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The Washington State Input-output Study for 1982

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THE WASHINGTON STATE INPUT-OUTPUT STUDY FOR 1982

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The Washington State Input-Output Study for 1982

by

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Preface

This report presents an analysis of the structural interdependencies among Washington industries, and between Washington industries and the rest of the world, for the year 1982. It is called an input-output (I/O) study because it describes the inputs used by Washington industries and the markets for their outputs.

This is the fourth of a series of studies that describe in considerable detail the interindustry linkages prevailing in the state of Washington. Prior studies covered the years 1972, 1967, and 1963. Each provides a wealth of information about economic activity in the state. These studies supply periodic estimates of the Gross State Product (GSP) of the region, the contribution of each industry to the GSP, and the intermediate and final markets for output.

Estimates of impact multipliers, useful in evaluating the ripple effects of spending, are one of the derivative products of these investigations. Such multipliers have been widely used in a variety of planning documents and in assessments of the impacts of a multitude of developmental projects.

These studies also provide basic materials for the evaluation of long-term structural changes in the transactions relationships between Washington State and the rest of the world.

Beyond their application within Washington State, the Washington I/O studies have provided regional scientists elsewhere with empirical materials for model testing. It is fair to say that regional economists everywhere have been making a major effort to simulate input-output models for regions by synthetic methods, and the Washington input-output studies have been extensively used to test the empirical validity of such models. In this way the Washington studies have made an important scientific contribution beyond the region under discussion.

The primary purpose of this report is to present empirical findings, not to speculate on their implications. The interpretation of these data and their applications to various economic problems is work yet to be done. We have undertaken initial analysis, but the basic data are made available so that others may join in drawing out their significance more deeply and broadly.

1. The Washington State Input-Output Table

An Economic Accounting System

The Washington input-output study is a comprehensive accounting of all conventionally defined economic activities within the state. The value of outputs produced by different industries is traced to the markets in which that output is sold. The disposition of outlays by each industry for inputs to support its production is identified. These accounts provide a warehouse of information, if users understand the accounting conventions employed, the system of classification, and the methods of valuation. These have been described in considerable detail in previous publications* but will be briefly mentioned in appropriate contexts in the present report.

A Semi-Survey Input-Output Table

Every input-output table is based on estimates from sources of varying degrees of reliability and consistency. The Washington table is no exception. Estimates of gross outputs (sales, shipments, production, revenues, receipts) for individual industries are drawn principally from the various industrial censuses conducted for the year 1982. Extensive use of reports by regulatory authorities, both state and federal, is also incorporated into the data base. Often several different estimates of gross outputs (or control totals) have been made from different sources and a judgment made as to which best represented the gross output flows of a sector. Where hard facts were not available, estimates have been made by a scaling from national measures. In some instances, shipments are adjusted to a value of production basis, but inventory change data are generally inadequate for drawing that distinction on a systematic basis.

The markets for gross output, and the distribution of costs incurred in production, are partly estimated from the above sources. For most sectors the estimates of the sources of inputs and markets for outputs are based on surveys of business establishments that were queried by mail questionnaires, company interviews, and phone conversations. Literally hundreds of managers of Washington businesses and scores of industry specialists in a variety of federal and state agencies provided quantitative and qualitative information. Construction of the table is analogous to a mining operation in which the search uncovered numerous veins of valuable material, but often disappointments, too.

From these varied sources, the staff of the input-output study prepared sector-by-sector estimates of the total inputs of each kind acquired to support production, where it came from (in-state, out-of-state, foreign), and the markets for outputs (in similar geographic detail). Initially an input-table and an output-table for each of the fifty-one industrial sectors were prepared; the former is a purchase table, based on purchasers'

*Philip J. Bourque et al., *The Washington Economy: An Input-Output Study*, Graduate School of Business Administration, University of Washington, and Washington State Department of Commerce and Economic Development (1967); Philip J. Bourque and Eldon E. Weeks, *Detailed Input-Output Tables for Washington State, 1963*, Washington Agricultural Experiment Station Circular 508 (1969); William B. Beyers et al., *Input-Output Tables for the Washington Economy, 1967*, Graduate School of Business Administation, University of Washington (1970); and Philip J. Bourque and Richard S. Conway, Jr., *The 1972 Washington Input-Output Study*, Graduate School of Business Administration, University of Washington (1977).

prices paid, while the latter is a sales table, based on producers' reported receipts. These two tables have been melded in a process called "arbitrage," which resolves conflicting estimates of inter-sector flows and places all valuations on a producers' price basis. Those distributions were made within the constraints that all output must find a market and that all output is decomposable into a cost or return.

