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Omaha Metropolitan Statistical Area Input-Output Tables and Multipliers: A User's Manual -- A Guide for Identifying and Assessing the Effects of Business Changes on the Omaha Economy

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Omaha Metropolitan Statistical Area
Input-Output Tables and Multipliers:
A User's Manual

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Center for Applied Urban Research

Russell L. Smith, Director

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Introduction

The impact of a new convention center or a new firm entering or leaving a region requires the use of multipliers to estimate the full economic effect. Multipliers account for the interactions from industries to industries and from industries to households and back, and are produced easily from input-output studies.

The last input-output study completed for the Omaha Metropolitan Statistical Area (MSA) was completed in 1969, and it was based on U.S. input-output tables from 1958. Since that time, the relative size of various Omaha industries has changed. Some experienced relative growth, others relative decline. Thus, current input-output tables were long overdue. Further, this manual provides employment and value-added multipliers (which were omitted from the last report). And, last but not least, this manual explains how to use the tables and multipliers. Hopefully, this information will help users in their decisionmaking processes.

Background

An input-output study focuses on a core sector, indicating the interrelationships of industries as buyers and sellers of goods and services to each other. This core sector connects with a final demand sector that includes consumers, government purchasers, investors, and exporters, and a final payment sector that includes compensation to employees, interest, rent, profit, and imports. The beauty of an input-output system is its ability to maintain sector detail while presenting an overview of the whole system. On a national or a regional level it remains, in Leontief's words, "our best tool for tracing impacts through an economic system" (1983).

We have come a long way since Wassily Leontief's first article on input-output analyses (1936). He worked with mechanical adding machines and crudely manufactured data. Currently, national input-output tables are produced every 5 years (approximately every 3 years in Japan). More accurate and relevant data are produced by powerful computers, resulting in reliable national tables.

Economists recognize the power of input-output studies to describe and predict local economies. Thus, they have developed input-output tables at the regional, state, and city levels. Because of budget limitations, many economists have tried to adapt national input-output tables to the unique industrial structure of a region (nonsurvey method), rather than pursue the

more resource-intensive method of surveying local industries. Although the survey method has been used for some areas, the nonsurvey method has been used more frequently because it is cost-effective.

The essence of the nonsurvey method for a regional input-output study is to adapt relationships found for the national tables. Different techniques are used to carry out this adaption. The IMPLAN system, developed by the U.S. Department of Agriculture's Forest Service at Fort Collins, Colorado, uses a technique which accounts for cross-hauling (the same goods are both exported from and imported into a region). Further, it allows aggregation of the region of concern (in this manual, the Omaha MSA, composed of Douglas, Sarpy, and Washington Counties in Nebraska and Pottawattamie County in Iowa) and of industry sectors unique to the region.

Purpose

The purpose of this study is to provide economic information to decisionmakers in the Omaha MSA and to assist them in planning and managing. Input-output studies provide a transactions table which describes all of the interrelationships (industry to industry, inputs to industry, and industry to final demanders) in monetary values. (An explanation of transactions table is provided later.) They also allow the easy development of multiplier tables, which are used to determine economic impacts.

Readers can learn much about the Omaha economy simply by reading through the input-output transactions table, which estimates the total value of products produced in Omaha. Multipliers, however, estimate how initial effects (for example, layoffs in one industry) influence other sectors or industries within the region. (The multiplier process and the use of multiplier tables are discussed later.)

This manual was developed for specialists (economic analysts, consultants, and economic development practitioners) and nonspecialists, (decisionmakers), and presents reliable employment, income, and value-added multipliers for the Omaha MSA. The last multipliers for the region were developed in 1967, and were not distributed widely.

Nonspecialists (decisionmakers) are unfamiliar with input-output studies and the techniques of economic impact analysis, but they are concerned about the effects of their decisions on various industrial sectors of the Omaha economy. They can benefit from the straightforward description of the input-output tables which provides a basic understanding of the Omaha economy. They can also benefit from the step-by-step applications of the various multipliers, from which preliminary estimates of the effects of policy

choices can be made. This, in turn, can lead to more rational decisions about the allocation of funds, for example.

Keeping these groups in mind, the purpose of the study became threefold:

- Prepare, present, and discuss the transactions table for the Omaha economy. This table provides expenditure patterns, interindustry relationships, resource expenditures, import and export patterns, and employment patterns—a comprehensive description of the economy.
- Prepare, present, and discuss tables on employment, income, and value-added multipliers. These tables show the employment, income, and value-added effects caused by changes in output of any sector within the region.
- Prepare, present, and discuss detailed explanations about how the multipliers can be used. This serves as an introduction to nonspecialists and helps them to select the correct multiplier. There is no one multiplier for a region, and, often, misleading results occur from application of the wrong multiplier.

This manual does not contain much of the detail commonly found in input-output literature. Expositions concerning the assumptions, reservations about applying the model, and complex mathematical notations are not used; thus, the manual should be more understandable to the nonspecialists. Hopefully, the specialists will not be bothered by this informality. In any case, a reading list is provided in the appendix for anyone who seeks additional information.

Organization

This manual is divided into three sections and an appendix. The first section is the introduction which presents background information, identifies the purpose of the study, and describes its organization.

The second section presents the industry transactions table, which shows the monetary transactions from final demanders to industries, among industries, and from industries to final inputs. Also included is the direct coefficients table which converts the total monetary amounts into fractions, that is, it shows how a \$1 increase in output of an industry would be distributed among the supplying industries. This section explains how to read the tables and identifies noteworthy characteristics of the Omaha economy, such as rank order of Omaha industries by value-added.

The third section presents tables of multipliers for the Omaha economy, including employment multipliers, income (personal and total) multipliers, and value-added multipliers. These tables are primarily for specialists but can also be used by nonspecialists who should be able to understand the descriptions and examples that explain how to use the various multipliers.

The appendix includes a table that shows the aggregation plan for the industry sectors in great detail which includes Bureau of Economic Analysis Industry numbers and Standard Industrial Classification (SIC) codes (Survey of Current Business, May 1984), price deflators for industry sectors from 1982 to 1985, and a glossary of terms.

Input-Output Transactions

In setting up the input-output model a number of decisions must be made. What data source? Survey? Nonsurvey? What areas should be included in the Omaha region? How many industry sectors? How should the industries be aggregated? An inexpensive and flexible method of developing an input-output model for Omaha was provided by the IMPLAN system.

Model Development

IMPLAN is a computer-based system developed by the U.S. Department of Agriculture's, Forest Service to assist in land management planning. The system derives regional input-output models from the U.S. input-output tables of 1977, which have 528 sectors. Regions can be as small as a single county, or they can include any combination of counties.

The IMPLAN system has adopted the 1977 national input-output tables to include the results of the 1982 Census of Industries. Because this census provided the most recent data available, 1982 was used as the base year for the Omaha input-output tables. Thus, all output, price, employment, and other data are reported for 1982.

Although the 1982 data were 5 years old when this manual was prepared, fundamental production relationships change very slowly. Industries can be recognized by the characteristics of their relationships with other industries 20 years later. So, although the Omaha model is based on 1982 data, it should be usable for some time to come.

The IMPLAN system is noteworthy when compared with other attempts to adapt the coefficients of the national input-output tables to the regional level; it allows for goods to be cross-hauled between regions. Other methods of adjustment allow a good or service that is in excess supply in a region to be exported but not imported, and those in excess demand to be imported but not

exported. This is not realistic because firms purchase supplies outside the region, although one or more suppliers may exist within the region. So, the same good may be both imported and exported, that is, cross-hauled. This is a significant advantage of the IMPLAN system.

Aggregation Plan

Two areas in which the IMPLAN system allows flexibility to the user are determining the geographic region and developing the aggregation scheme for the industrial sectors.

Geographic Aggregation. The objective of this study was to obtain an input-output system for the Omaha economy. To determine the relevant geographic area, the area that includes most of the labor force had to be identified. To exclude Sarpy County, for example, which provides a large proportion of the labor force within the city of Omaha, would lead to underestimation of employment and other economic effects. A high degree of industrial and demand interdependence are also important in determining the relevant area.

Thus, the entire Omaha Metropolitan Statistical Area (MSA), which is composed of Douglas, Sarpy, and Washington Counties in Nebraska and Pottawattamie County in Iowa, was included in the Omaha economy.

Industry Aggregation. Industry aggregation was much more complex than geographical aggregation. First, for industries to be combined they must have similar production techniques and distribution of sales. For example, industries such as creamery butter and cheese would be grouped together, while neither would be grouped with the glass containers industry. Standard Industrial Classification (SIC) codes were used to determine similar industries, because SIC codes are based on similar production processes.

Second, industries that did not exist in the Omaha MSA were excluded. This was a straightforward task because the IMPLAN system automatically excludes these industries when deriving a transactions table.

Third, industries that were significant in the Omaha MSA remained less aggregated, and some remained as separate sectors. At the same time, the number of sectors had to remain tractable, that is, in the range of 30 to 60 sectors.

The size of employment was the main variable used in considering an industry's significance. As a result, industries such as meat packing, grain mill products, railroads, and insurance were considered as separate sectors and were not aggregated within a larger industrial grouping (for example,

railroads within transportation or insurance within finance, insurance, and real estate).

The fourth consideration addressed concerns about the number of visitors to Omaha. This led to isolation of industries that are important to tourism, such as hotels and lodgings, personal services, and eating and drinking places.

The resulting aggregation scheme for industries is shown in table 1. A more detailed listing, which includes Bureau of Economic Analysis industry numbers and SIC codes, is presented in table 11 (appendix). The SIC code is the only information needed by a firm to locate its industry sector.

Table 1 contains no surprises in showing firms and industries that are significant or unique to the Omaha economy, for example, meat products; preserved foods; grain mill products; commercial printing; farm machinery and equipment; radio, tv, and communications equipment; railroads; motor freight transport; communications; insurance; and information services.

Transactions Table

Using the geographic and industry aggregation schemes specified above, the IMPLAN system was used to produce the input-output transactions table for the Omaha MSA (table 2).

This table consists of three main sectors: An interindustry transactions sector, a final demand sector, and an inputs payment sector.

The interindustry transactions sector which includes the columns and rows from 1 to 48 shows (in dollar values at producers' prices) the purchasing patterns of an industry from other industries, as we read down a column. Alternatively, it shows the distribution pattern of supplies from an industry to other industries, as we read across a row. For example, look at column number 44, eating and drinking places. Reading down the column, we expect important suppliers to eating and drinking places to be indicated by large dollar amounts. Examples are row 6 (meat products) which supplies \$28.3 million in output to the eating and drinking places sector; row 10 (other food and kindred products) which supplies \$21.3 million; row 35 (wholesale trade) which supplies \$30.2 million; and so on. Examples of industries that are not expected to be important suppliers are indicated by small dollar amounts, such as row 3 (mining), \$7,500; row 25 (radio, tv, and communications equipment), \$7,310; and row 27 (transportation equipment), \$11,520.

As an example of distribution of a supplier, look at row 6 (meat products). Examples of industries supplied by the meat products industry are meat products itself, which receives \$131.4 million in output; column 7 (preserved foods) which receives \$6.0 million of meat products' output;

Table 1
Sector Classifications Used in the Omaha MSA Input-Output Study

Resource Industries

1. Livestock
 - Feedlot and range fed cattle, dairy farms
 - Pigs, other livestock
2. Other Agriculture
 - Field crops, landscaping
 - Agricultural services
3. Mining
 - Sand and gravel, stone
 - Crude petroleum

Construction

4. New Construction
 - Residential, commercial, utility
 - Highways and streets
5. Maintenance and Repair Construction
 - Residential, other

Food Products

6. Meat Products
 - Meat packing, sausages
7. Preserved Foods
 - Frozen specialties
8. Grain Mill Products
 - Cereal, prepared feeds
 - Flour, pet food
9. Bakery Products
 - Bread, cakes, cookies
10. Other Foods
 - Dairy products, soft drinks, macaroni
 - Fats and oils, coffee, malt liquors, other foods

Manufacturing*

11. Textile and Apparel
 - Nonwoven fabrics, canvas products
 - Curtains, house furnishings
12. Wood Products
 - Kitchen cabinets, millwork, handwood dimension
 - Prefabricated buildings, pallets, and skids
13. Furniture and Fixtures
 - Partitions and fixtures upholstered
 - Mattresses, household
14. Paper Products
 - Containers, coating, and glazing
 - Bags, envelopes, die-cut
15. Commercial Printing
 - Engraving
16. Other Printing and Publishing
 - Newspapers, business forms, books
 - Lithographics, typesetting, binding
17. Chemicals and Petroleum Products
 - Fertilizer, drugs, soaps, paints
 - Lubricating oils, plastic materials
18. Rubber, Plastics, and Leather
 - Hose, tanning
19. Stone, Clay, and Glass
 - Concrete
20. Primary Metals
 - Foundries, lead
 - Wire drawing

*Other than food products.

- 21. Fabricated Metals
 - Cans, sash and doors, structural
 - Sheet metal, foil, and leaf
 - Screw machine products, pipes and fittings
- 22. Farm Machinery and Equipment
 - Lawn and garden
- 23. Office and Computing Equipment
 - Office machinery
- 24. Other Nonelectric Machinery
 - Pumps and compressors
 - Food products machinery
 - Special dies and tools
- 25. Radio, TV, and Communications Equipment
 - Telephone and telegraph
 - Records and tapes
- 26. Other Electric and Electronic Equipment
 - Electronic components, batteries
 - X-ray apparatus
- 27. Transportation Equipment
 - Truck bodies and trailers
 - Motor vehicle parts
- 28. Instruments
 - Photographic equipment
 - Ophthalmic goods
- 29. Other Manufacturing
 - Needles and pins
 - Brooms and brushes, signs

Transportation, Communication, and Utilities

- 30. Railroads
- 31. Motor Freight Transport
 - Warehousing

- 32. Other Transportation
 - Public transit, interurban taxi
 - Air, water, pipelines
 - Services, post office
- 33. Communications
 - Telephone and telegraph
 - Broadcasting
- 34. Utilities
 - Electric, natural gas
 - Water, sanitary services

Trade

- 35. Wholesale
- 36. Retail

Finance, Insurance, and Real Estate

- 37. Finance
 - Banks, loan companies, security dealers
- 38. Insurance
 - Carriers, agents
- 39. Real Estate

Services

- 40. Hotels and Lodging
- 41. Personal Services
 - Cleaning, shoe repair
 - Photographic, beauty shops
 - Automobile
- 42. Business Services
 - Advertising agencies, legal
 - Accounting, research, engineering
 - Building services

- 43. Information Services
 - Computer and data processing, telemarketing
 - Reservations, credit card service
 - Direct mail advertising, credit reporting
- 44. Eating and Drinking Places
- 45. Amusement and Recreation Services
 - Bowling alleys, pool halls, golf courses, sports clubs
 - Commercial sports, motion pictures
 - Theatrical producers, entertainers
- 46. Other Services
 - Health, education, and social services
 - Membership organizations
- 47. Government Enterprise
- 48. Special Industries
 - Government, households, and rest of the world industries
 - Inventory valuation adjustment

column 17 (chemicals and petroleum products) which receives \$1.2 million; and column 44 (eating and drinking places) which receives \$28.3 million. Industries such as primary metals, commercial printing, and mining (columns 20, 15, and 3) receive nothing from meat products, as we would expect.

One point illustrated by the figures in the interindustry transactions sector is that total production by all industries within the region for industries within the region must equal the total inputs received from industries within the region. That is, total intermediate demand must be the same as total intermediate supply, which is about \$4.3 billion. The figure can be located at the bottom of the intermediate demand column and at the extreme right of the intermediate supply row.

The final demand sector of the transactions table consists of the seven columns to the right of the interindustry matrix; one column each for consumption, investment, federal government spending, state and local government spending, and exports. All of which are summed in another column, final demand. The total demand column indicates total output produced (in dollars) by each sector and supplied to either other industries (intermediate demand) or as final demand.

As we read down each column in the final demand sector, the purchase of goods from each industrial sector can be determined. For example, the consumption column indicates that consumers purchased \$67.7 million within the region from the meat products industry (row 6), \$137.8 million from insurance (row 8), and \$272.9 million from eating and drinking places (row 44). Within the investment category, \$75.0 million was spent for farm machinery and equipment (row 22); and under regional exports, about \$0.56 billion was purchased from the insurance industry (row 38) from outside the Omaha region.

