u>
	Net (decrease) -----	-142.9
I-O 65.0300 Motor freight transportation and warehousing		
4.0000	Receipts from the transportation of farm workers for others -----	2.8
69.0100	Merchant wholesalers receipts for storing grain and other CCC products -----	97.0
69.0200	Sale of unclaimed merchandise by warehouses -----	<u>-76.6</u>
	Net (increase) -----	23.2
I-O 65.0400 Water transportation		
61.0200	Receipts by marinas for boat repairs -----	-114.5
69.0200	Receipts from the sale of merchandise on board boats -----	-1.4
69.0200	Receipts by boat dealers for boat storage -----	16.0
74.0000	Receipts from the sale of meals on boats -----	-3.4
74.0000	Receipts from the sale of meals by marinas -----	<u>-23.0</u>
	Net (decrease) -----	-126.3
I-O 65.0500 Air transportation		
69.0200	Receipts for merchandise sold at airports -----	-90.7
74.0000	Receipts for drinks sold on airplanes -----	-33.1
76.0100	On plane cinema fees -----	<u>-14.2</u>
	Net (decrease) -----	-138.0
I-O 66.0000 Communications, except radio and TV		
11.0000	Installation of central switching equipment -----	<u>700.2</u> X
	Net (increase) -----	700.2

Table A.--Specific Redefinitions and Coverage
Adjustments in the 1972 I-0 Table
(Millions of dollars)
- continued -

From or to (-) 1/	Affected industry	Amount	
I-0 69.0100 Wholesale trade			
4.0000	Crop and livestock services performed in wholesale trade establishments -----	-256.6	B
12.0000	Receipts for installing and repairing plumbing and heating -----	-24.5	
14.0101	Receipts for cutting and selling purchased carcasses -----	-2,406.9	B
14.0102	Receipts for meats prepared in manufacturers sales branches -----	-222.0	B
14.0103	Receipts for poultry dressing performed in wholesale trade establishments -----	-420.4	B
14.1502	Receipts by grain elevators and farm supply stores for custom prepared feeds -----	-1,248.6	B
15.0200	Receipts for stemming and drying tobacco at wholesale establishments -----	-957.5	B
16.0100	Receipts of "converters" who buy goods in the grey, have them finished on contract, and sell at wholesale -----	-2,307.7	A
17.1002	Receipts of "converters" who buy wool, have it combed and converted to tops on contract, and sell at wholesale -----	-66.3	
50.0001	Receipts for rebuilt carburetors produced in wholesale trade -----	-69.9	
59.0302	Receipts for rebuilt motor vehicle parts (excluding carburetors) produced in wholesale trade -----	-1,086.2	B
64.0102	Receipts for lapidary work performed in wholesale trade establishments -----	-345.2	B
65.0300	Merchant wholesalers receipts for storing grain and other CCC products -----	-97.0	
72.0200	Receipts for electrical repair work -----	-2,680.1	B
73.0100	Receipts of sales branches and other wholesalers for computers, photocopying, and other miscellaneous machine rental and repair -----	-7,287.6	B
75.0000	Receipts for auto repair and allied services -----	-1,029.3	B
4.0000	Receipts from the resale of agricultural supplies, i.e., fertilizer, feeds, etc. -----	9.5	
11 & 12	Receipts from the sale of machinery and equipment -----	81.6	
73.0100	Receipts for merchandise including the sale of used equipment, i.e., computers, etc. -----	562.1	I
	Net (decrease) -----	-19,852.6	

Table A.--Specific Redefinitions and Coverage
Adjustments in the 1972 I-O Table
(Millions of dollars)
- continued -