The Regional Gross Flows Table

The primary product of this study is an interindustry gross flows table (see Appendix Table I), which is also referred to as the I/O table. Reading across each row shows the transactions among Washington industries (intermediate flows) and between industrial sectors and final markets. Final markets include Washington personal consumption expenditures (PCE), Washington gross private domestic investment (GPDI), Washington state and local government purchases (WA S&L), federal expenditures, exports to rest-of-U.S. (Exports-U.S.), and foreign exports (Exports-foreign). Each column shows the purchases by each Washington sector from other Washington sectors, the value added by each sector, and imports. Several caveats to readers of the table follow:

1. Reading down each column provides estimates of the value of *operating* inputs purchased from Washington sectors to support the level of gross output designated at the bottom of the table. Purchases of capital goods are not shown separately for each industry; capital spending is shown as a consolidated vector in the gross private domestic investment column (GPDI).

2. All flows are reported in producers' prices. This means the input costs of transportation, and trade margins of middlemen, are shown as purchases from the Transportation Services and the Trade sectors. An easy accounting rule to remember is that the buyer pays for freight and merchandising.

3. Value added (VA) is a measure of the portion of each sector's gross output created by the resources engaged within that sector. VA is gross in that it is measured before capital consumption allowances and indirect business taxes. It is exclusive of direct production subsidies.

Since VA is a measure of the gross income created by the resources employed within each industry, it is, in principle, a measure of the gross domestic product of the United States originating within Washington State. Not all VA accrues as income to residents of Washington State; portions accrue to property owners elsewhere, or for tax payments.

4. Reading across each row provides estimates of the flows of output to various markets. Foreign exports shown in the gross flows table differ significantly from customs-based foreign trade data. Customs data include transshipments, exclude service flows, and report imports and exports on a place of entry/exit basis and not on a place of use or state of origin basis.

5. The activity of government enterprises is combined with their private sector counterparts. Puget Sound Naval Shipyard is included in Shipbuilding, for example. The activity included in each sector is defined by the Standard Industrial Classification (SIC) system codes shown in Table 1. The sector names are capsule abbreviations of the included activity.

Table 1: Washington Input-Output Sector Definitions, 1982

Sector No.	Industry Name	Standard Industrial Classification (SIC) System Codes
1	Field & Seed Crops	011, 013 (exc. 0134), pt. 019
2	Vegetables & Fruits	0134, 016, 107, pt. 019
3	Livestock & Products	02
4	Other Agriculture	018
5	Fisheries	09 (exc. 097)
6	Meat Products	201
7	Dairy Products	202
8	Canning & Preserving	203, 2091, 2092
9	Grain Mill Products	204
10	Beverages	208
11	Other Foods	205-207, 2095-2099
12	Textiles	22
13	Apparel	23
14	Mining	10-14
15	Forestry	08 (inc. national & state forests, christmas tree farms)
16	Logging	241
17	Sawmills	242
18	Plywood	2435, 2436
19	Other Wood Products	2431, 2434, 2439, 244, 245, 249
20	Furniture & Fixtures	25
21	Pulp Mills	261
22	Paper Mills	262
23	Paperboard, Other Paper	263-266
24	Printing & Publishing	27
25	Industrial Chemicals	281, 286, 287, 289
26	Other Chemicals	282-285
27	Petroleum	29
28	Glass Products	321-323
29	Cement, Stone & Clay	324-329
30	Iron & Steel	331, 332, 339
31	Other Nonferrous Metals	3331-3333, 3339, 334, 3351, 3356, 3357, 3362, 3369
32	Aluminum	3334, 3353-3355, 3361
33	Structural Metal Products	344
34	Other Fabricated Metals	341-343, 345-349
35	Nonelectrical Motive Equip.	351-353
36	Machine Tools & Shops	354, 359
37	Nonelectrical Industrial Equip.	355-358
38	Electrical Machinery	36
39	Aerospace	372, 376
40	Motor Vehicles	371, 374, 375, 379
41	Ship & Boat Building	373 (inc. Puget Sound Naval Shipyard)
42	Other Manufacturing	30, 31, 38, 39
43	Transportation Services	40-47 (inc. Postal Service, state ferries, ports & public transit)
44	Electric Companies	491, pt. 493 (inc. BPA, PUDs & municipal electric utilities)
45	Gas Companies	492, pt. 493 (inc. municipal gas companies)
46	Other Utilities	Pt. 493, 494-497 (inc. public water, sewage, sanitary & irrigation systems)
47	Communications	48
48	Construction	15-17
49	Trade	50-59 (inc. state liquor stores)
50	Finance, Ins. & Real Estate	60-67
51	Services	07, 097, 70-89 (exc. public hospitals & schools)

6. Following the practice of the industrial censuses, we have chosen the unit of observation within most sectors as the establishment whose primary product determines its sector classification. Establishments sometimes produce products (secondary products) that are primary to some other sector (e.g., Trade sector establishments performing Service sector activities). Unlike national input-output tables, the Washington input-output table does not distinguish between primary and secondary product output; thus, the output of sawmills (primary product being lumber) may include logging activity (secondary product) conducted by some sawmills. Output of the agricultural sectors, fisheries, forestry, and construction is measured on a product basis.