The third major sector of the transactions table is the inputs purchased sector which is made up of the bottom nine rows of the table. This sector indicates the use of inputs of labor, that is, employee compensation; capital equipment, land and structures under proprietary income and other proprietary income; and payments made to government as indirect business taxes.

The addition of these items is the value-added by each industry. The aggregate value-added for the Omaha economy is often called gross regional product and is a measure of the total wealth produced in Omaha. Conceptually, it is equivalent to gross national product for the United States. As an example, if we read down column 8 (grain mill products), we see that \$46.4 million is paid within the industry to employee compensation, \$1.6 million to indirect business tax, and \$60 million to proprietary income (interest premiums, rents, and profits). The total value-added by grain mill products within the Omaha MSA is \$108 million.

Additional rows are also included in the inputs purchased sector. One is imports, by each industry from outside the region; the other is the number of employees (both full- and part-time) within each industry. The grain mill products industry imported \$138.9 million from outside the region and employed 1,620 individuals in 1982.

Direct Coefficients Table

The direct coefficients shown in table 3, are derived from the interindustry transactions table. Instead of total dollar amounts it shows the proportion of each dollar of output sold by the industry (at the top of the industry column) that must be spent for inputs from an industry (indicated to the left of each row). For example, for every \$1 of output from the bakery products industry (column 9), 2.7 cents (\$.02698) is spent on inputs from the grain mill products industry (row 8), 3.3 cents (\$.03252) on other foods (row 10), 1.4 cents (\$.01350) on paper products (row 14), 4.3 cents (\$.04298) on wholesale trade (row 35), and so on.

This table can be used to supplement information gained from the transactions table, but its main use is for a mathematical technique called inversion, which results in the total requirements table which, in turn, is used to derive multipliers tables (discussed later).

Characteristics of the Omaha Economy

The transactions table provides a wealth of interesting detail on the Omaha economy. A few aggregate statistics, however, provide some insight into the characteristics of the Omaha economy, notably: Value-added by industry, value-added of exports by industry, and the aggregate net export figures.

Gross Regional Product (Value-added)

Regional value-added is the increase in value resulting from the application of labor, capital, and other resources that are located within the Omaha MSA. The application of resources results in incomes received by the owners of these resources through wages and salaries, rents, interest, and profits. Thus, value-added is equal to the incomes received within the Omaha MSA.

Because of the increase in value that occurs within Omaha and because of the total incomes received within the region, the total value-added is a

measure of the economic well-being of Omaha (the gross regional product which is the regional equivalent of the gross national product).

The interindustry transactions table shows in the final column that the total value-added (gross regional product) of the Omaha MSA in 1982 was approximately \$8.5 billion. Given an estimated 596,000 residents in 1982, the regional production per capita was \$14,176, compared with \$13,239 for the entire United States.

Table 4 shows how the various industrial sectors in Omaha compare in producing wealth and income (value-added) within the region. These figures can also be seen along the value-added row of the transactions table, table 3. Real estate heads the list of value-added with \$949 million, while wood products contribute the least at \$6.5 million.

The importance of various industries has changed since the previous input-output study was completed (Stolen and Chang, 1967). Services (which includes other services, business services, personal services, information services, eating and drinking places, and hotels and lodgings) has increased from 10.8 percent of total regional value-added in 1963, to 22.2 percent in 1982. This is consistent with the national trend, which is moving away from manufacturing and agriculture toward service industries, and, as a by-product, contributes to greater stability of the Omaha economy. Other increases of significance are as follows: Real estate from 9.7 percent to 13.1 percent, transportation and warehousing (includes railroads, motor freight, and other transportation) from 5.6 percent to 7.9 percent.

Some of the industries within the Omaha region that experienced relative declines between 1963 and 1982 were as follows: Food and kindred products (includes meat products, grain mill products, bakery products, preserved foods, and other foods) from 12.7 percent to 5.2 percent; retail and wholesale trade, from 19.6 percent to 16.5 percent; finance and insurance, from 12.5 percent to 7.6 percent; livestock and livestock products, from 1.9 percent to .5 percent.

Exports

Industrial output within a region, other than intermediate goods and services, is either exported or consumed within the region. Exports to other regions bring in money and generate incomes that are respent for goods and services which are produced within the region or imported. An increase in exports brings more money into the region, and, as a consequence, expands the region's wealth.

Table 4
Relative Importance of Sectors in the Omaha MSA,
by Value-added, 1982¹

Rank	Sector	Value-added (\$1,000)	Percent of total
1	Real estate	949,474	13.12
2	Other services	613,992	8.49
3	Retail trade	608,547	8.41
4	Wholesale trade	585,428	8.09
5	Communications	360,498	4.98
6	Business services	359,330	4.97
7	Insurance	324,847	4.49
8	Utilities	257,964	3.57
9	Railroads	239,359	3.31
10	Finance	223,377	3.09
11	Personal services	223,287	3.09
12	Motor freight transport	192,952	2.67
13	Eating and drinking places	191,461	2.65
14	New construction	186,318	2.58
15	Information services	159,967	2.21
16	Other transportation	138,957	1.92
17	Radio, tv, and communication equipment	132,358	1.83
18	Meat products	124,300	1.72
19	Maintenance and repair construction	123,511	1.71
20	Other agriculture	119,900	1.66
21	Grain mill products	108,081	1.49
22	Chemicals and petroleum products	99,051	1.37
23	Other foods	76,781	1.06
24	Primary metals	73,703	1.02
25	Office and computing equipment	67,194	0.93
26	Fabricated metals	60,674	0.84
27	Farm machinery and equipment	51,125	0.71
28	Printing and publishing	49,595	0.69
29	Bakery products	44,033	0.61
30	Paper products	42,953	0.59
31	Commercial printing	42,210	0.58
32	Furniture and fixtures	41,597	0.57
33	Government enterprises	39,428	0.54
34	Livestock	38,014	0.53
35	Amusement and recreation	34,379	0.48
36	Other nonelectric machinery	33,999	0.47
37	Other manufacturing	30,664	0.42
38	Hotels and lodging	24,941	0.34
39	Preserved foods	24,450	0.34
40	Rubber, plastics, and leather	24,089	0.33
41	Mining	23,792	0.33
42	Instruments	23,493	0.32
43	Transportation equipment	21,216	0.29
44	Other electric and electronic equipment	13,015	0.18
45	Textiles and apparel	12,686	0.18
46	Stone, clay, and glass	11,217	0.16
47	Wood products	6,941	0.10
	Total	7,235,148	100.00

¹ The \$7.2 billion total value-added excludes special industries which, if included, would total \$8.5 billion as indicated in the transactions table.

Value-added of Exports. Although the merits of exporting industries are known and explain public officials' eagerness to attract them to locate in Omaha, it is not the whole story. Wealth within the region can also be increased by establishing firms within the region to replace imports. As a result, money that would leave the region to pay for imports would stay within the region and increase the incomes of residents. This is increasing regional wealth by import substitution.

An import substitution policy may be more effective in increasing the region's wealth than attempts to attract export industries. In the latter case, local public officials are in competition with officials from other regions, and, frequently, they make concessions in the bidding process that reduce the net benefits. Second, a regional economy that is diversified and in which most of the wealth is produced internally is less vulnerable to variations in demand for its exports; that is, it is more stable.

Nevertheless, it is interesting to examine the various industrial sectors when they are ranked by the income produced (value-added) in Omaha from export activity. Table 5 shows the relative importance of industrial sectors according to the value-added by regional exports.

As expected, industrial sectors which characterize the Omaha region rank near the top of the list. Insurance (ranked 1); railroads (ranked 3); communications (ranked 6); radio, tv, and communications equipment (ranked 8); grain mill products (ranked 9); and meat products (ranked 10) are all familiar and important industries within the region.

Some surprises among the industries that are highly ranked by value-added of exports are other services, which includes the health sector and education, and the motor freight transport industry. One industry expected to expand in exports in the Omaha region in the future is information services, presently ranked 16, which includes data processing and telecommunications.

Total Net Exports. An item which raises some interesting questions is net exports. The interindustry transactions table shows that total regional exports are about \$6.4 billion, while total regional imports are about \$3.7 billion. Therefore, net exports are about \$2.7 billion (\$6.4 - \$3.7 billion); thus, more goods and services leave the Omaha region than enter.

This net outflow of goods and services must be balanced by a net outflow of incomes of an equal amount. Some of this outflow can be accounted for by indirect business taxes (\$0.6 billion) going to the state and federal governments. However, assuming that all of these taxes go out of the region. It is still necessary to explain where \$2.1 billion goes. If little of the \$5.4 billion paid as employee compensation leaves the region because few employees live outside the region, the explanation must be proprietary income

Table 5
Relative Importance of Sectors in the Omaha MSA,
by Value-added of Regional Exports, 1982 ¹

Rank	Sector	Value-added of regional exports (\$1,000)	Percent of total
1	Insurance	198,592	6.69
2	Other services	196,734	6.62
3	Railroads	194,455	6.55
4	Wholesale trade	168,271	5.67
5	Retail trade	137,344	4.63
6	Communications	133,915	4.51
7	Real estate	132,317	4.46
8	Radio, tv, and communication equipment	100,766	3.39
9	Grain mill products	100,021	3.37
10	Meat products	94,114	3.17
11	Utilities	86,819	2.92
12	Other agriculture	85,772	2.89
13	Motor freight transport	84,378	2.84
14	Primary metals	65,550	2.21
15	Chemicals and petroleum products	60,003	2.02
16	Information services	50,351	1.70
17	Other transportation	49,842	1.68
18	Fabricated metals	48,902	1.65
19	Business services	43,484	1.46
20	Other foods	43,397	1.46
21	Personal services	41,226	1.39
22	Eating and drinking places	36,529	1.23
23	Office and computing equipment	35,853	1.21
24	Furniture and fixtures	30,081	1.01
25	Other nonelectric machinery	28,413	0.96
26	Other manufacturing	27,491	0.93
27	Bakery products	26,140	0.88
28	Paper products	24,208	0.82
29	Preserved foods	23,321	0.79
30	Other printing and publishing	23,491	0.79
31	Rubber, plastics, and leather	22,623	0.76
32	Commercial printing	19,918	0.67
33	Instruments	18,401	0.62
34	Finance	17,313	0.58
35	Farm machinery and equipment	16,017	0.54
36	New construction	15,251	0.51
37	Maintenance and repair construction	14,133	0.48
38	Mining	13,511	0.46
39	Transportation equipment	13,568	0.46
40	Stone, clay, and glass	10,639	0.36
41	Government enterprises	8,099	0.27
42	Textile and apparel	6,821	0.23
43	Other electric and electronic equipment	4,883	0.16
44	Amusement and recreation	2,191	0.07
45	Wood products	1,961	0.07
46	Livestock	1,918	0.06
47	Hotels and lodging	114	0.00
	Total	2,969,593	100.00

¹ Value-added of regional exports is obtained by multiplying the average value-added per output of an industry by the value of the regional exports.

(payments to property owners, profits, and payments to owners of capital equipment who live outside the region).

The total of both elements of proprietary income is \$2.4 billion, which means that 85 percent (\$2.1/\$2.4 billion) of the rent, interest, profits, and payments other than employee compensation and indirect business taxes are received by nonresidents or institutions outside Omaha. To put it another way, of the \$8.4 billion value-added income created in Omaha, approximately \$2.1 billion (24 percent) is received by nonlabor from outside the region.

It is not too surprising that the split between labor and nonlabor payments is 72 percent and 28 percent. This agrees with other measures of the income split. What is interesting is the proportion of nonlabor payments that leave the region. It is, however, at least consistent with the traditional view that Omaha supplies a productive labor force with a solid work ethic, and, because of this, it appears that Omaha is a great place to make investments.

Multipliers

Before readers can use the multipliers presented in this section, they must understand what multipliers are or, more specifically, what the multiplication process is.

Understanding the Multiplier Process

The idea behind the multiplier is that any change in one variable, such as employment in a given industry, will have an effect that is greater than the initial effect. For example, a layoff of 100 employees at one plant may lead to a total layoff of 250 employees throughout the Omaha economy. In this case, the employment multiplier would be 2.5.

Basically, this occurs because the various sectors of the economy (for example, industries, households, and exports) interact by buying from and selling to each other. A reduction in production levels and employment in one industrial sector leads to reductions in output and income payments in other sectors. This, in turn, leads to more changes in other industries, and so on. The net result is that the initial impact in one sector gets multiplied throughout the economy.

Consider the direct requirements of each industry shown in table 3. This table shows the amount of expenditures for inputs (from industries listed at the left of each row) for each \$1 increase in output (by the industry listed at the top of the column). For example, the industry listed at the top of column 15, commercial printing, will purchase 1.549 cents from utilities (listed at the right of row 34) and 4.702 cents from wholesale trade (listed at the right of

row 35) for each \$1 increase in its sales. Or, for each \$1,000 increase in sales by commercial printing, \$15.49 ($\$1,000 \times .01549$) will be purchased from utilities and \$47.02 ($\$1,000 \times .04702$) from wholesale trade. Any sum other than \$1,000 can be used and its effect shown similarly.

Now, just to get the idea of how the multiplier process works, follow the \$47.02 increase in wholesale trade by going to the top of column 35. By looking down to row 42, we see that for each \$1 purchase from wholesale trade 4.359 cents is purchased from business services by the wholesale trade industry. Or, a \$47.02 increase in output from wholesale trade leads to a \$2.05 ($47.02 \times .04359$) increase in output from business services. The \$2.05 increase in output from business services (listed at the top of column 42) leads, in turn, to a 5.09 cents ($\$2.05 \times .03541$) increase in real estate (row 39).

So, a \$1,000 increase in commercial printing leads to a \$47.02 increase in the purchase of wholesale trade. As a result, wholesale trade purchases \$2.05 from business services, which in turn purchases \$0.05 from real estate. Thus, a \$1,000 increase in output has become \$1,049.12 ($\$1,000 + \$47.02 + \$2.05 + \0.05).

This is only one path of purchases from the original \$1,000 increase of commercial printing's output. Other paths are occurring at the same time. Some of the more significant industries commercial printing also buys from are chemicals and petroleum (row 17) \$18.59 ($\$1,000 \times .08159$); railroads (row 30) \$5.67 ($\$1,000 \times .00567$); motor freight transport (row 31) \$9.16; communications, (row 33) \$8.17; and other firms in the commercial printing industry, \$18.40. These industries will increase purchases from still other industries.

In fact, the aggregate of all the increases, including the initial \$1,000 from commercial printing, adds up to a \$1,690 change in output for the Omaha MSA.

The initial impact for starting this multiplier process was output, but it could have been any variable (output, income, and employment are the most common initial impacts observable). The total effect was given in terms of output, but it also could have been any variable (personal income, employment, and value-added are the most common variables of interest). In essence, the multiplier is the estimate of how one variable will affect another variable as a result of the interaction among all sectors of the economy.

There are many different multipliers for the Omaha MSA, and to achieve an accurate estimate of the full effects of any initial economic impact, we must use the correct multiplier. The various multipliers will be discussed later, but, first, let us determine how the multipliers are obtained.

Total Requirements Table

Recall that the direct requirements table shows the proportion of each dollar increase in output that an industry spends for inputs (the outputs of other industries)—the direct effect. The industries providing these inputs then increase their purchases from other industries, and so on—the indirect effect. Now, we can determine the combined purchases—direct and indirect effects—resulting from all rounds of purchases by all industries using a mathematical technique called inversion. Carrying out this inversion on the direct requirements table results in the total requirements table (often referred to as the Leontief Inverse) (table 6).

To illustrate the meaning of the total requirements table let us again use the example of the commercial printing industry experiencing an increase in output of \$1,000. Reading down column 15 to row 15 indicates that the effect on output from the commercial printing industry itself is an increase of \$1,011.94 ($\$1,000 \times 1.01194$). This increase consists of the direct effect and the indirect effects as all industries experiencing increases in output increase their purchases from commercial printing. Purchases from wholesale trade (row 35) increase by \$53.47 ($\$1,000 \times .05347$), although initially commercial printing purchased \$47.02 (as indicated in the direct requirements table). Thus, the total requirements table is more useful because it takes into account a wider range of effects (direct and indirect) than the direct requirements table.

There is yet another effect—the induced effect. The induced effect takes into consideration the fact that when industries expand (or contract) their output, incomes to households, which supply the inputs, are affected. These inputs are primarily labor, which receives wages and salaries (employee compensation); land, which receives rent; capital, which receives interest, and so on. Households, in turn, increase their expenditures for the output of regional industries, which means that total output of the region increases even more.