From or to (-) 1/	Affected Industry	Amount	
I-O 69.0200 Retail trade			
12.0000	Receipts for oil and gas burner installation and service by fuel oil dealers -----	-176.9	
12.0000	Receipts for installing and repairing glass and screens by retailers -----	-137.4	
14.1801	Receipts for the sale of bakery products produced on the same premise by retail bakeries -----	-1,340.0	B
18.0400	Receipts for custom tailoring, dressmaking, and fur goods production by retailers -----	-201.4	X
61.0200	Receipts by boat dealers for boat repairs -----	-78.7	
65.0400	Receipts by boat dealers for boat storage -----	-16.0	
72.0200	Department store and other retail store receipts for cleaning services, portraits, repair work (electrical, jewelry, TV, shoe, appliance), and furniture reupholstering, etc. -----	-2,279.5	B
72.0300	Department store receipts for beauty and barber services--	-20.9	
73.0100	Retail store receipts for photofinishing, interior decorating, and certain equipment rental -----	-798.4	B
74.0000	Lunch counter, refreshment stand, and dining room receipts for prepared foods and drinks for immediate consumption -----	-3,289.7	B
75.0000	Receipts for automotive repair performed by shops primarily engaged in the sale of automobiles (auto dealers) or parts -----	-10,722.8	B
75.0000	Receipts for automotive rental, washing, and allied services -----	-732.3	B
76.0200	Receipts by retailers for the rental of boats, motorcycles, bicycles, and other sporting equipment ----	-68.2	
4.0000	Receipts from the resale of animals, nursery products, etc. -----	22.5	
11 & 12	Receipts from the sale of construction materials and household appliances not considered part of the value of put-in-place construction -----	183.8	
65.0300	Sale of unclaimed merchandise by warehouses -----	76.6	
65.0400	Receipt from the sale of merchandise on board boats -----	1.4	
65.0500	Receipts for merchandise sold at airports -----	90.7	
72.0100	Receipts for merchandise sales (gasoline, liquor, newspapers, candy, etc.) at hotels, motels, and camps -----	232.4	I
72.0200	Sale of merchandise by laundries, repair shops, and other personal service establishments -----	599.3	I

**Table A.--Specific Redefinitions and Coverage
Adjustments in the 1972 I-O Table
(Millions of dollars)
- continued -**

From or to (-) 1/	Affected industry	Amount
I-O 69.0200 Retail trade (con.)		
72.0300	Sale of merchandise by beauty and barber shops -----	55.9
73.0100	Sale of merchandise by business service establishments ---	360.9 I
74.0000	Sale of merchandise by eating and drinking establishments-	737.5 I
75.0000	Sale of merchandise by automobile repair and allied service establishments -----	405.1 I
76.0200	Sale of merchandise by bowling alleys, amusement parks, etc. -----	614.7 I
77.0400	Sale of merchandise (books, supplies, etc.) by private schools -----	281.2 I
77.0500	Sale of merchandise by museums, clubs, social organizations, and other membership organizations -----	1,600.6 I
	Net (decrease) -----	-14,599.6
I-O 71.0200 Real estate		
11.0000	Real estate activity of operative builders -----	1,633.7 X
73.0300	Royalty receipts of writers, etc. -----	715.8 R
	Net (increase) -----	2,349.5
I-O 72.0100 Hotels and lodging places		
69.0200	Receipts for merchandise sales (gasoline, liquor, newspapers, candy, etc.) at hotels, motels, and camps -----	-232.4 I
72.0200	Receipts for laundry and valet services -----	-27.1
72.0300	Beauty and barber shop receipts -----	-38.0
74.0000	Receipts of restaurants and lunch counters operated by hotels -----	-2,999.3 B
76.0200	Receipts for room rental in social and recreational membership clubs -----	8.5
77.0400	Revenue from housing provided by private colleges -----	424.5 B
	Net (decrease) -----	-2,863.8

Table A.--Specific Redefinitions and Coverage
Adjustments in the 1972 I-O Table
(Millions of dollars)
- continued -