7. The gross flows table is not exact. Individual entries therein are approximations based on a persistent effort to describe the transactions structure of the Washington economy in a meaningful way. The flows are reported in millions of dollars. Traces of lesser flows were eliminated in the balancing of the table.

Conceptual Problems

Beyond the numerous empirical difficulties encountered in table assembly, there are certain conceptual issues not satisfactorily resolved. Three deserve particular attention because they have not been generally recognized or addressed in other regional input-output studies.

1. *The Headquarters Problem.* All production units operating in Washington State have office/management/sales staff whose costs are supported by the revenues from the sales of goods and services. However, these functions may be provided by offices located elsewhere, essentially involving the "importation of overhead services." Since these costs are unrecorded, the value of imported services are understated and the VA of some Washington industries is overstated.

On the opposite side of the same coin, some Washington companies (e.g., Boeing, Weyerhaeuser, Paccar, Burlington Northern) have headquarter facilities in Washington whose costs are partially incurred in support of production facilities elsewhere. Such companies are engaged in the production of management services for export to other regions. Since VA is generally calculated as reported shipments minus costs of materials and services consumed, the VA and exports by sectors with large headquarters tend to be underestimated.

2. *Out of State Production by Washington Business.* In principle, VA is a measure of the value created by the resources engaged in productive activity within Washington State. Certain factors of production, however, are highly mobile and engage in productive activity beyond the borders of the state. A case in point is the Washington fishing fleet, part of which regularly (and not incidentally) engages in the Alaskan fishery. Should the production of this industry include the value of that catch, most of which is landed in Alaska? We have chosen to define the output of the Washington fisheries as the value of the catch landed in Washington as reported by the Washington Department of Fisheries. On the other hand, the U.S. Department of Commerce, in preparing estimates of Washington personal income, includes the earnings of Washington fishermen derived from the Alaskan fishery. Obviously, there is more than one way to define the economic activity of a region.

This example could be extended to other sectors, such as Construction or Transportation Services. In principle, we have chosen to confine our estimates of the value of output, and VA, to those activities geographically within Washington State.

This implies a place of work concept, rather than a place of residence, as the basis for measuring output and VA.

3. *Defining Value Added (VA).* VA is a measure of the value of output created by the resources engaged within a sector; therefore it is a measure of the income available (gross of capital consumption allowances and taxes) for dispersal to various factors of production. We have not attempted to decompose VA flows into its constituent elements such as property income, employee compensation, or business taxes. That should be on the agenda for future research.

In the Electricity sector, the VA of Bonneville Power Authority (BPA) is a measured gross of its disbursements to WPPSS and net residential power exchange costs, even though these expenditures are reported as "purchases" in BPA accounts. The division between what constitutes an expense for inputs and what is an investment outlay or subsidy is drawn with some difficulty. In the Electricity sector we have tilted toward following the physical flows of electricity and their associated production costs within Washington State.

A Gross Flows Perspective

The Washington Interindustry Gross Flows Table provides a broad perspective of the flows of revenue and outlays of industry in terms closely akin to business accounting. Much as company annual reports disclose operating revenues and operating costs, the gross flows table resembles a consolidated income and expenditure statement for all Washington business. However, it is a unique accounting statement in that the sources of revenue and distribution of costs are identified geographically; moreover, the bottom line is not profit but incomes earned by all factors of production. The Washington Gross Flows Table provides a bridge between conventional business accounting and regional economic measures such as employment, payrolls, or earnings.

This bridge can be important in placing ongoing business activity in context. For example, announcements of new orders for goods, or sales volumes of new industry, are frequently quoted in millions of dollars. Business and Occupation taxes are levied on gross receipts. The size of an industry has many dimensions, not the least being shipments or revenues. Such activity may be placed in perspective if compared with similar gross flows data for other industrial sectors.

The measures of industry output shown in the Washington Interindustry Gross Flows Table are specific to the year 1982. Users should make allowance for the growth fortunes and for inflationary trends of different sectors since then. These considerations suggest that continuous updating could enhance the practical utility of the table. Since there is some evidence that the structure of industry changes but slowly, the table provides an important descriptive perspective of the transactions structure of our Washington economy, its limitations cited notwithstanding.