We can include the household sector in a row and column and derive a new total requirements table, one that is said to be closed with respect to households. (The one used in this manual, however, excludes all such induced effects and is said to be open.) However, the IMPLAN system, in an attempt to be more realistic, carries out a different methodology for treating households and does not produce closed total requirements tables. It does, however, in the table of multipliers include the induced effect (household interaction), along with the direct and indirect effects.

Multiplier Tables

As indicated earlier, any number of multipliers can be used. The ones published here for the Omaha MSA are as follows: Value-added multipliers (table 7), total income multipliers (table 8), personal income multipliers (table 9), and employment multipliers (table 10).

Output multipliers are also available from IMPLAN, but are not published here. The main use of the output effects is to obtain value-added, income, and employment effects. In terms of importance to the Omaha economy, output effects alone are misleading because the value of inputs is counted again in the value of the outputs they are used to produce, as a result, they over-value effects. Further aggregate output effects combine the outputs of different industries, for example, the output of bakery products is added to the output of real estate and so on, which is not very meaningful. Finally, the inclusion of the output multiplier table would increase the likelihood of its misuse.

Value-added Multipliers

A good or service is purchased in the marketplace because it is desirable for its own sake or because it is useful in doing something else. It is said to have worth or value. In the market system, value is expressed by price. The process of adding value occurs when we take a good or service as an input and alter it in such a way that it is worth more on the market and commands a higher price. By this process, an individual or group adds to wealth, well-being, or value and, at the same time, increases their incomes.

The importance of value-added is, on one hand, the contribution a region makes to the region, nation, and, if exported, the world, and, on the other hand, equal to the income accruing within the region. So, a region's value-added, which can be referred to as the gross regional product, is at the same time the wealth produced in the region and the income received in the region. It is an important measure because it includes employee compensation, proprietary income, and government revenues received because of economic activity in the region. It is the economic pulse, the single measure of a region's vitality.

Direct Value-added. The most important columns from table 7 are the direct, total, Type III, and induced factor columns. The direct column indicates the proportion of industry output that is due to value-added—the value-added per output ratio. Thus, 45.9 cents of every \$1 of output from bakery products (sector 9) is a result of value-added by the bakery products

Table 7
Value-added Multipliers, Omaha MSA, 1982

Sector	Direct	Indirect	Induced	Total	Type I	Type III	Induced Factor
1 Livestock	0.116	0.142	0.080	0.338	2.22	2.91	1.31
2 Other agriculture	0.483	0.219	0.127	0.829	1.45	1.72	1.18
3 Mining	0.594	0.198	0.102	0.894	1.33	1.51	1.13
4 New construction	0.346	0.237	0.224	0.807	1.69	2.34	1.38
5 Maintenance and repair construction	0.461	0.161	0.164	0.786	1.35	1.71	1.26
6 Meat products	0.118	0.179	0.090	0.386	2.52	3.28	1.30
7 Preserved foods	0.250	0.253	0.163	0.666	2.01	2.66	1.32
8 Grain mill products	0.291	0.237	0.108	0.635	1.81	2.19	1.21
9 Bakery products	0.459	0.195	0.181	0.835	1.42	1.82	1.28
10 Other foods	0.275	0.195	0.113	0.583	1.71	2.12	1.24
11 Textile and apparel	0.328	0.128	0.197	0.653	1.39	1.99	1.43
12 Wood products	0.324	0.191	0.247	0.763	1.59	2.35	1.48
13 Furniture and fixtures	0.384	0.189	0.238	0.811	1.49	2.11	1.41
14 Paper products	0.317	0.154	0.133	0.603	1.48	1.90	1.28
15 Commercial printing	0.453	0.161	0.223	0.837	1.35	1.85	1.36
16 Other printing and publishing	0.445	0.200	0.201	0.846	1.45	1.90	1.31
17 Chemicals and petroleum products	0.312	0.231	0.113	0.656	1.74	2.10	1.21
18 Rubber, plastics, and leather	0.389	0.196	0.191	0.776	1.50	2.00	1.33
19 Stone, clay, and glass	0.364	0.229	0.181	0.774	1.63	2.13	1.31
20 Primary metals	0.301	0.163	0.109	0.573	1.54	1.90	1.24
21 Fabricated metals	0.339	0.153	0.141	0.632	1.45	1.87	1.29
22 Farm machinery and equipment	0.358	0.192	0.145	0.695	1.54	1.94	1.26
23 Office and computing equipment	0.538	0.206	0.136	0.880	1.38	1.64	1.18
24 Other nonelectric machinery	0.424	0.154	0.192	0.770	1.36	1.82	1.33
25 Radio, tv, and communication equipment	0.399	0.200	0.150	0.749	1.50	1.88	1.25
26 Other electric and electronic equipment	0.366	0.203	0.202	0.771	1.55	2.11	1.35
27 Transportation equipment	0.319	0.132	0.158	0.609	1.42	1.91	1.35
28 Instruments	0.526	0.155	0.163	0.843	1.29	1.60	1.24
29 Other manufacturing	0.483	0.166	0.233	0.881	1.34	1.83	1.36
30 Railroads	0.536	0.161	0.183	0.880	1.30	1.64	1.26
31 Motor freight transport	0.594	0.231	0.222	1.047	1.39	1.76	1.27
32 Other transportation	0.580	0.171	0.243	0.994	1.29	1.71	1.32
33 Communications	0.840	0.078	0.178	1.096	1.09	1.30	1.19
34 Utilities	0.247	0.152	0.075	0.473	1.62	1.92	1.19
35 Wholesale trade	0.666	0.205	0.251	1.122	1.31	1.69	1.29
36 Retail trade	0.725	0.179	0.380	1.284	1.25	1.77	1.42
37 Finance	0.626	0.250	0.285	1.161	1.40	1.85	1.33
38 Insurance	0.352	0.278	0.241	0.871	1.79	2.48	1.38
39 Real estate	0.807	0.138	0.057	1.002	1.17	1.24	1.06
40 Hotels and lodging	0.429	0.317	0.493	1.239	1.74	2.89	1.66
41 Personal services	0.529	0.188	0.179	0.896	1.35	1.69	1.25
42 Business services	0.704	0.183	0.269	1.156	1.26	1.64	1.30
43 Information services	0.719	0.179	0.213	1.110	1.25	1.54	1.24
44 Eating and drinking places	0.407	0.243	0.420	1.070	1.60	2.63	1.65
45 Amusement and recreation	0.531	0.261	0.550	1.341	1.49	2.53	1.69
46 Other services	0.562	0.236	0.351	1.150	1.42	2.05	1.44
47 Government enterprises	0.433	0.222	0.226	0.880	1.51	2.03	1.34
48 Government industry	1.000	0.000	0.549	1.549	1.00	1.55	1.55
49 Household industry	1.000	0.000	3.003	4.003	1.00	4.00	4.00

1

The direct, indirect, induced, and total columns indicate the fraction of a \$1 increase in value-added for each \$1 increase in output. For example, a \$1 increase in output of preserved foods (row 7) involves a direct increase of \$.25 of value-added in the preserved foods industry, an indirect effect adds \$.253 in the supporting industries (including preserved foods), value-added for all industries in the Omaha MSA increases by \$.666.

Table 8
Total Income Multipliers, Omaha MSA, 1982

Sector	Direct	Indirect	Induced	Total	Type I	Type III	Induced Factor
1 Livestock	0.096	0.129	0.071	0.296	2.34	3.08	1.31
2 Other agriculture	0.465	0.192	0.113	0.770	1.41	1.66	1.17
3 Mining	0.511	0.176	0.091	0.778	1.34	1.52	1.13
4 New construction	0.335	0.216	0.199	0.751	1.65	2.24	1.36
5 Maintenance and repair construction	0.447	0.142	0.146	0.734	1.32	1.64	1.25
6 Meat products	0.115	0.159	0.080	0.353	2.38	3.07	1.29
7 Preserved foods	0.246	0.228	0.144	0.618	1.93	2.51	1.30
8 Grain mill products	0.286	0.216	0.096	0.599	1.76	2.09	1.19
9 Bakery products	0.455	0.179	0.161	0.794	1.39	1.75	1.25
10 Other foods	0.254	0.178	0.101	0.532	1.70	2.10	1.23
11 Textile and apparel	0.321	0.116	0.175	0.611	1.36	1.91	1.40
12 Wood products	0.311	0.172	0.220	0.703	1.55	2.26	1.45
13 Furniture and fixtures	0.378	0.173	0.211	0.761	1.46	2.02	1.38
14 Paper products	0.305	0.140	0.118	0.563	1.46	1.84	1.26
15 Commercial printing	0.440	0.146	0.198	0.785	1.33	1.78	1.34
16 Other printing and publishing	0.436	0.184	0.178	0.798	1.42	1.83	1.29
17 Chemicals and petroleum products	0.295	0.211	0.100	0.606	1.72	2.06	1.20
18 Rubber, plastics, and leather	0.381	0.180	0.170	0.730	1.47	1.92	1.30
19 Stone, clay, and glass	0.346	0.209	0.161	0.716	1.60	2.07	1.29
20 Primary metals	0.279	0.148	0.097	0.524	1.53	1.88	1.23
21 Fabricated metals	0.330	0.139	0.125	0.594	1.42	1.80	1.27
22 Farm machinery and equipment	0.351	0.173	0.129	0.653	1.49	1.86	1.25
23 Office and computing equipment	0.528	0.193	0.121	0.842	1.37	1.59	1.17
24 Other nonelectric machinery	0.414	0.140	0.171	0.725	1.34	1.75	1.31
25 Radio, tv, and communication equipment	0.384	0.182	0.133	0.699	1.47	1.82	1.23
26 Other electric and electronic equipment	0.358	0.185	0.179	0.723	1.52	2.02	1.33
27 Transportation equipment	0.265	0.119	0.140	0.523	1.45	1.98	1.37
28 Instruments	0.517	0.142	0.145	0.803	1.27	1.55	1.22
29 Other manufacturing	0.468	0.151	0.207	0.825	1.32	1.76	1.33
30 Railroads	0.503	0.152	0.162	0.817	1.30	1.62	1.25
31 Motor freight transport	0.569	0.214	0.198	0.981	1.38	1.72	1.25
32 Other transportation	0.557	0.158	0.216	0.930	1.28	1.67	1.30
33 Communications	0.761	0.071	0.158	0.990	1.09	1.30	1.19
34 Utilities	0.226	0.140	0.066	0.432	1.62	1.91	1.18
35 Wholesale trade	0.542	0.189	0.223	0.955	1.35	1.76	1.31
36 Retail trade	0.576	0.162	0.337	1.075	1.28	1.87	1.46
37 Finance	0.602	0.236	0.253	1.091	1.39	1.81	1.30
38 Insurance	0.299	0.253	0.214	0.766	1.85	2.56	1.39
39 Real estate	0.652	0.123	0.051	0.825	1.19	1.27	1.07
40 Hotels and lodging	0.394	0.290	0.438	1.122	1.74	2.85	1.64
41 Personal services	0.504	0.166	0.159	0.829	1.33	1.65	1.24
42 Business services	0.695	0.168	0.239	1.102	1.24	1.59	1.28
43 Information services	0.714	0.167	0.189	1.070	1.23	1.50	1.21
44 Eating and drinking places	0.366	0.219	0.373	0.958	1.60	2.62	1.64
45 Amusement and recreation	0.468	0.238	0.488	1.195	1.51	2.55	1.69
46 Other services	0.560	0.215	0.312	1.087	1.38	1.94	1.40
47 Government enterprises	0.433	0.206	0.201	0.840	1.48	1.94	1.31
48 Government industry	1.000	0.000	0.488	1.488	1.00	1.49	1.49
49 Household industry	1.000	0.000	2.667	3.667	1.00	3.67	3.67

¹ The direct, indirect, induced, and total columns indicate the fraction of a \$1 increase in total income for each \$1 increase in output. For example, a \$1 increase in output of preserved foods (row 7) provides a direct total income of \$.246 in the preserved foods industry and a total increase for all industries within the Omaha MSA of \$.618.

Table 9
Personal Income Multipliers, Omaha MSA, 1982

Sector	Direct	Indirect	Induced	Total	Type I	Type III	Induced Factor
1 Livestock	0.060	0.061	0.042	0.163	2.02	2.72	1.35
2 Other agriculture	0.085	0.083	0.067	0.235	1.97	2.76	1.40
3 Mining	0.192	0.086	0.054	0.331	1.45	1.73	1.19
4 New construction	0.297	0.143	0.118	0.558	1.48	1.88	1.27
5 Maintenance and repair construction	0.412	0.096	0.087	0.594	1.23	1.44	1.17
6 Meat products	0.097	0.101	0.047	0.245	2.04	2.53	1.24
7 Preserved foods	0.159	0.154	0.086	0.399	1.97	2.51	1.27
8 Grain mill products	0.125	0.138	0.057	0.320	2.11	2.56	1.22
9 Bakery products	0.330	0.113	0.096	0.538	1.34	1.63	1.22
10 Other foods	0.139	0.115	0.060	0.314	1.83	2.26	1.24
11 Textile and apparel	0.243	0.076	0.104	0.423	1.31	1.74	1.33
12 Wood products	0.257	0.117	0.131	0.505	1.45	1.96	1.35
13 Furniture and fixtures	0.304	0.113	0.126	0.543	1.37	1.79	1.30
14 Paper products	0.228	0.093	0.070	0.391	1.41	1.72	1.22
15 Commercial printing	0.329	0.095	0.118	0.542	1.29	1.65	1.28
16 Other printing and publishing	0.313	0.120	0.106	0.539	1.38	1.72	1.24
17 Chemicals and petroleum products	0.158	0.129	0.060	0.347	1.82	2.19	1.21
18 Rubber, plastics, and leather	0.284	0.112	0.101	0.497	1.40	1.75	1.25
19 Stone, clay, and glass	0.297	0.131	0.096	0.524	1.44	1.76	1.22
20 Primary metals	0.228	0.101	0.058	0.386	1.44	1.70	1.18
21 Fabricated metals	0.233	0.093	0.074	0.401	1.40	1.72	1.23
22 Farm machinery and equipment	0.254	0.120	0.077	0.451	1.47	1.77	1.20
23 Office and computing equipment	0.434	0.140	0.072	0.646	1.32	1.49	1.13
24 Other nonelectric machinery	0.322	0.092	0.102	0.516	1.28	1.60	1.25
25 Radio, tv, and communication equipment	0.358	0.115	0.079	0.552	1.32	1.54	1.17
26 Other electric and electronic equipment	0.284	0.124	0.107	0.514	1.44	1.81	1.26
27 Transportation equipment	0.266	0.081	0.083	0.430	1.31	1.62	1.24
28 Instruments	0.307	0.091	0.086	0.484	1.30	1.58	1.22
29 Other manufacturing	0.317	0.096	0.123	0.536	1.30	1.69	1.30
30 Railroads	0.442	0.116	0.096	0.654	1.26	1.48	1.17
31 Motor freight transport	0.417	0.142	0.118	0.676	1.34	1.62	1.21
32 Other transportation	0.497	0.100	0.128	0.725	1.20	1.46	1.21
33 Communications	0.410	0.042	0.094	0.546	1.10	1.33	1.21
34 Utilities	0.092	0.076	0.039	0.207	1.83	2.26	1.23
35 Wholesale trade	0.412	0.115	0.133	0.659	1.28	1.60	1.25
36 Retail trade	0.465	0.082	0.201	0.747	1.18	1.61	1.37
37 Finance	0.461	0.147	0.151	0.758	1.32	1.65	1.25
38 Insurance	0.285	0.166	0.127	0.579	1.58	2.03	1.28
39 Real estate	0.030	0.059	0.030	0.119	3.00	4.02	1.34
40 Hotels and lodging	0.288	0.159	0.260	0.708	1.55	2.46	1.58
41 Personal services	0.280	0.102	0.094	0.477	1.36	1.70	1.25
42 Business services	0.421	0.094	0.142	0.658	1.22	1.56	1.28
43 Information services	0.425	0.102	0.112	0.639	1.24	1.50	1.21
44 Eating and drinking places	0.290	0.132	0.222	0.644	1.46	2.22	1.53
45 Amusement and recreation	0.310	0.134	0.290	0.734	1.43	2.37	1.65
46 Other services	0.475	0.115	0.186	0.776	1.24	1.63	1.31
47 Government enterprises	0.229	0.134	0.119	0.482	1.59	2.11	1.33
48 Government industry	1.000	0.000	0.290	1.290	1.00	1.29	1.29
49 Household industry	1.000	0.000	1.587	2.587	1.00	2.59	2.59

¹ The direct, indirect, induced, and total columns indicate the fraction of \$1 of personal income that would result from a \$1 increase in output. For example, a \$1 increase in output of preserved foods (row 7) would result in a direct increase of \$.159 personal income within the preserved foods industry and a total increase of \$.399 personal income for all industries within the Omaha MSA.