From or to (-) 1/	Affected industry	Amount	
I-O 72.0200 Personal and repair services			
12.0000	Receipts for repair of central air conditioning -----	-50.3	
69.0200	Sale of merchandise by laundries, repair shops, and other personal service establishments -----	-599.3	I
73.0100	Receipts for commercial photographic services performed by photographic studios -----	-19.1	
11 & 12	Receipts for the installation of refrigeration equipment -----	383.0	X
69.0100	Receipts for electrical repair work -----	2,680.1	B
69.0200	Department store and other retail store receipts for cleaning services, portraits, repair work (electrical, jewelry, TV, shoe, appliance), and furniture reupholstering, etc. -----	2,279.5	B
72.0100	Receipts for laundry and valet services -----	27.1	
73.0100	Receipts for locksmith services and the repair of musical instruments, bicycles, and leather goods -----	120.3	
	Net (increase) -----	4,821.3	
I-O 72.0300 Beauty and barber shops			
69.0200	Sale of merchandise by beauty and barber shops -----	-55.9	
69.0200	Department store receipts for beauty and barber services -	20.9	
72.0100	Beauty and barber shop receipts of hotels, etc. -----	38.0	
	Net (increase) -----	3.0	
I-O 73.0100 Miscellaneous business services			
12.0000	Receipts for septic tank and furnace cleaning -----	-185.5	
69.0100	Receipts for merchandise including the sale of used equipment, i.e., computers, etc. -----	-562.1	I
69.0200	Sale of merchandise by business service establishments ---	-360.9	I
72.0200	Receipts for locksmith services and the repair of musical instruments, bicycles, and leather goods -----	-120.3	
73.0300	Receipts for engineering and architectural services -----	-94.9	
11 & 12	Receipts from the rental of construction equipment -----	1,130.0	B
69.0100	Receipts of sales branches and other wholesalers for computers, photocopying, and other miscellaneous machine rental and repair -----	7,287.6	B
69.0200	Retail store receipts for photofinishing, interior decorating, and certain equipment rental -----	798.4	B

**Table A.--Specific Redefinitions and Coverage
Adjustments in the 1972 I-0 Table
(Millions of dollars)
- continued -**

From or to (-) 1/	Affected industry	Amount	
I-0 73.0100 Miscellaneous business services (con.)			
72.0200	Receipts for commercial photographic services performed by photographic studios -----	19.1	
73.0300	Receipts for consulting services -----	90.8	
74.0000	Rental receipts for catering supplies, party equipment, etc. -----	<u>120.0</u>	
	Net (increase) -----	8,122.2	
I-0 73.0300 Miscellaneous professional services			
71.0200	Royalty receipts of writers, etc. -----	-715.8	R
73.0100	Receipts for consulting services -----	-90.8	
4.0000	Receipts for accounting services performed for others ----	0.9	
73.0100	Receipts for engineering and architectural services -----	<u>94.9</u>	
	Net (decrease) -----	-710.8	
I-0 74.0000 Eating and drinking places			
69.0200	Sale of merchandise by eating and drinking establishments -----	-737.5	I
73.0100	Rental receipts for catering supplies, party equipment, etc. -----	-120.0	
65.0100	Receipts from the sale of food and beverages -----	15.6	
65.0400	Receipts from the sale of meals on boats and at marinas --	26.4	
65.0500	Receipts for drinks sold on airplanes -----	33.1	
69.0200	Lunch counter, refreshment stand, and dining room receipts for prepared foods and drinks for immediate consumption -----	3,289.7	B
72.0100	Receipts of restaurants and lunch counters operated by hotels -----	2,999.3	B
76.0100	Receipts at refreshment stands and vending machines operated by theater owners -----	229.1	B
76.0200	Receipts from the sale of meals and beverages at bowling alleys, race tracks, golf courses, amusement parks, sports events, and clubs, etc. -----	1,102.0	B
77.0400	Board receipts by private schools -----	492.2	B

**Table A.--Specific Redefinitions and Coverage
Adjustments in the 1972 I-O Table
(Millions of dollars)
- continued -**

From or to (-) 1/	Affected industry	Amount	
I-0 74.0000 Eating and drinking places (con.)			
77.0500	Sale of meals and beverages by social and fraternal clubs, museums, etc. -----	491.9	B
78.0400	Receipts for food and beverage sales by Army-Air Force civilian post restaurants, officers' and enlisted men's clubs, and VA canteens -----	<u>340.7</u>	B
	Net (increase) -----	8,162.5	
I-0 75.0000 Automobile repair and services			
69.0200	Sale of merchandise by automobile repair and allied service establishments -----	-405.1	I
69.0100	Receipts for auto repair and allied services -----	1,029.3	B
69.0200	Receipts for automotive repair performed by shops primarily engaged in the sale of automobiles (auto dealers) or parts -----	10,722.8	B
69.0200	Receipts for automotive rental, washing, and allied services -----	<u>732.3</u>	B
	Net (increase) -----	12,079.3	
I-0 76.0100 Motion pictures			
74.0000	Receipts at refreshment stands and vending machines operated by theater owners -----	-229.1	B
65.0500	On plane cinema fees -----	<u>14.2</u>	
	Net (decrease) -----	-214.9	
I-0 76.0200 Amusement and recreation services			
69.0200	Sale of merchandise by bowling alleys, amusement parks, etc. -----	-614.7	I
72.0100	Receipts for room rental in social and recreational membership clubs -----	-8.5	
74.0000	Receipts from the sale of meals and beverages at bowling alleys, race tracks, golf courses, amusement parks, sports events, and clubs, etc. -----	-1,102.0	B