2. Washington's Income and Product Accounts

The Washington input-output tables provide the basic information for constructing the income and product accounts of the state. Washington's Gross State Product (GSP) is the sum of the VAs in all sectors of our economy. In 1982 these amounted to $58.5 billion, or 1.8% of the Gross National Product (GNP). In 1963, the year of the first input-output study for Washington State, the GSP then was but $9.1 billion, or 1.5% of GNP. After adjustment for inflation, the annualized growth rate of Washington's GSP for this interval was 3.8%, compared to a real GNP growth rate of 2.8%. Over the long-term, Washington's growth has outpaced the nation's.

Estimates of the Washington GSP for the years covered by the several input-output studies are shown in Table 2. The high growth rate between 1963 and 1967 is a reflection of an investment boom spurred by the rapid expansion of the Boeing Company during the mid-sixties. During the interval 1972-82, the Washington GSP growth rate of 3.6% per annum has exceeded the GNP growth rate of 2.0%.

Table 2: Washington Gross State Product
selected years, in current and constant (1982) dollars

Year	Washington GSP ($Mil.)* Nominal $	Constant $	Share of U.S. GNP	Constant $ Annualized Growth Rates
1963	9,066	27,981	1.5%	---
1967	12,733	35,467	1.6%	6.1
1972	19,171	41,228	1.6%	3.1
1982	58,487	58,487	1.8%	3.6

*The real GSP (in 1982 dollars) is estimated by deflating nominal GSP by the U.S. GNP price deflator.

The Sources of GSP, by Industry

Estimates of the industrial origin of the Washington GSP are summarized in Table 3. The percentage contribution of each category to the total GSP over the years is quite revealing about the long-term trends in the industrial structure of the state. The service sectors--establishments in Services, Trade, and Finance/Insurance/Real Estate--account for an increasing share of income originating in Washington State. More than one-third of GSP is now accounted for in these labor-intensive industries. The resource-oriented and manufacturing sectors have lost ground. The VA in general government (measured by compensation payments) currently accounts for about the same proportion of GSP as it did two decades earlier. Household VA, a measure of the net rental value of occupied homes (technically, gross housing product), has risen significantly over the past decade. The commodity-producing industries are clearly making a relatively smaller contribution to the Washington economy than they did in years past (see Figure 1).