Table 10
Employment Multipliers, Omaha MSA, 1982

Sector	Direct	Indirect	Induced	Total	Type I	Type III	Induced Factor
1 Livestock	4.67	3.44	2.72	10.83	1.74	2.32	1.34
2 Other agriculture	8.59	4.35	4.34	17.29	1.51	2.01	1.34
3 Mining	6.32	4.12	3.50	13.94	1.65	2.20	1.34
4 New construction	15.21	7.66	7.67	30.53	1.60	2.01	1.34
5 Maintenance and repair construction	11.61	5.12	5.61	22.33	1.44	1.92	1.34
6 Meat products	3.78	5.38	3.07	12.24	2.42	3.24	1.34
7 Preserved foods	9.38	7.21	5.56	22.15	1.77	2.36	1.34
8 Grain mill products	4.35	6.69	3.71	14.75	2.54	3.39	1.34
9 Bakery products	13.11	5.36	6.20	24.66	1.41	1.88	1.34
10 Other foods	6.09	5.47	3.88	15.44	1.90	2.54	1.34
11 Textile and apparel	16.32	3.74	6.73	26.79	1.23	1.64	1.34
12 Wood products	19.27	5.97	8.47	33.71	1.31	1.75	1.34
13 Furniture and fixtures	18.54	5.70	8.13	32.38	1.31	1.75	1.34
14 Paper products	9.24	4.28	4.54	18.06	1.46	1.95	1.34
15 Commercial printing	18.04	4.74	7.64	30.42	1.26	1.69	1.34
16 Other printing and publishing	14.36	6.12	6.87	27.36	1.43	1.91	1.34
17 Chemicals and petroleum products	5.59	5.93	3.86	15.38	2.06	2.75	1.34
18 Rubber, plastics, and leather	14.30	5.18	6.54	26.02	1.36	1.82	1.34
19 Stone, clay, and glass	12.55	5.97	6.21	24.73	1.48	1.97	1.34
20 Primary metals	6.77	4.37	3.74	14.89	1.65	2.20	1.34
21 Fabricated metals	9.88	4.48	4.82	19.18	1.45	1.94	1.34
22 Farm machinery and equipment	9.36	5.43	4.96	19.75	1.58	2.11	1.34
23 Office and computing equipment	8.64	5.23	4.65	18.53	1.60	2.14	1.34
24 Other nonelectric machinery	14.98	4.65	6.59	26.22	1.31	1.75	1.34
25 Radio, tv, and communication equipment	10.29	4.96	5.12	20.38	1.48	1.98	1.34
26 Other electric and electronic equipment	14.58	6.02	6.91	27.51	1.41	1.89	1.34
27 Transportation equipment	12.13	3.96	5.40	21.49	1.33	1.77	1.34
28 Instruments	12.10	4.50	5.57	22.17	1.37	1.83	1.34
29 Other manufacturing	18.98	4.77	7.97	31.72	1.25	1.67	1.34
30 Railroads	14.00	4.63	6.25	24.88	1.33	1.78	1.34
31 Motor freight transport	16.25	6.45	7.61	30.31	1.40	1.87	1.34
32 Other transportation	19.96	4.82	8.31	33.09	1.24	1.66	1.34
33 Communications	15.54	2.59	6.08	24.22	1.17	1.56	1.34
34 Utilities	4.24	3.36	2.55	10.15	1.79	2.40	1.34
35 Wholesale trade	19.29	6.36	8.61	34.25	1.33	1.78	1.34
36 Retail trade	34.62	4.15	13.01	51.78	1.12	1.50	1.34
37 Finance	21.86	7.20	9.75	38.82	1.33	1.78	1.34
38 Insurance	15.64	8.92	8.24	32.80	1.57	2.10	1.34
39 Real estate	3.04	2.81	1.96	7.81	1.93	2.57	1.34
40 Hotels and lodging	42.40	7.88	16.87	67.16	1.19	1.58	1.34
41 Personal services	12.94	5.28	6.11	24.33	1.41	1.88	1.34
42 Business services	22.18	5.27	9.21	36.65	1.24	1.65	1.34
43 Information services	17.03	4.66	7.28	28.97	1.27	1.70	1.34
44 Eating and drinking places	36.30	6.58	14.39	57.27	1.18	1.58	1.34
45 Amusement and recreation	47.47	8.62	18.82	74.92	1.18	1.58	1.34
46 Other services	29.78	6.08	12.03	47.89	1.20	1.61	1.34
47 Government enterprises	17.26	5.78	7.73	30.78	1.33	1.78	1.34
48 Government industry	56.08	0.00	18.82	74.90	1.00	1.34	1.34
49 Household industry	306.51	0.00	102.84	409.35	1.00	1.34	1.34

¹ The direct, indirect, induced, and total columns indicate the associated number of employees for each \$1 million change in output. For example, a \$1 million dollar increase in output of preserved foods (row 7) would involve a direct increase in employment of 9.38 persons in the preserved foods sector and a total increase in employment of 22.15 persons for all sectors in the Omaha MSA.

sector within the Omaha MSA, or another example, \$594,000 of every \$1 million spent on motor freight transport (sector 31) is value-added income received within the region by the motor freight transport sector. This column is useful in finding specific industry effects, rather than total regional effects, resulting from a change in output.

Indirect Value-added. The indirect column indicates the proportion of industry output that is value-added by all supporting sectors due to a change in output of a specific sector. It is the result of an industrial sector purchasing inputs from other supporting sectors which, in turn, purchase from other sectors, and so on. Thus, every \$1 million spent on bakery products (row 9) generates \$195,800 of increased value-added in all supporting sectors.

Induced Value-added. The induced column indicates the proportion of industry output that is value-added by all industries as a result of a change in householders' expenditures. The direct and indirect changes in output give rise to increases in householders' income. This results in increased expenditures, generates increases in output, and so on, each round having an ever-diminishing effect. The indirect effect is the aggregate of these effects due to increased incomes. One million dollars spent for bakery products (row 9) generates \$181,000 in increased value-added for all industries because of increases in household expenditures. Both the indirect and induced effects are of interest but of limited use in determining economic impacts.

Total Value-added. The total column is the most important. This includes the proportion of industry output that is value-added by all industries because of direct, indirect, and induced effects. Thus, every \$1 million of bakery products sold results in \$835,000 ($\$1,000,000 \times .835$) of value-added in the Omaha region; a \$1 million increase in output of amusement and recreation (row 45) results in a \$1,341,000 ($\$1,000,000 \times 1.341$) increase in value-added.

The total column is effectively a multiplier (sometimes called a response coefficient) that relates the increase in value-added that results from an increase in output. So, if we knew the change in output or sales of a particular industry, this multiplier would indicate the resulting change in value-added (or well-being) on the Omaha economy.

Type I and Type III Value-added Multipliers. A different type of multiplier is indicated by Type I and Type III. In the case of Type I multipliers, the direct changes in value-added are multiplied to obtain direct and indirect changes in value-added, and, for Type III multipliers, direct

changes in value-added are multiplied to obtain the aggregate of direct, indirect, and induced changes in value-added.

Type III multipliers account for all three effects, and will probably be used most often. If the direct change in value-added were known, as a result of a change in industry output, then we could calculate the total change in value-added. For example, if bakery products, experienced a direct change in value-added of \$459,000, then the total change in value-added would be about \$835,800, which is indicated by the total column but can also be obtained by multiplying the direct effect by the Type III multiplier ($\$459,000 \times 1.82$).

Type I and Type III multipliers relate value-added to value-added, the same variable. It is probably unlikely that access to direct value-added figures will be available, however, if we know the change in output, the direct column indicates the associated direct value-added amount. Direct changes in income and employment are usually more widely known, and, in these cases, the multipliers are more useful.

Value-added Induced Factor. The induced factor column is unique to this manual. The total requirements table indicates effects on individual sectors due to changes in other sectors. This information would be useful to managers who were trying to estimate the effects on their sector due to changes in other sectors. However, to get the total effect, which includes the induced effect, it is necessary to have a total requirements table which is closed with respect to households. This is not available. So, to estimate the total effect on a particular sector from the total requirements table, the induced factor (the ratio of the Type III to Type I multiplier) was created. Essentially, it is an estimate of how much more the induced effect adds over the direct and indirect effects. An example of its use will be given later.

Total Income Multipliers

Total income differs from value-added only in excluding the indirect business taxes collected by governments. It includes employee compensation and property income paid by industries for production occurring within the Omaha MSA (which is not necessarily received by residents of the Omaha MSA because much of the capital is supplied from outside the area).

The column headings are exactly the same as those for value-added. Direct indicates the direct income per output for each industry. Thus, of every \$1 million in output of bakery products, \$455,000 goes to incomes. The indirect, induced, and total columns correspond accordingly, for example, \$1 million in bakery products results in \$794,000 in total incomes.

As expected, each figure along a row in this table is smaller than the corresponding figure in the value-added table, because indirect business taxes are excluded. The Type I multiplier relates direct total income to obtain direct plus indirect total incomes, and the Type III multiplier relates direct total income to obtain direct plus indirect plus induced total incomes. The induced factor is the ratio of Type III to Type I multipliers, all have the same meaning as in the value-added case.

Personal Income Multipliers

Personal income differs from total income in that proprietary income and other proprietary income are excluded. It consist only of employee compensation. As expected, each entry is smaller than the corresponding item for total income multipliers.

The columns are exactly the same as those for value-added and total income. The direct column indicates the personal income per output for each industry. Thus, for every \$1 million in output of bakery products, \$330,000 goes to personal income.

Employment Multipliers

Employment multipliers focus on the number of employees. More precisely, they focus on job units (full-time and temporary) not work-year equivalents. This must be taken into consideration when comparing employment multipliers in an industry where seasonal workers are employed rather than year-round employees.

Direct, Indirect, Induced, and Total Employment Effects. The direct column indicates the average number of employees per \$1 million of output. Thus, for bakery products, the number of employees will increase by 13.11 for every \$1 million increase in output.

The indirect column shows the resulting increase in employment due to the purchase of inputs by bakery products from other industries and the further rounds of interindustry transactions that follow. For the bakery products industry, 5.36 employees are hired indirectly for every \$1 million increase in output.

The induced column shows the resulting increase in employment due to the increase in expenditures by households. This expenditure increase follows the increase in incomes that results from the direct and indirect output changes for the bakery products industry. This induced effect results in 6.2 employees hired for every \$1 million increase in output.

The total column combines the direct, indirect, and induced effects and is usually the figure of most concern when employment effects are wanted. A \$1 million increase in the bakery products industry results in an increase of 24.66 employees in the Omaha MSA due to all three effects. This, of course, includes additional employees in industries other than bakery products.

Note again that these four multipliers (direct, indirect, induced, and total) relate employment changes as a result of output changes.

Type I and Type III Employment Multipliers. Type I and Type III multipliers relate employment changes to employment change. In the case of Type I multipliers, direct employment in bakery products is multiplied by 1.41 to determine direct and indirect employment effects combined, that is, 13.11 direct employees multiplied by 1.41 equals 18.5, which is also equal to 13.11 (direct) plus 5.36 (indirect).

The more important of the two multipliers, Type III, includes the induced effect. Thus, direct employment changes in bakery products are multiplied by 1.88 to find the total employment change throughout the economy.

The Type III multiplier is especially useful because usually the number of employees who are laid off from a plant is known, or the number of employees who will be hired if a new plant enters the region is readily estimated. Thus, if a new telemarketing (see information services industry, sector 44) firm enters the Omaha region intending to hire 100 employees, the total increase in employment in the region is estimated to be 170 (100×1.7). When the direct employment effects are unknown, they can be estimated if the output changes are known. The direct column in the employment table gives the employees per each \$1 million change in output from which the direct employment effects can be calculated.

Considerations for Ranking Industries

One last but important point needs to be made about the multiplier tables, especially the employment and personal income tables. These tables can be used in yet another way. The total column in each of these tables can be used to rank the industries to find which will have the greatest or least employment or income effects due to changes in output.

Looking down the column of total employment multipliers, it is indicated that a \$1 million change in output in the meat products industry would lead to a change in employment of 12.24 employees in the Omaha region. But, a \$1 million change in output in the hotels and lodging places industry would lead to a change in employment of 67.16. This information can be used to establish priorities for public policy.

However, we must not over-emphasize employment when considering the beneficial or ill effects of these output changes. For example, business services would respond to a \$1 million change in output with a change in employment of 36.65, which is less than the change eating and drinking places would experience, 57.27. Yet, if we read the total column for personal incomes, we see that a \$1 million increase in business services would result in an increase in personal income of \$658,000, while eating and drinking places would increase by \$644,000. A smaller increase in employment but greater personal incomes results by supporting business services at the expense of eating and drinking places.

Use of Multipliers for Economic Impact Analyses

An economic impact analysis may involve evaluating the location of a new plant or industry in a region, the expansion or decline of a given industry, the value to the region of an existing industry, or the effects of a change in distribution of spending patterns. An important element for this analysis is the multiplier. There are literally thousands of multipliers that can be applicable to a regional economy. It is important, therefore, that the correct multiplier be chosen for a given situation. This section classifies the typical multiplier applications and presents examples of each type.

Basic Format

The idea of a multiplier starts with an initial effect on the Omaha economy, such as an increase in exports of a given sector. This leads to adaptations by sectors and households throughout the region, resulting in an aggregate final effect. The multiplier could be illustrated as follows:

$$\begin{array}{ccccccc} \text{Initial} & & \times & & \text{Multiplier} & & = & & \text{Final} \\ \text{effect} & & & & & & & & \text{effect} \end{array}$$

The initial effect can be one of several variables. It could be the monetary value of a change in output or the change in income, employment, or value-added associated with that change in output. It is assumed in these examples that the analyst wants to determine the total of all effects (direct, indirect, and induced) on the Omaha economy.

When the initial effect is a change in output, the appropriate multiplier is the total column, which includes the direct, indirect, and induced effects. If the initial effect is income, employment, or value-added, the Type III multiplier is appropriate because it also includes all three effects.

Typical Multiplier Applications

The most frequent application of multipliers for economic impact analysis involves the entry or exit of firms in the region. But, it can also involve determining the economic value of a firm to a region, which can be determined by considering the economic impact of that firm withdrawing from the region. In other words, the move is treated as an expansion or contraction of industry output. Or, it may involve a change in the distribution of expenditure patterns.

As a result, all applications treated here will be initiated as changes in output in an industry or changes in income, employment, or value-added, due to changes in output. In the following discussion, total income can be substituted for personal income, and total changes refers to the direct, indirect, and induced effects.

Typical Multiplier Applications

Group A

1. Change in output, Industry A	x	Total employment multiplier, Industry A [Total column, table 10]	=	Total change in employment, Omaha, MSA.
2. Change in output, Industry A	x	Personal income multiplier, Industry A [Total column, table 9]	=	Total change in personal income, Omaha, MSA.
3. Change in output, Industry A	x	Value-added multiplier, Industry A [Total column, table 7]	=	Total change in value-added, Omaha MSA.

Group B

4. Change in employment, Industry A	x	Type III employment multiplier, Industry A [Type III column, table 10]	=	Total change in employment, Omaha, MSA.
5. Change in personal income, Industry A	x	Type III personal income multiplier, [Type III column, table 9]	=	Total change in personal income, Omaha MSA.
6. Change in value-added, Industry A	x	Type III value-added multiplier, [Type III column, table 7]	=	Total change in value-added, Omaha MSA.

Group C

7. Change in output, Industry A	x	Industry A to Industry B employment multiplier, [see example 3 below]	=	Change in employment, Industry B.
8. Change in output, Industry A	x	Industry A to Industry B personal income multiplier, [see example 3 below]	=	Change in personal income, Industry B.
9. Change in output, Industry A	x	Industry A to Industry B value-added multiplier, [see example 3 below]	=	Change in value-added, Industry B.