**Table A.--Specific Redefinitions and Coverage
Adjustments in the 1972 I-0 Table
(Millions of dollars)
- continued -**

From or to (-) 1/	Affected industry	Amount	
I-0 76.0200 Amusement and recreation services (con.)			
69.0200	Receipts by retailers for the rental of boats, motorcycles, bicycles, and other sporting equipment -----	68.2	
77.0400	Admission fees to athletic events at private colleges and universities -----	81.1	
	Net (decrease) -----	<u>-1,575.9</u>	
I-0 77.0400 Educational services			
69.0200	Sale of merchandise (books, supplies, etc.) by private schools -----	-281.2	I
72.0100	Revenue from housing provided by private colleges -----	-424.5	B
74.0000	Board receipts by private schools -----	-492.2	B
76.0200	Admission fees to athletic events at private colleges and universities -----	-81.1	
	Net (decrease) -----	<u>-1,279.0</u>	
I-0 77.0500 Nonprofit organizations			
69.0200	Sales of merchandise by museums, clubs, social organizations, and other membership organizations -----	-1,600.6	I
74.0000	Sale of meals and beverages by social and fraternal clubs, museums, etc. -----	-491.9	B
	Net (decrease) -----	<u>-2,092.5</u>	
I-0 78.0400 Other Federal Government enterprises			
74.0000	Receipts for food and beverages sales by Army-Air Force civilian post restaurants, officers' and enlisted mens' clubs, and VA canteens -----	-340.7	B
	Net (decrease) -----	<u>-340.7</u>	

1/ If the redefinition is positive, the affected industry was assigned additional output; a negative sign means that the output was taken from the affected industry and assigned to the industry shown in the left column.

Table B.--Commodity Reclassifications in the 1972 I-O Table Which
Change SIC Primary Products to I-O Secondary Products
(Millions of dollars)

Commodity classification		Commodity	Value	
From initial I-O	To final I-O			
1.0100	14.0600	Milk processed and bottled on the farm ----	1,838.0	B
1.0302	3.0000	Raw furs (mink pelts, etc.) -----	57.7	
8.0000	31.0100	Liquefied petroleum gases -----	836.5	B
9.0000	36.1900	Ground, pulverized, and otherwise treated clay, ceramic, and refractory minerals, processed in conjunction with mining or quarrying operations--includes ground talc and gypsum -----	38.8	
10.0000	27.0100	Natural sodium, borate, and potassium salts processed (mined, milled, etc.) at the mine site -----	259.3	B
10.0000	36.1900	Barite ground, pulverized, or otherwise treated in conjunction with mining or quarrying operations -----	22.2	
14.0101	1.0301	Pulled wool -----	4.6	
14.0101	14.0102	Sausages and meat specialties produced from animals slaughtered at the same plant -----	3,418.8	X
14.1401	14.1403	Prepared flour mixes or doughs produced from grains milled at the same plant ----	143.5	
14.1802	14.3200	Cracker sandwiches made from crackers produced at the same plant -----	65.0	
14.2002	14.2001	Confectionery-type chocolate and cocoa products made from cocoa beans ground at the same plant -----	288.7	X
14.3200	14.2002	Chocolate and cocoa products made from purchased chocolate -----	55.9	
16.0100	19.0200	Woven bedspreads, towels, sheets, etc., made in weaving mills -----	632.3	X
16.0300	16.0200	Finishing and printing of purchased narrow fabrics -----	17.4	
18.0201	18.0400	Knit outerwear made from yarns or fabrics knit at the same plant -----	1,365.3	X
18.0202	18.0400	Knit underwear made from yarns or fabrics knit at the same plant -----	481.5	X
18.0203	19.0200	Knit bedspreads, towels, washcloths, etc., made from yarns or fabrics knit at the same plant -----	87.1	
24.0701	24.0200	Coated paper produced in establishments without papermaking equipment -----	111.8	
26.0100	73.0200	Newspaper receipts from advertising -----	5,941.7	B
26.0200	73.0200	Periodical receipts from advertising -----	1,805.9	B
26.0400	73.0200	Catalogs, directories, and shopping news --	427.1	B