Table 3: Sources of Washington Gross State Product

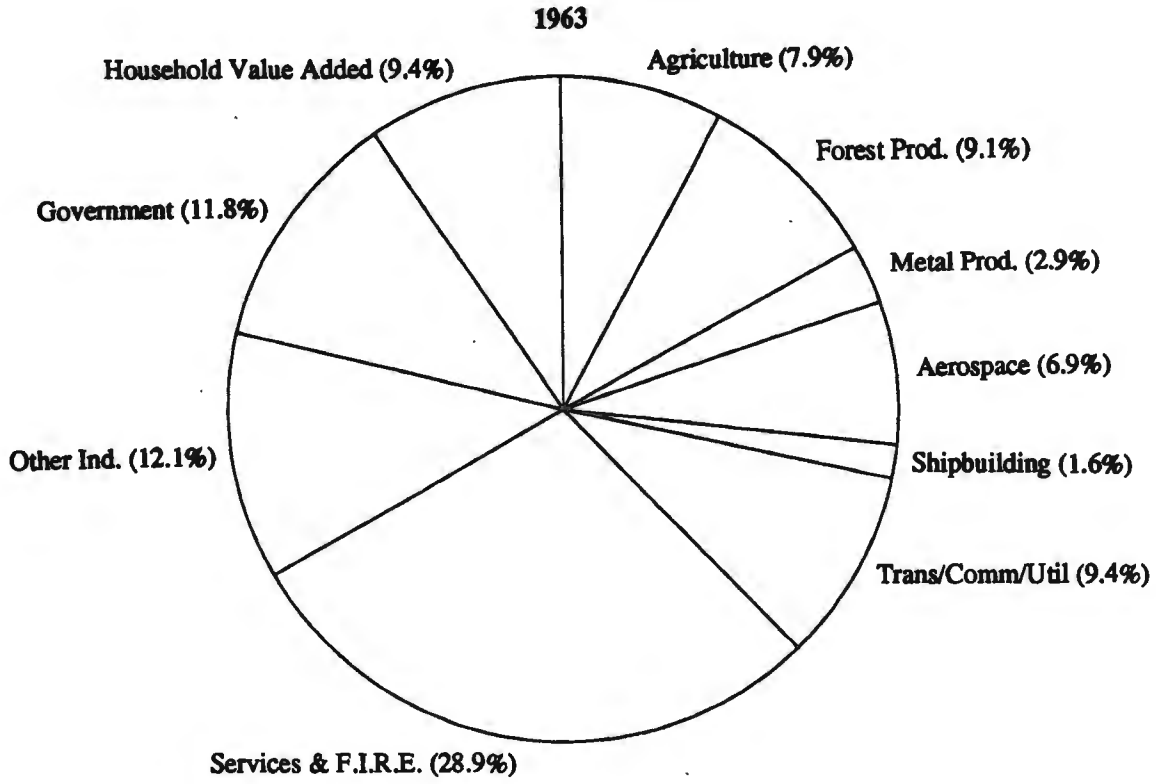
	1982		1972		1967		1963	
	$ Mil.	% of Total	$ Mil.	% of Total	$ Mil.	% of Total	$ Mil.	% of Total
Gross State Product	58,487	100%	19,171	100%	12,733	100%	9,066	100%
Agriculture, Fishing, Food Processing (1-11)	3,127	5.3%	1,235	6.4%	953	7.5%	712	7.9%
Forestry, Wood Products, Paper (15-19, 21-23)	2,262	3.9%	1,537	8.0%	993	7.8%	821	9.1%
Primary and Fabricated Metals (30-34)	1,143	2.0%	487	2.5%	376	3.0%	262	2.9%
Aerospace (39)	2,700	4.6%	863	4.5%	1,089	8.6%	629	6.9%
Shipbuilding (41)	1,260	2.2%	226	1.2%	205	1.6%	147	1.6%
Transportation, Communications, Public Utilities (43-47)	6,478	11.1%	1,941	10.1%	1,077	8.5%	852	9.4%
Finance, Insurance, Real Estate, Trade, Services (49-51)	20,994	35.9%	6,620	34.5%	3,708	29.1%	2,622	28.9%
All Other Industry (12-14, 20, 24-29, 35-38, 40, 42, 48)	7,590	13.0%	2,140	11.2%	1,554	12.2%	1,093	12.1%
Government: Federal and State and Local	6,774	11.6%	2,514	13.1%	1,558	12.2%	1,074	11.8%
Household Value Added	6,159	10.5%	1,608	8.4%	1,220	9.6%	854	9.4%

The Uses of Washington GSP

The markets for the output of the Washington economy are described in Table 4. Consumer markets within Washington are by far the most important to industry; two out of three dollars spent by Washington consumers are for goods and services provided by within-state suppliers. Of total consumer outlays of $40.4 billion, all but $12.7 billion was spent "at home."

Net exports by industrial sectors (excluding federal markets) have increased significantly compared to the sixties, but these gains have been offset by a decline in the proportion of GSP sold to the federal government. Washington state and local governments represent a rising market for final products, while Gross Private Domestic Investment (GPDI) shares are cyclically erratic.