Examples of Typical Multiplier Applications

The typical multiplier applications are composed of three groupings: A, B, and C. One example is provided for each grouping.

Group A

Group A shows the effect of a change in output on employment, income, or value-added for the Omaha MSA. To illustrate the application of this group consider the entry of a new firm in 1985 to the commercial printing industry, which was expected to have sales (output) of \$7.7 million. We want to determine the employment (income or value-added) impact on the Omaha MSA. First, we must adjust the dollar output from 1985 to 1982, because the tables and multipliers are based on 1982 values. The price deflator for commercial printing can be obtained by first reading table 11 in the appendix. Look at sector 15 (commercial printing) and determine that the IMPLAN sector number is 205. Now, turn to table 12, where the price deflator for IMPLAN sector 205 for 1985 is 1.098. This allows us to obtain the following output for 1982:

$$\frac{\$7.7 \text{ million}}{1.098} = \$7.0 \text{ million}$$

Using format (1) in group A for employment ((2)/(3) for personal income/value-added), we have from the total column in the employment multiplier table (personal income multiplier table/value-added multiplier table) for commercial printing:

$$\begin{array}{rcccl} \$7.0 \text{ million} & \times & 30.42 & = & 213 \\ & & (.542/.837) & & (\$3.79 \text{ million}/\$5.86 \text{ million}) \end{array}$$

Thus, the \$7.0 million (1982) increase in output of a new commercial printing firm would increase total employment in the Omaha MSA by 213 employees, (an increase in personal income of \$3.79 million and an increase in value-added of \$5.86 million). The monetary totals are for 1982, and can be adjusted to any other year by multiplying by the price index. The income and value-added figures may be calculated within the same year, in which case the figures need not be deflated.

We can determine the direct increase in employment (personal income or value-added) by referring to the commercial printing entry under the direct column in the employment (personal income or value-added) tables. Multiplying the change in output by this value will give the direct change, that is, the change for the industry alone, rather than for the Omaha economy. Thus, a \$7.0 million increase in output of commercial printing would increase its employment by 126.3 (\$7.0 million x 18.04), its personal income by \$2.3

million (\$7.0 million x 0.329), and its value-added by \$3.2 million (\$7.0 million x 0.453).

Group B

Group B shows the initial effect of a particular variable, such as employment, income, or value-added, for a given industry and the resulting total change of that variable on the Omaha MSA. For example, a firm in the farm machinery and equipment sector (row 22) experiences a decrease in output and lays off 50 employees, resulting in an annual decline in payroll of \$1.36 million, and an annual decline in value-added of \$1.91 million. What are the total effects of these variables for the Omaha MSA? In this case, the Type III multiplier is used. Its value from the employment multiplier table (personal income multiplier table/value-added multiplier table) is 2.11 (1.77/1.94). Using these on the initial effect gives:

50 employees	x	2.11	= 106 employees
(\$1.36 million/ \$1.91 million)		(1.77 million/ 1.94 million)	(\$2.41 million/ \$3.71 million)

Thus, the layoff of 50 employees in the farm machinery and equipment industry will lead to a total unemployment in the Omaha MSA of 106 employees, a loss of \$2.41 million in personal income, and a reduction of \$3.71 million in value-added.

Group C

Group C shows the effect a change in output of one industry will have on the change in employment, income, and value-added of a second industry. Multipliers that would achieve this are not produced by IMPLAN. They can, however, be estimated from the information available from IMPLAN and reproduced here.

Consider, for example, that there is a \$10 million decline in output in the commercial printing sector (row 15). A manager of a firm in the chemicals and petroleum products sector (row 17) is concerned about how this will affect the employment, income, or value-added of his industry. This can be learned through a number of steps.

Step 1. Let us first determine the change in output in the chemicals and petroleum products industry which would result from the change in commercial printing. The direct and indirect effects can be read from the

total requirements table. Starting at column 15 (commercial printing) move down to row 17 (chemicals and petroleum products). The table indicates that \$21,110 of every \$1 million (or \$0.02111 of every \$1) of output in commercial printing is spent on chemicals and petroleum products in Omaha (the direct and indirect effects). Because the total change in commercial printing is \$10 million, the indirect and direct effects on output of the chemical and petroleum products sector will be \$211,100. In essence, the industry to industry output changes can be found as follows:

Dollar change in output, Industry A	x	Direct and indirect effects, [col: Industry A row: Industry B total requirements table]	=	Dollar change in direct and indirect output, Industry B
\$10 million	x	.02111	=	\$211,100
				\$0.2111 million or \$211,110

Step 2. We must now determine the change in employment (personal income/value-added) in the chemicals and petroleum products industry as a result of the \$10 million change in output in commercial printing. To do this, the change in output in Industry B must be transformed into change in employment (personal income/value-added). Multiplying output by the ratio of employees per unit output (personal income per unit output/value-added per unit output) will do this. This ratio is the direct column for Industry B (chemicals and petroleum products) from the employment multipliers table (personal income multipliers table/value-added multipliers table). For chemicals and petroleum products the figure is 5.59 employees per \$1 million of output (\$158,200 personal income per \$1 million/\$312,200 value-added per \$1 million). This calculation can be illustrated as follows:

Dollar change in millions of direct and indirect output, Industry B	x	Employment output ratio (personal income output ratio/ value-added output ratio) [Direct column, table 10 (table 9/ table 7)]	=	Direct and indirect employment change (personal income change/value-added change) Industry B
\$0.2111	x	5.59 (\$158,200/ \$312,200)	=	1.18 employees (\$33,396 personal income/ \$65,905 value-added)

Step 3. Now, we only need to add an adjustment for the induced effects as a result of change in Industry A (commercial printing). The induced factor, comes into play at this point because it estimates the further increase in chemicals and petroleum products as a result of an increase in household expenditures. The induced factor, which should be referred to in the employment (personal income/value-added) table, is that of industry A (commercial printing) because the induced factor is an average change among all sectors due to a change in industry A. The induced factor for employment is 1.34 (1.28 for personal income and 1.36 for value-added).

Thus, the total effect of changes in Industry A's output on Industry B's employment (personal income/value-added) is found as follows:

Employment change (personal income change/ value-added change) due to direct and indirect effects on Industry B	x	Induced factor for Industry A [Table 10, (table 9/table 7)]	=	Total change in Industry B's employment (personal income/value- added)
1.18 employees (\$33,396/\$65,905)		1.34 (1.28/1.36)	=	1.58 employees (\$42,747/\$89,631)

Steps combined. We can combine three steps in one as follows:

Dollar change in output, Industry A	x	Direct and Indirect [col: Industry A row: Industry B Total requirements table	x	Employment output ratio (personal income output ratio/ value-added ratio) [Direct column, table 10 (table 9/ table 7)]	x	Induced factor for Industry A, [Table 10 (table 9/ table 7)]	=	Total change in Industry B's employment
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\$10 million	x	.02111	x	5.59 (\$158,200/ \$312,200)	x	1.34 (1.28/ 1.36)	=	1.58 employees (\$42,747/ \$89,631)
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Thus, chemicals and petroleum products would experience a reduction of 1.6 employees, \$42,750 in personal income, and \$89,630 in value-added as a result of a \$10 million reduction in sales in the commercial printing industry.

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Appendices

Table 11
Omaha MSA Sector Aggregation Scheme

Omaha Sector	IMPLAN sector number	Bureau of Economic Analysis industry number	Sector description	Standard Industrial Classification Code
1. Livestock is an aggregate of the following sectors:	1	1.0100	Dairy farm products	0241, pt. 0191, pt. 0259, pt. 0291
	2	1.0200	Poultry and eggs	025 (excl. pt. 0254 and pt. 0259), pt. 0191, pt. 0219, pt. 0291
	3	1.0311	Ranch fed cattles	021 (excl. pt. 0219), pt. 0191, pt. 0259, pt. 0291
	4	1.0312	Range fed cattles	"
	5	1.0313	Cattle feedlots	"
	6	1.0314	Sheep, lambs and goats	"
	7	1.0315	Hogs, pigs and swine	"
	8	1.0316	Other meat animal and products	"
	9	1.0302	Miscellaneous livestock	027 (excl. 0279), pt. 0191, pt. 0219, pt. 0259, pt. 0291
2. Other Agriculture is an aggregate of the following sectors:	10	2.0100	Cotton	0131, pt. 0191, pt. 0219, pt. 0259, pt. 0291
	11	2.0201	Food grains	pt. 011, pt. 0191, pt. 0219, pt. 0259, pt. 0291
	12	2.0221	Feed grains	pt. 011, pt. 0139, pt. 0191, pt. 0219, pt. 0259, pt. 0291
	13	2.0222	Hay and pasture	"
	14	2.0203	Grass seeds	pt. 0139, pt. 0191, pt. 0219, pt. 0259, pt. 0291
	16	2.0401	Fruits	pt. 017, pt. 0191, pt. 0219, pt. 0259, pt. 0291
	18	2.0501	Vegetables	0134, 0161, pt. 0219, pt. 0259, pt. 0291, pt. 0119, pt. 0139, pt. 0191
	19	2.0502	Sugar crops	0133, pt. 0219, pt. 0259, pt. 0291, pt. 0191
	20	2.0503	Miscellaneous crops	pt. 0119, pt. 0139, pt. 0259, pt. 0291
	21	2.0600	Oil bearing crops	0116, pt. 0119, pt. 013, pt. 0173, pt. 0219, pt. 0259, pt. 0291
	22	2.0701	Forest products	pt. 018, pt. 0191, pt. 0219, pt. 0259, pt. 0291
	23	2.0702	Greenhouse & nursey product	"
	26	4.0001	Agricultural, forestry, fishery serv.	0254, 07 pt. 0279, (excl. 074 and 078), 085, 092, pt. 0279
27	4.0002	Landscape and horticultural serv.	078	
3. Mining is an aggregate of the following sectors:	41	8.0101	Natural gas	0311-1
	42	8.0102	Crude petroleum	0311
	43	8.0200	Natural gas liquids	1321
	45	9.0201	Crushed and broken limestone	1422
	46	9.0202	Crushed and broken granite	1423
	47	9.0203	Crushed and broken stone, n.e.c.	1429
	48	9.0301	Construction sand and gravel	1442
	58	9.1200	Misc. nonmetallic minerals, n.e.c.	1499
	4. New construction is an aggregate of the following sectors:	66	11.0100	New residential structures
67		11.0200	New industrial & commercial building	"
68		11.0300	New utility structure	pt. 16-17
69		11.0400	New highways and streets	"
70		11.0500	New farm structures	pt. 15, pt. 17
71		11.0600	New mineral extraction facilities	pt. 108, pt. 1112, 1213, pt. 138, pt. 148
72		11.0700	New government facilities	pt. 15-17
5. Maintenance and repair construction is an aggregate of the following sectors:	73	12.0100	Maintenance and repair, residential	pt. 15, pt. 17
	74	12.0200	Maintenance and repair other facilities	pt. 15-17
	75	12.0215	Maintenance and repair oil and gas wells	pt. 138
6. Meat products is an aggregate of the following sectors:	82	14.0100	Meat packing plants	2011
	83	14.0102	Sausages and other prepared meats	2013
	84	14.0103	Poultry dressing plants	2016
7. Preserve foods is an aggregate of the following sectors:	93	14.0900	Canned fruits and vegetables	2033
	95	14.1100	Pickles, sauces, and salad dressing	2035
	98	14.1302	Frozen specialties	2038
8. Grain mill products is an aggregate of the following sectors:	99	14.1401	Flour and other grain mill product	2041
	100	14.1402	Cereal preparations	2043
	101	14.1403	Blended and prepared flour	2045
	102	14.1501	Dogs, cat, and other pet food	2047
	103	14.1502	Prepared feeds, n.e.c.	2048
	104	14.1600	Rice milling	2044
9. Bakery products is an aggregate of the following sectors:	106	14.1801	Bread, cake, and related products	2051
	107	14.1802	Cookies and crackers	2052

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Table 11 continued
Omaha MSA Sector Aggregation Schema

Omaha Sector	IMPLAN sector number	Bureau of Economic Analysis industry number	Sector description	Standard Industrial Classification Code	
10. Other foods is an aggregate of the following sectors:	86	14.0200	Creamery butter	2021	
	87	14.0300	Cheese, natural and processed	2022	
	89	14.0500	Ice cream and frozen dessert	2024	
	90	14.0600	Fluid milk	2026	
	109	14.2001	Confectionery products	2065	
	112	14.2101	Malt liquors	2082	
	116	14.2200	Bottled and canned soft drinks	2086	
	117	14.1300	Flavoring extracts and syrups, n.e.c.	2087	
	121	14.2700	Animal and marine fats and oils	2077	
	122	14.2800	Roasted coffee	2095	
	123	14.2900	Shortening and cooking oils	2079	
	124	14.3000	Manufactured ice	2097	
	125	14.3100	Macaroni and spaghetti	2098	
	126	14.3200	Food preparations, N.E.C.	2099	
11. Textile and apparel is an aggregate of the following sectors:	131	16.0100	Broadwoven fabric mills & finishing	221-3, 2261-2	
	135	17.0100	Floor coverings	227	
	143	17.1001	Nonwoven fabrics	2297	
	151	18.0400	Apparel made from purchased materials	231-8, 39996	
	152	19.0100	Curtains and draperies	2391	
	153	19.0200	Housefurnishings, n.e.c.	2392	
	154	19.0301	Textile bags	2393	
	155	19.0302	Canvas products	2394	
	156	19.0303	Pleating and stitching	2395	
	157	19.0304	Automotive and apparel trimmings	2396	
12. Wood products is an aggregate of the following sectors:	160	20.0100	Logging camps and logging contractors	2411	
	162	20.0300	Hardwood dimension and floor	2426	
	164	20.0501	Millwork	2431	
	165	20.0502	Wood kitchen cabinets	2434	
	168	20.0702	Prefabricated wood buildings	2452	
	170	20.0901	Wood pallets and skids	2448	
	172	20.0903	Wood products, n.e.c.	2499	
	173	21.0000	Wood containers	2441, 2449	
	13. Furniture and fixtures is an aggregate of the following sectors:	174	22.0101	Wood household furniture	2511
		175	22.0102	Household furniture, n.e.c.	2519
176		22.0103	Wood tv and radio cabinets	2517	
177		22.0200	Upholstered household furniture	2512	
178		22.0300	Metal household furniture	2514	
179		22.0400	Mattresses and bedsprings	2515	
180		23.0100	Wood office furniture	2521	
181		23.0200	Metal office furniture	2522	
183		23.0400	Wood partitions and fixtures	2541	
184		23.0500	Metal partitions and fixture	2542	
185		23.0600	Blinds, shades, and drapery	2591	
186		23.0700	Furniture and fixtures, n.e.c.	2599	
14. Paper products is an aggregate of the following sectors:		189	24.0300	Paperboard mills	263.
	190	24.0400	Envelopes	2642.	
	191	24.0500	Sanitary paper products	2647.	
	192	24.0602	Building paper and board mills	266.	
	193	24.0701	Paper coating and glazing	2641.	
	194	24.0702	Bags, except textile	2643.	
	195	24.0703	Die-cut paper and board	2645.	
	197	24.0705	Stationery products	2648.	
	198	24.0706	Converted paper products n.e.c.	2649.	
	199	25.0000	Paperboard containers and boxes	265.	
15. Commercial printing is an aggregate of the following sectors:	205	26.0501	Commercial printing	2751-2, 2754	
	210	26.0801	Engraving and plate printing	2753	

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Table 11 continued
Omaha MSA Sector Aggregation Scheme