Table B.--Commodity Reclassifications in the 1972 I-O Table Which
Change SIC Primary Products to I-O Secondary Products
(Millions of dollars)
- continued -

Commodity classification		Commodity	Value	
From initial I-O	To final I-O			
26.0501	73.0200	Catalogs, directories, and advertising printing, regardless of process -----	4,331.5	B
26.0803	73.0200	Lithographic platemaking services of an advertising nature -----	111.7	
26.0803	73.0200	Typesetting of advertising material -----	232.7	X
26.0804	73.0200	Photoengraving plates of an advertising nature -----	94.1	
26.0805	73.0200	Electrotyping and stereotyping duplicate plates of an advertising nature -----	10.7	
27.0202	27.0201	Mixed fertilizers produced from purchased materials -----	651.9	X
31.0100	27.0100	Liquefied refinery gases, aliphatics, and aromatics for chemical use as feedstocks, etc. -----	1,457.9	X
36.1900	36.2100	Dead burned magnesite -----	32.2	
37.0101	27.0100	Coke oven tar and light oil derivatives ---	30.7	
37.0101	27.0201	Coke oven ammonia -----	8.1	
37.0101	37.0102	Ferroalloys made in blast furnaces -----	42.1	
37.0101	37.0300	Seamless rolled ring ferrous forgings produced in steel mills -----	266.1	X
37.0101	68.0200	Coke oven gas -----	21.3	
37.0103	37.0101	Steel wire not produced in steel mills ----	328.7	X
37.0103	42.0500	Noninsulated wire, rope, cable, strand, fencing, and other wire products made in wire drawing mills -----	865.9	B
37.0104	37.0101	Cold rolled steel sheet, strip, and bars not produced in hot rolling mills -----	1,487.1	X
37.0105	37.0101	Welded or seamless steel pipe and tubes not made in steel mills -----	1,264.5	X
38.0600	38.0100	Secondary recovery (from scrap and dross) of copper -----	560.0	X
38.0600	38.0200	Secondary recovery (from scrap and dross) of lead -----	284.6	X
38.0600	38.0300	Secondary recovery (from scrap and dross) of zinc -----	122.0	
38.0600	38.0400	Secondary recovery (from scrap and dross) of aluminum -----	408.6	X
38.0600	38.0500	Secondary recovery (from scrap and dross) of nonferrous metals, n.e.c. -----	343.0	X
38.0800	38.0400	Aluminum extrusions, billets and ingots, produced in rolling mills -----	167.1	

Table B.--Commodity Reclassification in the 1972 I-O Table Which
 Change SIC Primary Products to I-O Secondary Products
 (Millions of dollars)
 - continued -

Commodity Classification		Commodity	Value
From initial I-O	To final I-O		
38.0800	38.1000	Aluminum wire and cable made in rolling mills -----	61.0
38.0900	38.1000	Nonferrous wire, excluding copper and aluminum, produced in rolling mills -----	61.4
38.1000	42.0500	Nonferrous wire cloth and other woven wire products made in nonferrous wire drawing plants -----	33.9
58.0500	38.1000	Appliance wire and cord and flexible cord sets manufactured from purchased insulated wire -----	103.4
59.0100	59.0301	Complete vehicles (except passenger cars and motor homes) produced from purchased chassis -----	765.1 X
64.1100	73.0200	Advertising displays and specialties -----	587.4 X
66.0000	73.0200	Receipts for telephone directory advertising -----	901.2 B
67.0000	73.0200	Commercial time sales -----	4,449.6 B
67.0000	76.0200	Talent performances by radio and TV performers -----	59.3
72.0100	71.0200	Room receipts from permanent guests -----	227.3 B
73.0100	73.0200	Direct mail advertising services, graphic, and other activities relating to advertising -----	1,410.0 X
76.0100	73.0200	Receipts from screen advertising and production of TV commercials -----	87.9
77.0300	77.0100	Payments to doctors in group prepayment plans, HMO's, etc. -----	396.0 X

APPENDIX C
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- 02111 Economic Indicators of the Farm Sector: State Income and Balance Sheet Statistics. DOA, Washington, D.C., annual.
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