Figure 1: Sources of Washington GSP



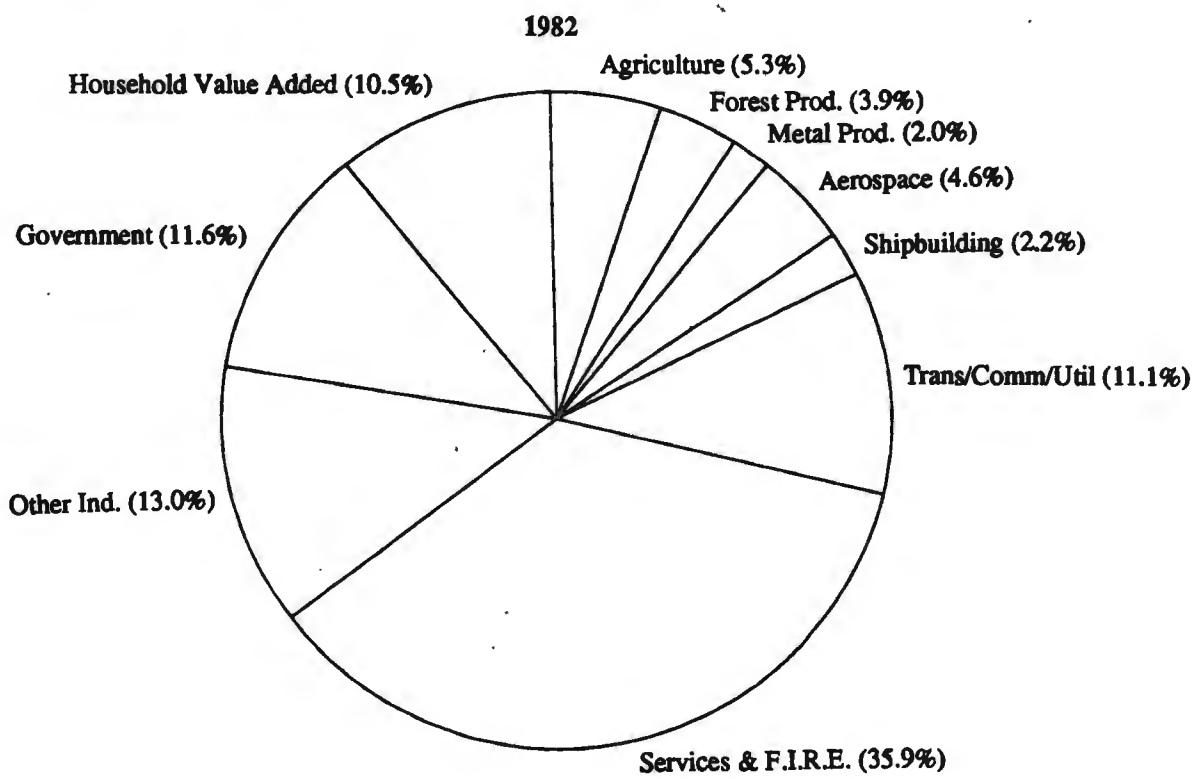


Table 4: The Markets for Washington Output
(Sources of Final Demand for Washington GSP)
millions of dollars and percent of total

	1963		1967		1972		1982	
	$ Mil.	% of GSP	$ Mil.	% of GSP	$ Mil.	% of GSP	$ Mil.	% of GSP
Gross State Product	9,066	100.0	12,733	100.0	19,171	100.0	58,487	100.0
WA PCE purchased from WA suppliers	4,492	49.5	6,474	50.8	8,716	45.5	27,724	47.4
WA GPDI purchased from WA suppliers	663	7.3	1,432	11.2	1,372	7.2	3,579	6.1
WA S&L government expenditures in WA	953	10.5	1,537	12.1	2,490	13.0	8,618	14.7
Federal expenditures in WA	1,864	20.6	2,166	17.0	2,384	12.4	6,778	11.6
Net exports by industrial sectors (1-51)	1,093	12.1	1,124	8.8	4,209	22.0	11,788	20.2

Notes: Totals may not add due to rounding. Net exports by industrial sectors 1-51 are defined to include exports to rest-of-U.S. and foreign markets, less imports by industry.

The external trade relationships of Washington State are especially interesting. They document what is surmised from more anecdotal evidence: Washington State is broadening its trade relationships with the rest of the world. The state has become more import-dependent and at the same time more export-oriented. The evidence supporting this hypothesis is shown in Table 5, which compares the external accounts of Washington State for the year 1982 with those for 1963.

Total exports of Washington industry--which is inclusive of sales to the federal government, exports to the rest-of-U.S., and foreign exports--amounted to $39.7 billion in 1982. This is more than seven times greater than that of 1963. As a reference point with which to compare multiples of values expressed in nominal dollars, the GSP over this period increased 6.3 times. Exports are more important than formerly, but the composition of export markets is changing too. There is increasing emphasis on foreign markets. The most notable feature in Table 5 is that exports to foreign markets have expanded many times faster than GSP. Exports to the rest-of-U.S. have grown only slightly faster, while exports to the federal government have increased only 3.6 times. Washington dependency on federal spending is much less than it used to be.

On the import side, Washington purchases from the United States by industry and by consumers have grown relative to GSP. Imports by state and local governments show weak growth, probably reflecting the shift in state and local procurement toward the purchase of more locally provided services.

Table 5: The External Trade Accounts of Washington State, 1963 and 1982
millions of dollars

	1963	1982	1982/63
Total exports by markets	5,382	39,708	7.4
to federal government	1,864	6,778	3.6
to rest-of-U.S.	3,041	23,957	7.9
to foreign markets	476	8,973	18.9
Imports by sectors, all sources	4,568	36,242	7.9
Total imports from rest-of-U.S.	4,203	31,358	7.5
by consumers	1,527	11,822	7.7
by industry	2,140	17,517	8.2
by investors	289	1,143	4.0
by state & local govts.	247	876	3.5
Total imports - foreign	365	4,884	13.4
by consumers	81	862	10.6
by industry	284	3,625	12.8
by investors	---	367	---
by state & local govts.	---	30	---
Net Exports	814	3,466	---
Trade with rest-of-U.S. (including federal)	703	-623	---
Foreign Trade	111	4,089	36.8
Gross State Product (GSP)	9,066	58,487	6.3

Foreign imports, which account for 13% of total regional imports in 1982, have shown rapid growth. This is somewhat surprising since the Washington petroleum refining industry--a major importer--now is less dependent upon foreign sources of crude than formerly, but higher prices of crude oil may have offset lower volumes of foreign imports.