Omaha Sector	IMPLAN sector number	Bureau of Economic Analysis industry number	Sector description	Standard Industrial Classification Code
16. Other printing and publishing is an aggregate of the following sectors:	200	26.0100	Newspapers	271
	201	26.0200	Periodicals	272
	202	26.0301	Book publishing	2731
	203	26.0302	Book printing	2732
	204	26.0400	Miscellaneous publishing	274
	206	26.0502	Lithographic platemaking and services	2795
	207	26.0601	Manifold business forms	276
	208	26.0602	Blankbooks and looseleaf binders	2782
	209	26.0700	Greeting card publishing	277
	211	26.0802	Bookbinding and related work	2789
	212	26.0803	Typesetting	2791
	213	26.0804	Photoengraving	2793
	17. Chemicals and petroleum products is an aggregate of the following sectors:	215	27.0100	Industrial inorganic, organic chem.
216		27.0201	Nitrogenous and phosphatic fertilizers	2873-4
217		27.0202	Fertilizers, mixing only	2875
218		27.0300	Agricultural chemicals, n.e.c.	2879
220		27.0402	Adhesives and sealants	2891
221		27.0403	Explosives	2892
222		27.0404	Printing ink	2893
224		27.0406	Chemical preparations, n.e.c.	2899
225		28.0100	Plastics materials and resin	2821
226		28.0200	Synthetic rubber	2822
229		29.0100	Drugs	283
230		29.0201	Soap and other detergents	2841
231		29.0202	Polishes and sanitation good	2842
234		30.0000	Paints and allied products	285
235		31.0101	Petroleum refining	291
236		31.0102	Lubricating oils and greases	2992
18. Rubber, plastics and leather is an aggregate of the following sectors:	244	32.0400	Miscellaneous plastic products	307
	245	32.0500	Rubber and plastics hose and belting	304
	246	33.0001	Leather tanning and finishing	311
	248	34.0201	Shoes, except rubber	3143-94, 3149
	251	34.0302	Luggage	316
19. Stone, clay, and glass is an aggregate of the following sectors:	255	35.0100	Glass and glass products, except containers	321, 3229, 232
	256	35.0200	Glass containers	3221
	257	36.0100	Cement, hydraulic	324
	258	36.0200	Brick and structural clay tile	3251
	261	36.0500	Structural clay products, n.e.c.	3259
	262	36.0600	Vitreous plumbing fixtures	3261
	266	36.0900	Pottery products, n.e.c.	3269
	267	36.1000	Concrete block and brick	3271
	268	36.1100	Concrete products, n.e.c.	3272
	269	36.1200	Ready-mixed concrete	3273
	271	36.1400	Gypsum products	3275
	272	36.1500	Cut stone and stone products	328
	275	36.1800	Gaskets, packing and sealing	3293
	276	36.1900	Minerals, ground or treated	3295
279	36.2200	Nonmetallic mineral products	3299	
20. Primary metals is an aggregate of the following sectors:	285	37.0200	Iron and steel foundries	332
	286	37.0300	Iron and steel forgings	3462
	287	37.0401	Metal heat treating	3398
	288	37.0402	Primary metal products, n.e.c.	3399
	290	38.0200	Primary lead	3332
	293	38.0500	Primary nonferrous metals n.e.c.	3339
	294	38.0600	Secondary nonferrous metals	334
	298	38.1000	Nonferrous wire drawing and insulating	3357
	299	38.1100	Aluminum castings	3361
	301	38.1300	Nonferrous castings, n.e.c.	3369
	21. Fabricated metals is an aggregate of the following sectors:	303	39.0100	Metals cans
304		39.0200	Metal barrels, drums and pails	3412
305		40.0100	Metal sanitary ware	3431
306		40.0200	Plumbing fixture fittings and trim	3432
307		40.0300	Heating equipment, except electric	3433
308		40.0400	Fabricated structural metal	3441

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Table 11 continued
Omaha MSA Sector Aggregation Scheme

Omaha Sector	IMPLAN sector number	Bureau of Economic Analysis industry number	Sector description	Standard Industrial Classification Code
	309	40.0500	Metal doors, sash, and trim	3442
	310	40.0600	Fabricated plate work (boiler shops)	3443
	311	40.0700	Sheet metal work	3444
	312	40.0800	Architectural metal work	3446
	313	40.0901	Prefabricated metal building	3448
	314	40.0902	Miscellaneous metal work	3449
	315	41.0100	Screw machine products and bolt, n.e.c.	345
	318	41.0203	Metal stampings, n.e.c.	3469
	320	42.0201	Hand and edge tools, n.e.c.	3423
	322	42.0300	Hardware, n.e.c.	3429
	323	42.0401	Planting and polishing	3471
	324	42.0402	Metal coating and allied services	3479
	325	42.0500	Miscellaneous fabricated wire products	3495-6
	326	42.0700	Steel springs, except wire	3493
	327	42.0800	Pipe, valves, and pipe fittings	3494, 3498
	328	42.1000	Metal foil and leaf	3497
	329	42.1100	Fabricated metal products, n.e.c.	3499
22. Farm machinery and equipment is an aggregate of the following sectors:	332	44.0001	Farm machinery and equipment	3523
	333	44.0002	Lawn and garden equipment	3524
23. Office and computing equipment is an aggregate of the following sectors:	362	51.0101	Electronic computing equipment	3573
	365	51.0400	Typewriters and office machinery	3572, 3579
24. Other nonelectric machinery is an aggregate of the following sectors:	331	43.0200	Internal combustion engines, n.e.c.	3519
	334	45.0100	Construction machinery and equipment	3531
	335	45.0200	Mining machinery, except oil	3532
	336	45.0300	Oil field machinery	3533
	337	46.0100	Elevators and moving stairways	3534
	338	46.0200	Conveyors and conveying equipment	3535
	339	46.0300	Hoists, cranes and monorails	3536
	340	46.0400	Industrial trucks and tractors	3537
	341	47.0100	Machine tools, metal cutting types	3541
	343	47.0300	Special dies and tools and accessories	3544-5
	344	37.0401	Power driven hand tools	
	346	37.0403	Metalworking machinery, n.e.c.	3549
	347	48.0100	Food products machinery	3551
	352	48.0600	Special industry machinery	3559
	353	49.0100	Pumps and compressors	3561, 3563
	355	49.0400	Industrial patterns	3565
	357	49.0500	Power transmission equipment	3566, 3568
	359	49.0700	General industrial machinery n.e.c.	3569
	360	50.0001	Carburetors, pistons, rings, valves	3592
	361	50.0002	Machinery, except electrical, n.e.c.	3599
	366	52.0100	Automatic merchandising machinery	3581
	367	52.0200	Commercial laundry equipment	3582
	368	52.0300	Refrigeration and heating equipment	3585
	369	52.0400	Measuring and dispensing pumps	3586
	370	52.0500	Service industry machines, n.e.c.	3589
25. Radio, tv and communications equipment is an aggregate of the following sectors:	389	56.0100	Radio and tv receiving sets	3651
	390	56.0200	Phonograph records and tape	3652
	391	56.0300	Telephone and telegraph apparatus	3661
	392	56.0400	Radio and tv communication equipment	3662
26. Other electric and electronic equipment is an aggregate of the following sectors:	371	53.0100	Instruments to measure electricity	3825
	372	53.0200	Transformers	3612
	373	53.0300	Switchgear and switchboard apparatus	3613
	374	53.0400	Motors and generators	3621
	375	53.0500	Industrial controls	3622
	376	53.0600	Welding apparatus, electric	3623
	386	55.0100	Electric lamps	3641
	387	55.0200	Lighting fixtures and equipment	3645-8
	393	57.0100	Electron tubes	3671-3
	395	57.0300	Electronic components, n.e.c.	3675-9
	396	58.0100	Storage batteries	3691
	397	58.0200	Primary batteries, dry and wet	3692
	398	58.0300	X-ray apparatus and tubes	3693
	400	58.0500	Electrical equipment, n.e.c.	3699

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Table 11 continued
Omaha MSA Sector Aggregation Scheme

Omaha Sector	IMPLAN sector number	Bureau of Economic Analysis industry number	Sector description	Standard Industrial Classification Code
27. Transportation equipment is an aggregate of the following sectors:	401	59.0100	Truck and bus bodies	3713
	402	59.0200	Truck and trailers	3715
	403	59.0301	Motor vehicles	3711
	404	59.0302	Motor vehicles parts and accessories	3714
	405	60.0100	Aircraft	3721
	407	60.0400	Aircraft and missile equipment n.e.c.	3728, 3769
	408	61.0100	Ship building and repairing	3731
	409	61.0200	Boat building and repairing	3732
	410	61.0300	Railroad equipment	374
	411	61.0500	Motorcycles, bicycles, and parts	375
	412	61.0601	Travel trailers and campers	3792
	415	61.0700	Transportation equipment, n.e.c.	3799
28. Instruments is an aggregate of the following sectors:	416	62.0100	Engineering and scientific instruments	3811
	417	62.0200	Mechanical measuring devices	3823-4, 3829
	419	62.0400	Surgical and medical instruments	3841
	420	62.0500	Surgical appliances and supplies	3842
	424	63.0200	Ophthalmic goods	385
	425	63.0300	Photographic equipment and supplies	386
29. Other manufacturing is an aggregate of the following sectors:	79	13.0500	Small arms	3484
	426	64.0101	Jewelry, precious metal	3911
	427	64.0102	Jewelers materials and lapidary ware	3915
	428	64.0104	Silverware and plated ware	3914
	429	64.0105	Costume jewelry	3961
	430	64.0200	Musical instruments	393
	431	64.0301	Games, toys, and children vehicles	3944
	433	64.0400	Sporting and athletic goods, n.e.c.	3949
	436	64.0503	Marking devices	3953
	438	64.0600	Artificial trees and flowers	3962
	440	64.0702	Needles, pins, and fasteners	3964
	441	64.0800	Brooms and brushes	3991
	443	64.1000	Burial caskets and vaults	3995
	444	64.1100	Signs and advertising displays	3993
	445	64.1200	Manufacturing industries, n.e.c.	3999 (excl. 39996).
30. Railroads is an aggregate of the following sectors:	446	65.0100	Railroads and related services	40, 474, pt. 4789
31. Motor freight transport is an aggregate of the following sectors:	448	65.0300	Motor freight transport and	42, pt. 4789
32. Other transportation is an aggregate of the following sectors:	447	65.0200	Local, interurban passenger	41
	449	65.0400	Water transportation	44
	450	65.0500	Air transportation	45
	451	65.0600	Pipe lines, except natural gas	46
	452	65.0701	Transportation services	471, 4723, pt.478
	453	65.0702	Arrangement of passenger transport	4722
	516	78.0100	U.S. postal service	4311
	519	79.0100	Local government passenger transport	pt. 41
33. Communications is an aggregate of the following sectors:	454	66.0000	Communications, except radio and t.v.	48 (excl. 483)
	455	67.0000	Radio and tv broadcasting	483
34. Utilities is an aggregate of the following sectors:	456	68.0100	Electric services	491, pt. 493
	457	68.0200	Gas production and distribute	492, pt. 493
	458	68.0301	Water supply and sewerage systems	494, 4952
	459	68.0302	Sanitary serv. and steam and irri. system	495 (excl. 4952), 496-7 pt. 493
	620	79.0200	State and local electric utilities	pt. 491
35. Wholesale trade is an aggregate of the following sectors:	460	69.0101	Recreational related wholesale trade	pt. 50
	461	69.0102	Other wholesale trade	pt. 50, 51
36. Retail trade is an aggregate of the following sectors:	462	69.0201	Recreational related retail trade	pt. 55, pt. 59
	463	69.0202	Other retail trade	52-7, pt. 59, 7393, 8042

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Table 11 continued
Omaha MSA Sector Aggregation Scheme

Omaha Sector	IMPLAN sector number	Bureau of Economic Analysis industry number	Sector description	Standard Industrial Classification Code	
37. Finance is an aggregate of the following sectors:	464	70.0100	Banking	60	
	465	70.0200	Credit agencies	61 (excl. 6732)	
	466	70.0300	Security and commodity brokers	62	
38. Insurance is an aggregate of the following sectors:	467	70.0400	Insurance carriers	63	
	468	70.0500	Insurance agents and brokers	64	
39. Real estate and rentals is an aggregate of the following sectors:	469	71.0100	Owner-occupied dwellings	not applicable	
	470	71.0200	Real estate	65-6, pt. 1531	
40. Hotels and lodging is an aggregate of the following sectors:	471	72.0100	Hotels and lodging places	70 excl. dining	
41. Personal services is an aggregate of the following sectors:	472	72.0201	Laundry, cleaning and shoe repair	721, 725	
	473	72.0202	Funeral service and crematories	726	
	474	72.0203	Portrait and photographic studios	722, 729	
	475	72.0204	Electrical repair services	762	
	476	72.0205	Watch, clock, jewelry and furn. repair	763-4	
	477	72.0300	Beauty and barber shops	723-4	
	492	75.0001	Automobile rental and leasing	751	
	493	75.0002	Automobile repair and services	753, 7549	
	494	75.0003	Automobile parking and car wash	752, 7542	
	42. Business services is an aggregate of the following sectors:	478	73.0101	Miscellaneous repair shops	769
		479	73.0102	Services to buildings	734
480		73.0103	Personal supply services	736	
482		73.0105	Management and consulting services	7391-2, 7397	
483		73.0106	Detective and protective services	7393	
484		73.0107	Equipment repair and leasing	7394	
485		73.0108	Photofinishing, commercial photography	7332-3, 7395	
487		73.0200	Advertising	731	
488		73.0301	Legal services	811	
489		73.0302	Engineering, architectural services	8911	
490	73.0303	Accounting, auditing and bookkeeping	833, 899		
43. Information services is an aggregate of the following sectors:	481	73.0104	Computer and data processing	737	
	486	73.0109	Other business services	732, 7331, 7339, 7399	
44. Eating and drinking places is an aggregate of the following sectors:	491	74.0000	Eating and drinking places	58, pt. 70	
45. Amusement and recreation is an aggregate of the following sectors:	495	76.0100	Motion pictures	78	
	496	76.0200	Dance halls, studios and schools	791	
	497	76.0201	Theatrical producers, bands, etc.	792	
	498	76.0202	Bowling alleys and pool halls	793	
	499	76.0203	Commercial sports except racing	7941	
	500	76.0204	Racing and track operation	7948	
	501	76.0205	Membership sports and recreation clubs	7997	
	502	76.0207	Amusement and recreation serv., n.e.c.	799 (excl.7997)	
	46. Other services is an aggregate of the following sectors:	503	77.0100	Doctors and dentists	801-3
		504	77.0200	Hospitals	806
505		77.0301	Nursing and protective care services	805	
506		77.0302	Other medical and health services	074, 8049, 807-9	
507		77.0401	Elementary and secondary schools	821	
508		77.0402	Colleges, univers., and profess. schools	822	
509		77.0403	Other educational services	823-9	
510		77.0501	Business associations	861-2	
511		77.0502	Labor and civic organization	863-4	
512		77.0503	Religious organizations	866	
513		77.0504	Other nonprofit organization	84, 865, 869, 8922, 6732	
514		77.0800	Residential care	8361	
515		77.0900	Social services, n.e.c.	8321, 8399	

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Table 11 continued
Omaha MSA Sector Aggregation Scheme

Omaha Sector	IMPLAN sector number	Bureau of Economic Analysis industry number	Sector description	Standard Industrial Classification Code
47. Government enterprises is an aggregate of the following sectors:	518	78.0400	Other federal government enterprises	several
	521	79.0300	Other state and local govt. enterprises	several
48. Special industries is an aggregate of the following sectors:	525	82.0000	Government industries	
	526	83.0000	Rest of the world industries	
	527	84.0000	Household industries	
	528	85.0000	Industry valuation adjustment	

¹ For industry classification and related census-SIC (Standard Industrial Classification) codes see U.S. Department of Commerce, Bureau of Economic Analysis, "Industry Classification of the 1977 Input-Output Tables," Survey of Current Business, 64, No. 5 (May 1984):80-84.