Washington's External Trade Balance

On balance, Washington's net exports in respect to the rest of the world were $3.5 billion in 1982. This is only 4.3 times as much as 1963, while GSP rose sixfold. This modest trade rise in the balance follows from the fact that *both* exports and imports have expanded faster than GSP, and imports have risen faster than exports.

Washington's overall surplus on its external trade accounts displays decided shifts in geography since 1963. Our trade surplus with the rest-of-U.S. (including federal purchases) has become negative (-$623 billion), while it has risen substantially with respect to foreign countries. While federal procurement from Washington State has

grown but slowly, Washington producers have found new markets in the United States and, more significantly, abroad.

Foreign Trade

In 1982 foreign exports are a $9 billion dollar market for Washington goods and service. On the foreign import side, Washington users have purchased nearly $5 billion of goods and services. Thus, Washington State's foreign trade surplus is over $4 billion. According to the U.S. Department of Commerce, the nation's trade surplus was then $26 billion. Washington State is obviously a major contributor to that trade surplus.*

The principal Washington foreign exporters and importers are shown in Tables 6 and 7. Aerospace is our leading exporter. Even in a year of depressed aircraft deliveries,

Table 6: Washington State Foreign Exports by Industry of Origin, 1982
millions of dollars, producer values

Total Exports	$8,973
Aerospace	3,556
Trade	1,440
Logging	657
Transportation	528
Field Crops	494
Other Manufacturing	337
Canning & Preserving	300
Paper	256
All Other	1,405

Table 7: Washington State Foreign Imports by Acquiring Sector, 1982
millions of dollars, producer values

Total Imports	$4,884
Petroleum	1,112
Aerospace	553
Aluminum	400
Transportation	183
Trade	150
Households	862
All Other Sectors	1,624

*These measures are significantly different from the foreign trade flows based on customs district information. Data for the Washington customs district are inclusive of transshipments passing through the state, and for still other reasons are not good measures of exports originating from Washington State producers or imports acquired by Washington State users.

that industry has accounted for about 40% of Washington's foreign exports. The Trade and Transportation Services sectors are also important exporters of services, including the provision of transshipment services for exports originating elsewhere in the United States. (Recall the accounting rule: the purchaser pays the freight and merchandising costs.)

The leading foreign importing sectors in Washington State are Petroleum (crude oil from Canada and other foreign sources), Aerospace (parts and subassemblies), Aluminum (for alumina), and consumers. Other importing sectors in Washington are identified in the Washington Gross Flows Table.

Industrial Growth

Economic growth may be measured in many ways and over different time spans. From a gross output perspective, industries in Washington State have more than tripled the nominal value of their outputs between 1972 and 1982, as shown in Table 8. Showing the most rapid output growth is Electrical Machinery, a sector whose 1982 shipments are eight times those in 1972. The value of Petroleum sector shipments have grown nearly that much, principally due to rapid rise in refinery (and crude oil) prices.

Slow growth industries include Plywood (-13%), Sawmills (+31%), Apparel (+36%), Motor Vehicles (+55%), and Grain Mills (+55%). Growth in the value of output in the service sectors, where job growth has been particularly rapid, has been above average [e.g., Transportation Services (+326%), Services (+290%), and Trade (+249%)].

Another measure of relative growth is the change in the VA (GSP) originating in sectors. Industrial VA has tripled over the decade. Increases have been greatest in Electrical Machinery, Shipbuilding, Other Manufacturing, Petroleum, and Electric Utilities. At the other end of the growth spectrum are Plywood and Sawmills whose VA has declined over the decade, reflecting the severe depression in those sectors in 1982. Other sectors with especially low GSP growth include Pulp Mills, Grain Mills, and Apparel.

A detailed analysis of the changes that have taken place in the growth rates of different sectors of the Washington economy is beyond the scope of this report. The information presented here is, however, an important step in the analysis of the sources of real economic growth and productivity advances within the Washington economy. The patterns that have characterized the growth of different industrial sectors--in this study and in its predecessors--will be more meaningful after they have been adjusted for inflation by appropriate price indexes. Such inflation-adjusted measures will be revealing about the real output and income trends of individual sectors. Combined with employment data, these real flows should be useful in the analysis of productivity changes in different industries.