Table 12
Base Year (1982) Price Deflators (1982-1985)

IMPLAN Sector		1982	1983	1984	1985
Number	Sector				
1	Dairy farm products	1.000	1.012	1.106	0.888
2	Poultry and eggs	1.000	1.012	1.106	0.888
3	Ranch fed cattle	1.000	1.012	1.106	0.888
4	Range fed cattle	1.000	1.012	1.106	0.888
5	Cattle feedlots	1.000	1.012	1.106	0.888
6	Sheep, lambs and goats	1.000	1.012	1.106	0.888
7	Hogs, pigs and swine	1.000	1.012	1.106	0.888
8	Other meat animal products	1.000	1.012	1.106	0.888
9	Miscellaneous livestock	1.000	1.012	1.106	0.888
10	Cotton	1.000	1.012	1.106	0.780
11	Food grains	1.000	1.012	1.106	0.780
12	Feed grains	1.000	1.012	1.106	0.780
13	Hay and pasture	1.000	1.012	1.106	0.780
14	Grass seeds	1.000	1.012	1.106	0.780
16	Fruits	1.000	1.012	1.106	0.780
18	Vegetables	1.000	1.012	1.106	0.780
19	Sugar crops	1.000	1.012	1.106	0.780
20	Miscellaneous crops	1.000	1.012	1.106	0.780
21	Oil bearing crops	1.000	1.012	1.106	0.780
22	Forest products	1.000	1.012	1.106	0.780
23	Greenhouse and nursery product	1.000	1.122	1.200	0.780
26	Agricultural, forestry, fishery services	1.000	1.122	1.200	0.985
27	Landscape and horticultural services	1.000	1.122	1.200	0.985
41	Natural gas	1.000	0.929	0.914	0.894
42	Crude petroleum	1.000	0.000	0.000	0.894
43	Natural gas liquids	1.000	0.929	0.896	0.894
45	Crushed and broken limestone	1.000	1.018	1.056	1.081
46	Crushed and broken granite	1.000	1.018	1.056	1.081
47	Crushed and broken stone, n.e.c.	1.000	1.018	1.056	1.081
48	Construction sand and gravel	1.000	1.018	1.056	1.081
58	Misc. nonmetallic minerals	1.000	1.018	1.056	1.081
66	New residential structures	1.000	1.019	1.060	1.083
67	New industrial and commercial buildings	1.000	1.019	1.060	1.120
68	New utility structures	1.000	1.019	1.060	1.058
69	New Highways and streets	1.000	1.019	1.060	1.138
70	New farm structures	1.000	1.019	1.060	1.806
71	New mineral extraction facilities	1.000	1.019	1.060	1.119
72	New government facilities	1.000	1.019	1.060	1.104
73	Maintenance and repair, residential	1.000	1.037	1.081	1.090
74	Maintenance and repair, other	1.000	1.037	1.081	1.090
75	Maintenance and repair oil and gas wells	1.000	1.037	1.081	1.090
79	Small arms	1.000	1.291	1.379	1.063
82	Meat packing plants	1.000	0.945	0.945	0.947
83	Sausages and other prepared meats	1.000	0.945	0.945	0.947
84	Poultry dressing plants	1.000	0.945	0.945	0.947
85	Poultry and egg processing	1.000	0.945	0.945	0.947
86	Creamery butter	1.000	1.006	1.011	1.003
87	Cheese, natural and processed	1.000	1.006	1.011	1.003
88	Condensed and evaporated milk	1.000	1.006	1.011	1.003
89	Ice cream and frozen dessert	1.000	1.006	1.011	1.003
90	Fluid milk	1.000	1.006	1.011	1.003
91	Canned and cured sea foods	1.000	1.024	1.120	1.106
92	Canned specialties	1.000	1.024	1.120	1.106
93	Canned fruits and vegetables	1.000	1.024	1.120	1.106
94	Dehydrated food products	1.000	1.024	1.120	1.106
95	Pickles, sauces, and salad dressing	1.000	1.024	1.120	1.106
98	Frozen specialties	1.000	1.024	1.120	1.150
99	Flour and other grain mill products	1.000	1.027	1.065	0.976
100	Cereal preparations	1.000	1.027	1.065	0.976
101	Blended and prepared flour	1.000	1.027	1.065	0.976
102	Dog, cat, and other pet food	1.000	1.027	1.065	0.976
103	Prepared feeds, n.e.c.	1.000	1.027	1.065	0.976
104	Rice milling	1.000	1.027	1.065	0.976
105	Wet corn milling	1.000	1.027	1.065	0.976
106	Bread, cake, and related products	1.000	1.037	1.065	0.976

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Table 12 continued
Base = Year (1982) Price Deflators (1982-1985)

IMPLAN		1982	1983	1984	1985
Sector	Sector				
Number					
107	Cookies and crackers	1.000	1.037	1.085	1.121
108	Sugar	1.000	1.085	1.116	1.121
109	Confectionery products	1.000	1.084	1.139	1.113
110	Chocolate and cocoa products	1.000	1.084	1.139	1.113
111	Chewing gum	1.000	1.084	1.139	1.113
112	Malt liquors	1.000	1.037	1.061	1.086
116	Bottled and canned soft drinks	1.000	1.026	1.067	1.081
117	Flavoring extracts and syrup	1.000	1.026	1.067	1.081
121	Animal and marine fats and oils	1.000	1.112	1.397	0.976
122	Roasted coffee	1.000	1.112	1.397	0.976
123	Shortening and cooking oils	1.000	1.112	1.397	0.976
124	Manufactured ice	1.000	1.112	1.397	0.976
125	Macaroni and spaghetti	1.000	1.112	1.397	0.976
126	Food preparations, n.e.c.	1.000	1.112	1.397	0.976
131	Broadwoven fabric mills and	1.000	1.014	1.063	1.031
135	Floor coverings	1.000	1.014	1.054	1.038
143	Nonwoven fabrics	1.000	1.002	1.027	1.038
151	Apparel made from purchased	1.000	1.017	0.996	1.050
152	Curtains and draperies	1.000	0.981	0.996	1.027
153	Housefurnishings, n.e.c.	1.000	0.981	0.996	1.027
154	Textile bags	1.000	0.981	0.996	1.027
155	Canvas products	1.000	0.981	0.996	1.027
156	Pleating and stitching	1.000	0.981	0.996	1.027
157	Automotive and apparel trimm	1.000	0.981	0.996	1.027
159	Fabricated textile products	1.000	0.981	0.996	1.027
162	Hardwood dimension and floor	1.000	1.136	1.126	1.108
164	Millwork	1.000	1.054	1.041	1.105
165	Wood kitchen cabinets	1.000	1.052	1.041	1.105
168	Prefabricated wood buildings	1.000	1.052	1.041	1.119
170	Wood pallets and skids	1.000	1.052	1.041	1.080
172	Wood products, n.e.c.	1.000	1.052	1.041	1.080
173	Wood containers	1.000	1.052	1.041	1.080
174	Wood household furniture	1.000	1.021	1.053	1.089
175	Household furniture, n.e.c.	1.000	1.021	1.053	1.089
176	Wood tv and radio cabinets	1.000	1.021	1.053	1.089
177	Upholstered household furniture	1.000	1.021	1.053	1.089
178	Metal household furniture	1.000	1.021	1.053	1.089
179	Mattresses and bedsprings	1.000	1.021	1.053	1.089
180	Wood office furniture	1.000	1.039	1.078	1.105
181	Metal office furniture	1.000	1.089	1.078	1.105
183	Wood partitions and fixtures	1.000	1.039	1.078	1.127
184	Metal partitions and fixtures	1.000	1.039	1.078	1.127
185	Blinds, shades, and drapery	1.000	1.039	1.078	1.105
186	Furniture and fixtures, n.e.c.	1.000	1.039	1.078	1.105
189	Paperboard mills	1.000	1.031	1.102	1.073
190	Envelopes	1.000	1.031	1.102	1.079
191	Sanitary paper products	1.000	1.031	1.102	1.079
192	Building paper and board mills	1.000	1.031	1.102	1.079
193	Paper coating and glazing	1.000	1.031	1.102	1.079
194	Bags, except textile	1.000	1.031	1.102	1.079
195	Die-cut paper and board	1.000	1.031	1.102	1.079
197	Stationery products	1.000	1.031	1.102	1.079
198	Converted paper products, n.e.c.	1.000	1.031	1.102	1.079
199	Paperboard containers and boxes	1.000	1.982	1.105	1.106
200	Newspapers	1.000	1.067	1.109	1.244
201	Periodicals	1.000	1.078	1.105	1.241
202	Book publishing	1.000	1.078	1.105	1.159
203	Book printing	1.000	1.078	1.105	1.159
204	Miscellaneous	1.000	1.078	1.105	1.094
205	Commercial printing	1.000	1.015	1.078	1.098
206	Lithographic platemaking and services	1.000	1.015	1.078	1.126
207	Manifold business forms	1.000	1.015	1.078	1.098
208	Blankbooks and looseleaf binders	1.000	1.015	1.078	1.145
209	Greeting card publishing	1.000	1.015	1.078	1.107
210	Engraving and plate printing	1.000	1.015	1.078	1.098

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Table 12 continued
Base: Year (1982) Price Deflators (1982-1985)

IMPLAN		1982	1983	1984	1985
Sector	Sector				
Number					
211	Bookbinding and related work	1.000	1.015	1.078	1.145
212	Typesetting	1.000	1.015	1.078	1.126
213	Photoengraving	1.000	1.015	1.078	1.126
215	Industrial inorganic, organi	1.000	0.972	0.891	0.983
216	Nitrogenous and phosphatic fertilizers	1.000	0.959	0.973	0.910
217	Fertilizers, mixing only	1.000	0.959	0.973	0.910
218	Agricultural chemicals, n.e.c.	1.000	0.959	0.973	0.910
220	Adhesives and sealants	1.000	0.995	0.997	0.963
221	Explosives	1.000	0.995	0.997	0.963
222	Printing ink	1.000	0.995	0.997	0.963
224	Chemical preparations, n.e.c.	1.000	0.995	0.997	0.963
225	Plastics materials and resin	1.000	1.024	1.090	1.109
226	Synthetic rubber	1.000	1.024	1.090	1.109
229	Drugs	1.000	1.076	0.982	1.109
230	Soap and other detergents	1.000	1.014	1.144	1.197
231	Polishes and sanitation goods	1.000	1.014	1.028	1.112
234	Paints and allied products	1.000	1.008	1.038	1.062
235	Petroleum and coal product	1.000	0.901	0.873	0.836
236	Lubricating oils and greases	1.000	0.901	0.873	1.083
244	Miscellaneous plastics products	1.000	1.023	1.055	1.055
245	Rubber and plastics hose and belting	1.000	1.026	1.042	1.068
246	Leather tanning and finishing	1.000	0.999	1.007	1.146
248	Shoes, except rubber	1.000	1.021	1.025	1.050
251	Luggage	1.000	1.021	1.025	1.146
255	Glass and glass products, except containers	1.000	1.037	1.011	1.006
256	Glass containers	1.000	1.037	1.011	1.006
257	Cement, hydraulic	1.000	1.003	1.043	1.061
258	Brick and structural clay tiles	1.000	1.068	1.102	1.078
261	Structural clay products, n.e.c.	1.000	1.068	1.102	1.078
262	Vitreous plumbing fixtures	1.000	1.050	1.106	1.078
266	Pottery products, n.e.c.	1.000	1.050	1.106	1.078
267	Concrete block and brick	1.000	1.003	1.043	1.037
268	Concrete products, n.e.c.	1.000	1.003	1.043	1.037
269	Ready-mixed concrete	1.000	1.003	1.043	1.037
271	Gypsum products	1.000	1.003	1.043	1.037
272	Cut stone and stone products	1.000	1.018	1.060	1.078
275	Gaskets, packing and sealing	1.000	1.018	1.060	1.078
276	Minerals, ground or treated	1.000	1.018	1.060	1.078
279	Nonmetallic mineral products	1.000	1.018	1.060	1.078
285	Iron and steel foundries	1.000	1.013	1.053	1.069
286	Iron and steel forgings	1.000	1.013	1.053	1.022
287	Metal heat treating	1.000	1.013	1.053	0.930
288	Primary metal products, n.e.c.	1.000	1.013	1.053	0.091
290	Primary lead	1.000	1.068	1.014	0.091
293	Primary nonferrous metals, n.e.c.	1.000	1.068	1.014	0.091
294	Secondary nonferrous metals	1.000	1.068	1.014	0.930
298	Nonferrous wire drawing and insulating	1.000	1.070	0.927	0.997
299	Aluminum castings	1.000	1.025	1.084	1.072
301	Nonferrous castings, n.e.c.	1.000	1.068	1.014	1.089
303	Metal cans	1.000	1.022	1.067	1.055
304	Metal Barrels, drums and pails	1.000	1.022	1.067	1.055
305	Metal sanitary ware	1.000	1.026	1.067	1.102
306	Plumbing fixture fittings and trim	1.000	1.026	1.067	1.102
307	Heating equipment, except electric	1.000	1.026	1.067	1.102
308	Fabricated structural metal	1.000	0.997	1.022	1.023
309	Metal doors, sash, and trim	1.000	0.997	1.022	1.023
310	Fabricated plate work (boilershops)	1.000	0.997	1.022	1.023
311	Sheet metal work	1.000	0.997	1.022	1.023
312	Architectural metal work	1.000	0.997	1.022	1.023
313	Prefabricated metal building	1.000	0.997	1.022	1.023
314	Miscellaneous metal work	1.000	0.997	1.022	1.023
315	Screw machine products and bolt n.e.c.	1.000	0.990	1.020	1.027
318	Metal stampings, n.e.c.	1.000	1.002	1.046	1.102
320	Hand and edge tools, n.e.c.	1.000	1.001	1.060	1.093
322	Hardware, n.e.c.	1.000	1.037	1.060	1.093

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Table 12 continued
Base - Year (1982) Price Deflators (1982-1985)

IMPLAN Sector Number	Sector	1982	1983	1984	1985
323	Plating and polishing	1.000	0.997	1.021	1.099
324	Metal coating and allied services	1.000	0.997	1.021	1.099
325	Miscellaneous fabricated wire products	1.000	0.997	1.021	1.061
326	Steel springs, except wire	1.000	0.997	1.021	1.061
327	Pipe, valves, and pipe fittings	1.000	0.997	1.021	1.061
328	Metal foil and leaf	1.000	0.997	1.021	1.061
329	Fabricated metal products, n.e.c.	1.000	0.997	1.021	1.061
332	Farm machinery and equipment	1.000	1.049	1.081	1.073
333	Lawn and garden equipment	1.000	1.049	1.081	1.073
334	construction machinery and equipment	1.000	1.024	1.040	1.071
335	Mining machinery, except oil	1.000	1.024	1.040	0.987
336	Oil field machinery	1.000	1.024	1.040	0.987
337	Elevators and moving stairways	1.000	0.995	1.009	1.028
338	Conveyors and conveying equipment	1.000	0.995	1.009	1.028
339	Hoists, cranes, and monorails	1.000	0.995	1.009	1.028
340	Industrial trucks and tractors	1.000	0.995	1.009	1.028
341	Machine tools, metal cutting types	1.000	1.017	1.041	1.062
343	Special dies and tools and accessories	1.000	1.017	1.041	1.062
344	Power driven hand tools	1.000	1.017	1.041	1.062
345	Rolling mill machinery	1.000	1.017	1.041	1.062
346	Metalworking machinery, n.e.c.	1.000	1.017	1.041	1.062
347	Food products machinery	1.000	1.037	1.072	1.017
352	Special industry machinery	1.000	1.037	1.072	1.017
353	Pumps and compressors	1.000	1.014	1.033	1.046
356	Industrial patterns	1.000	1.014	1.033	1.046
357	Power transmission equipment	1.000	1.014	1.033	1.046
359	General industrial machinery	1.000	1.014	1.033	1.046
360	Carburetors, pistons, rings, valves	1.000	1.045	1.094	1.103
361	Machinery, except electrical n.e.c.	1.000	1.045	1.094	1.103
366	Automatic merchandising machinery	1.000	1.033	1.041	1.077
367	Commercial laundry equipment	1.000	1.033	1.041	1.077
368	Refrigeration and heating equipment	1.000	1.033	1.041	1.077
369	Measuring and dispensing pumps	1.000	1.033	1.041	1.077
370	Service industry machines, n.e.c.	1.000	1.033	1.041	1.077
371	Instruments to measure elect	1.000	1.048	1.082	1.119
372	Transformers	1.000	1.048	1.082	1.072
373	Switchgear and switchboard apparatus	1.000	1.048	1.082	1.072
374	Motors and generators	1.000	1.062	1.097	1.090
375	Industrial controls	1.000	1.062	1.097	1.090
376	Welding apparatus, electric	1.000	1.062	1.097	1.090
386	Electric lamps	1.000	1.095	1.175	1.121
387	Lighting fixtures and equipment	1.000	1.095	1.175	1.121
389	Radio and tv receiving sets	1.000	0.978	0.949	0.954
390	Phonograph records and tape	1.000	0.978	0.949	0.954
391	Telephone and telegraph apparatus	1.000	1.037	1.074	1.060
392	Radio and tv communication equipment	1.000	1.037	1.074	1.116
393	Electron tubes	1.000	1.042	1.096	1.153
395	Electronic components, n.e.c.	1.000	1.042	1.096	1.099
396	Storage batteries	1.000	0.989	0.995	1.007
397	Primary batteries, dry and wet	1.000	0.989	0.995	1.042
398	X-ray apparatus and tubes	1.000	0.989	0.995	1.086
400	Truck and bus bodies	1.000	0.989	0.995	1.042
401	Truck trailers	1.000	1.021	1.039	1.069
402	Motor vehicles	1.000	1.021	1.039	1.075
403	Motor vehicle parts and accessories	1.000	1.021	1.039	1.075
404	Aircraft	1.000	1.021	1.039	1.026
405	Aircraft and missile engines	1.000	1.108	1.169	1.140
407	Aircraft and missile equipment	1.000	1.108	1.169	1.086
408	Ship building and repairing	1.000	1.029	1.052	1.107
409	Boat building and repairing	1.000	1.029	1.052	1.107
410	Railroad equipment	1.000	1.011	1.022	1.059
411	Motorcycles, bicycles, and parts	1.000	1.028	1.052	0.885
412	Travel trailers and campers	1.000	1.028	1.027	0.885
415	Transportation equipment, n.e.c.	1.000	1.028	1.027	0.885
416	Engineering and scientific instruments	1.000	1.047	1.070	1.070

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Table 12 continued
Base - Year (1982) Price Deflators (1982-1985)

IMPLAN Sector Number	Sector	1982	1983	1984	1985
417	Mechanical measuring devices	1.000	1.047	1.070	1.119
419	Surgical and medical instruments	1.000	1.047	1.070	1.110
420	Surgical appliances and supplies	1.000	1.047	1.070	1.110
424	Ophthalmic goods	1.000	1.047	1.070	0.963
425	Photographic equipment and supplies	1.000	1.023	1.017	1.036
426	Jewelry, precious metal	1.000	1.416	1.088	1.010
427	Jewelers materials and lapidary ware	1.000	1.416	1.088	1.010
428	Silverware and plated ware	1.000	1.416	1.088	1.010
429	Costume jewelry	1.000	1.416	1.088	1.124
430	Musical instruments	1.000	1.001	1.000	1.124
431	Games, toys, and childrens vehicles	1.000	1.001	1.000	1.032
433	Sporting and athletic goods	1.000	1.001	1.000	1.032
435	Lead pencils and art goods	1.000	1.046	1.069	1.124
436	Marking devices	1.000	1.046	1.069	1.124
438	Artificial trees and flowers	1.000	1.046	1.069	1.124
440	Needles, pins, and fasteners	1.000	1.046	0.709	1.124
441	Brooms and brushes	1.000	1.046	1.069	1.124
443	Burial caskets and vaults	1.000	1.046	1.069	1.124
444	Signs and advertising displays	1.000	1.046	1.069	1.124
445	Manufacturing industries, n.e.c.	1.000	1.046	1.069	1.124
446	Railroads and related services	1.000	1.011	1.058	0.998
447	Local, interurban passenger	1.000	1.089	1.158	1.244
448	Motor freight transport and warehousing	1.000	1.011	1.018	1.110
449	Water transportation	1.000	1.146	1.313	1.173
450	Air transportation	1.000	1.180	1.401	1.181
451	Pipe lines, except natural gas	1.000	1.149	1.192	1.093
452	Transportation services	1.000	1.046	1.084	0.931
453	Arrangement of passenger transport	1.000	1.046	1.084	0.931
454	Communications, except radio	1.000	1.065	1.099	1.198
455	Radio and tv broadcasting	1.000	1.034	1.113	1.193
456	Electric services	1.000	1.030	1.088	1.089
457	Gas production and distribution	1.000	1.089	1.167	1.141
458	Water supply and sewerage systems	1.000	1.084	1.165	1.224
459	Sanitary services and steam and irrigation systems	1.000	1.084	1.165	1.224
460	Recreational related wholesale trade	1.000	1.011	1.032	1.048
461	Other wholesale trade	1.000	1.011	1.032	1.048
462	Recreational related retail	1.000	1.035	1.051	1.105
463	Other retail trade	1.000	1.035	1.051	1.105
464	Banking	1.000	1.056	1.116	1.259
465	Credit agencies	1.000	1.212	1.188	1.251
466	Security and commodity brokers	1.000	1.212	1.188	0.990
467	Insurance carriers	1.000	0.993	1.004	1.236
468	Insurance agents and brokers	1.000	1.011	1.022	1.129
469	Owner-occupied dwellings	1.000	1.059	1.115	1.178
470	Real estate	1.000	1.012	1.071	1.181
471	Hotels and lodging places	1.000	1.062	1.171	1.191
472	Laundry, cleaning and shoe repair	1.000	1.039	1.095	1.163
473	Funeral service and crematories	1.000	1.039	1.095	1.320
474	Portrait and photographic studios	1.000	1.039	1.095	1.169
475	Electrical repair services	1.000	1.039	1.095	1.151
476	Watch, clock, jewelry and furniture repair	1.000	1.039	1.095	1.155
477	Beauty and barber shops	1.000	1.049	1.095	1.140
478	Miscellaneous repair shops	1.000	1.109	1.139	1.302
479	Services to building	1.000	1.109	1.139	1.194
480	Personnel supply services	1.000	1.109	1.139	1.194
481	Computer and data processing	1.000	1.109	1.193	1.194
482	Management and consulting services	1.000	1.109	1.139	1.194
483	Detective and protective services	1.000	1.109	1.139	1.194
484	Equipment repair and leasing	1.000	1.109	1.139	1.194
485	Photofinishing, commercial photography	1.000	1.109	1.139	1.194
486	Other business services	1.000	1.109	1.139	1.194
487	Advertising	1.000	1.109	1.139	1.194
488	Legal services	1.000	1.085	1.145	1.320
489	Engineering, architectural services	1.000	1.085	1.145	1.133
490	Accounting, auditing and bookkeeping	1.000	1.085	1.145	1.318

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Table 12 continued
Base Year (1982) Price Deflators (1982-1985)

IMPLAN Sector Number	Sector	1982	1983	1984	1985
491	Eating and drinking places	1.000	1.044	1.088	1.136
492	Automobile rental and leasing	1.000	1.044	1.081	1.194
493	Automobile repair and services	1.000	1.044	1.081	1.113
494	Automobile parking and car wash	1.000	1.044	1.081	1.113
495	Motion pictures	1.000	1.142	1.247	1.208
496	Dance halls, studios and schools	1.000	1.142	1.084	1.103
497	Theatrical producers, bands	1.000	1.042	1.084	1.208
498	Bowling alleys and pool halls	1.000	1.042	1.084	1.208
499	Commercial sports except racing	1.000	1.042	1.084	1.218
500	Racing and track operation	1.000	1.042	1.084	1.218
501	Membership sports and recreation	1.000	1.042	1.084	1.103
502	Amusement and recreation services	1.000	1.042	1.084	1.103
503	Doctors and dentist	1.000	1.075	1.152	1.218
504	Hospitals	1.000	1.064	1.122	1.195
505	Nursing and protective care	1.000	1.087	1.153	1.222
506	Other medical and health services	1.000	1.087	1.153	1.222
507	Elementary and secondary schools	1.000	1.059	1.108	1.119
508	Colleges, universities, and professional schools	1.000	1.059	1.108	1.119
509	Other educational services	1.000	1.059	1.108	1.119
510	Business associations	1.000	1.055	1.102	1.320
511	Labor and civic organization	1.000	1.055	1.102	1.076
512	Religious organizations	1.000	1.055	1.102	1.078
513	Other nonprofit organization	1.000	1.055	1.102	1.078
514	Residential care	1.000	1.062	1.171	1.080
515	Social servic n.e.c.	1.000	1.055	1.102	1.080
516	U.S. postal service	1.000	1.055	1.055	1.056
517	Federal electric utilities	1.000	1.030	1.088	1.118
518	Other federal government enterprises	1.000	1.005	1.055	1.105
519	Local government passenger transport	1.000	1.047	1.138	1.133
520	State and local electric utilities	1.000	1.030	1.088	1.235
521	Other state and local govt enterprises	1.000	1.047	1.139	1.303
527	Household industry	1.000	1.011	1.036	1.025

1 When dealing with employment effects, all dollar values must be deflated to 1982 dollars. For example, if 1985 data for banking, IMPLAN sector 464 and finance sector 32 in this study, were being used and employment effects were desired, this data should be deflated to 1982 values. Assuming a change in output in 1985 dollars of \$10 million, the 1982 equivalent is as follows:

$$\frac{\$10}{1.259} = \$7.94 \text{ million}$$

Glossary

Direct Employment Change. The change in employment of a sector in response to a change in final demand for its output (the direct employment coefficient times a change in final demand).

Direct Employment Coefficients. Base year total employment of a sector divided by its base year total gross outputs (TGO). The coefficient represents persons employed (jobs not work years) per \$1 million of total gross output.

Direct Requirements. The dollar value of inputs required by a purchasing industry from a selling industry in order for the purchasing industry to produce \$1 worth of output. Direct requirements are computed by dividing each industry's purchases (column entries in an input-output model) by its total gross output (total supply). They are only computed for the processing sector. Direct requirements are also referred to as technical coefficients, direct coefficients, or input requirements.

Direct Employee Compensation Income Coefficients. Wage and salary (income) payments to employees of a sector divided by the total gross output of the sector. The coefficient represents the wages and salaries paid to employees per \$1 million of total gross output. The coefficient actually becomes the percentage of total gross output paid to employees working in the sector.

Employment. Number of jobs required to produce the output of each sector. A job may be 1 week, 1 month, or 1 year in duration. Employment is the basic data used in determining other county-level data; thus, it is the major element in the regional model development. Base-year employment is displayed as thousands of jobs.

Employee Compensation. Wages and salaries paid (in thousands of 1982 dollars) to employees by the firms within each sector. Employee compensation is reported by place of production, not by place of residence of the employees. That is, if the industry is located in the region, the entire amount of wages and salaries paid to employees is included in the region's compensation and would overstate the income in the region.

Federal Government Expenditures. Total purchases (in thousands of 1982 dollars) by federal government agencies within the region from producing sectors both inside and outside the region. The federal government also sell items such as timber and gravel, and makes transfer payments, such as buying agricultural crops some years and selling them other years. If the net expenditures are positive, purchases exceed sales; but, if the net expenditures are negative, sales are larger than purchases in that sector.

Final Demand. Total final demand is the sum of personal consumption expenditures, capital formation, inventory change, state and local government expenditures, federal government expenditures, and regional exports. Except for foreign exports, these expenditures represent purchases by entities within the region from producing sectors both within and outside the region.

Indirect Business Tax. Includes items such as manufacturers' excise tax, wholesale excise tax, retail excise tax, and retail sale tax, which businesses have to pay when purchasing goods and services they use in their production process. Indirect business tax is reported by place of production rather than by place of final sale.

Industry. A firm or group of firms that assembles inputs in a production process and produces an output or group of outputs. Firms are grouped into an industry because they produce homogeneous or similar products and use the same or similar inputs and have the same or similar production processes.

Interindustry Transactions. The total dollar value (in thousands of 1982 dollars) of inputs required by purchasing industries within the region from selling industries within the region in order for the purchasing industry to produce the total gross output. Interindustry transactions represent the flow of goods and services moving through the economy from resources to the production of final products. However, all of the products that are traded between the regional industries represented by the interindustry transactions are intermediate goods purchased for use in the production of other goods and services. Interindustry transactions do not represent any sales of final goods (final demand) and services or sales to industries outside the region (exports).

Intermediate Demand. The sum of all sales (interindustry transactions) of outputs to other industries within the region by industries within the region. Intermediate outputs are used by the purchasing industries as inputs in their production processes.

Intermediate Supply. The sum of all purchases (interindustry transactions) of outputs produced by other industries within the region and used as inputs in the production process of an industry within the region.

Inventory Change. Includes both additions (positive amounts) and depletions (negative amounts). Inventory additions include the current year (1982) outputs produced but not sold by the year's end. Inventory depletions include the previous year's production that was used or sold during the current year (1982). If the net inventory change is positive, the additions are greater than the depletions. However, if the net change is negative, the depletions are greater than the additions.

Investment. Total purchases (in thousands of 1982 dollars) by firms in the region as investment (land, plant, and equipment used in the production process) from sectors both inside and outside the region. As used in this study it includes both capital formation and inventory additions.

Multiplier (Type I). The ratio of the direct plus the indirect change to the direct change resulting from a unit increase in final demand for any given sector. IMPLAN has multipliers for personal and total income, value-added, employment, and output.

Multiplier (Type III). The ratio of the direct plus the indirect plus the induced change resulting from a unit increase in final demand for any given sector.

Number of Sectors. The number of sectors (industries) in an input-output model built with the IMPLAN system includes only the sectors that exist in the region. Any sector that has a positive total gross output in any county that is included in the region will be included in the model. Aggregation combines sectors and reduces the number of sectors in the model.

Other Proprietary Income. Includes rental income of persons, corporate profits with an adjustment for inventory valuation, net interest payments, subsidies, business transfers, and capital consumption allowances. Income is reported by place of production and not by place of residence.

Output/Employee. The amount of output (total gross output) produced by one employee (job). It is calculated by employees (jobs) in the sector.

Personal Consumption Expenditures. Total purchases (in thousands of 1982 dollars) by the residents (households) of a region from each producing sector. These purchases may come from sectors inside the region and, as such, are part of final demand. Some of these purchases may come from sectors outside the region and are, thus, imports purchased directly by the residents of the region.

Personal Income/Job. A ratio of employee compensation to number of employees (jobs) in a sector. The ratio is reported in millions of 1982 dollars per job and can be used to compare with local wage and salary rates.

Proprietary Income. Profits, rents, royalties, and interests, accruing to noncorporate entities. This includes sole proprietorships, partnerships, and tax-exempt corporations. Income is reported by place of production and not by place of residence of owner.

Regional Exports. Outputs that are produced but not consumed or used in the production of other outputs in the region. Exports are outputs purchased by industries and consumers outside the region from industries within the region. A comparison is made between the total supply from a sector and the demand for the outputs within the region. If the supply is greater than the sum of all

the demands, the residual is assumed to be exported because it is produced and not used or consumed inside the region.

Regional Imports. Purchases of outputs by industries and final demanders inside the region from producing industries outside the region, including producing industries outside the United States.

Sector. An industry or industries that are grouped together in an input-output model to reduce the size of the model, while still accounting for all industries.

State and Local Government Expenditures. Total purchases (in thousands of 1982 dollars) by state and local governments within the region from producing sectors both inside and outside the region. State and local governments also sell items such as timber and gravel. If the net expenditures are positive, purchases exceed sales; however, if the net expenditures are negative, then sales are greater than purchases.

Total Demand. The value, in producer prices, of all outputs produced by the industries in a sector during 1982. Total demand is the sum of all sales of an industry during a calendar year. It includes net inventory change, which includes the value of outputs produced during the year and not sold and the value of output on hand and in process at the beginning of the year. For an economy as a whole, total demand double-counts the value of production because it accounts for all sales; intermediate outputs are counted everytime they are sold. For example, a calf is sold at the beginning of the year to a feed lot, then sold later in the year to a packing plant, then sold through the wholesaler and retailer to the consumer. The value of the original calf is accounted for several times. Total demand is the controlling value used to develop a regional input-output model with the IMPLAN system. Total demand represents the supply from the region and, as such, is not changed by any of the mathematical manipulation used in developing the model.

Total Final Payments. The payments for inputs that are not produced by industries within the region. Total final payments include employee compensation; indirect business taxes; property-type income; and competitive, noncompetitive, and foreign imports.

Total Requirements Matrix. A matrix of total requirement coefficients or the amount each industry in the economy is required to produce (directly and indirectly) in order for the purchasing industry to deliver one dollar's worth of output to final demand. The open model signifies that the household sector is exogenous to the model (it is outside the coefficients' matrices). The household sector is treated as part of final payments and final demand is an open model. The induced effects (employees and owners of industries spending their incomes within the region) are not considered inside the model,

and must be calculated through iteration or some other method outside the matrix inversion technique.

Total Supply. The sum of all purchases of outputs used as inputs in the production process of an industry inside the region. Total supply includes the sum of all purchases from other industries inside the region (intermediate supply), plus the purchases of all inputs not produced by industries in the region. Total supply will always equal total demand for any producing sector, because total supply accounts for all inputs, including profit and imports, and total demand accounts for all outputs, including consumption and exports.

Value-Added. The sum of employee compensation, indirect business taxes, and property-type income. Value-added is essentially the income accruing to a region (Omaha MSA) when an output is produced and sold. Employee compensation and property-type income go directly to the households and indirect business taxes go to governments. Value-added is often used as a proxy for gross regional product, or the cumulative value of all new production of the region during the year.

About the Author

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