Energy Outlays in Washington State

The dollar value of output in the energy sectors has risen more than that of other Washington industries. While industrial output has doubled in nominal dollars between 1972 and 1982, Petroleum shipments in 1982 have been eight times those of 1972, Natural Gas sales have risen by a factor of five, and Electricity sales have been four times those of the earlier period. Much of these increases represent higher prices, of course; the real or inflation-adjusted increases await the deflation by appropriate price indexes.

Table 8: Output and Value Added by Sector 1972 and 1982

I/O NAME & NUMBER	Gross Output (mil. $) 1972	1982	1982/1972	Value Added (mil. $) 1972	1982	1982/1972
FIELD CROPS 1	393	1158	295%	252	746	296%
VEGGIES & FRUIT 2	371	759	205%	291	592	203%
LIVESTOCK 3	354	916	259%	101	291	288%
MISC. AGRI. PROD. 4	58	136	234%	34	116	341%
FISHING 5	40	94	235%	23	56	243%
MEAT PRODUCTS 6	328	1091	333%	55	112	204%
DAIRY PRODUCTS 7	245	780	318%	45	114	253%
CANNING 8	484	1594	329%	181	528	292%
GRAIN MILL 9	173	305	176%	43	50	116%
BEVERAGES 10	283	694	245%	126	224	178%
OTHER FOODS 11	231	598	259%	83	298	359%
TEXTILE MILL 12	16	50	313%	10	22	220%
APPAREL 13	139	189	136%	63	85	135%
MINING 14	77	238	309%	48	164	342%
FORESTRY 15	260	603	232%	231	517	224%
LOGGING 16	574	1738	303%	254	390	154%
SAWMILL 17	823	1081	131%	372	321	86%
PLYWOOD 18	352	305	87%	147	79	54%
MISC. WOOD 19	285	499	175%	101	167	165%
FURNITURE 20	59	164	278%	31	84	271%
PULPMILL 21	225	355	158%	83	92	111%
PAPERMILL 22	346	1253	362%	149	382	256%
MISC. PAPER 23	446	1041	233%	201	314	156%
PRINT & PUBLISH 24	241	865	359%	160	491	307%
INDUS. CHEMICALS 25	239	857	359%	148	543	367%
OTHER CHEMICALS 26	35	185	529%	16	59	369%
PETROLEUM 27	588	4629	787%	116	564	486%
GLASS 28	23	116	504%	16	52	325%
CEMENT ETC. 29	187	413	221%	86	194	226%
FERROUS METALS 30	107	306	286%	67	162	242%
NONFERROUS 31	47	257	547%	26	60	231%
ALUMINUM 32	860	2050	238%	261	470	180%
STRUCTURAL METALS 33	160	582	364%	72	236	328%
LIGHT METALS 34	139	520	374%	61	215	352%
FARM CONSTR. MACH 35	83	406	489%	39	161	413%
MACHINE TOOLS 36	81	197	243%	45	124	276%
INDUS. EQUIPMENT 37	144	606	421%	72	333	463%
ELECTRICAL MACH 38	114	907	796%	57	522	916%
AEROSPACE 39	1861	8936	480%	863	2700	313%
MOTOR VEH/RR CARS 40	323	502	155%	86	209	243%
SHIPBUILDING 41	349	1890	542%	226	1260	558%
OTHER MANUF. 42	221	1136	514%	125	708	566%
TRANSPORTATION 43	1295	5517	426%	922	2859	310%
ELECTRIC UTIL 44	579	2565	443%	351	1675	477%
GAS UTIL 45	220	1144	520%	76	175	230%
OTHER UTIL 46	164	327	199%	135	269	199%
COMMUNICATIONS 47	545	1912	351%	456	1500	329%
CONSTRUCTION 48	2324	6532	281%	1022	3275	320%
TRADE 49	4300	15000	349%	3500	11000	314%
F.I.R.E. 50	1452	3800	262%	1026	2686	262%
SERVICES 51	2750	10736	390%	2093	7308	349%
TOTAL	25993	88534	341%	15047	45554	303%

A broad glimpse of the changed disposition of energy output is shown in Table 9. Total industrial outlays for Washington produced energy have risen more than consumer outlays, probably the consequence of a regulatory disposition toward keeping household energy costs contained and a more effective response of households in conservation efforts. Even so, Washington households devote 5.5% of their family budget to purchases from Washington energy supplying sectors, compared to 3.4% a decade earlier. For industry, energy costs as a proportion of their gross output--now 4.5%--rose even more.

Table 9: Industrial and Consumer Expenditures for Output of Washington Energy Sectors, 1972-82
millions of dollars

	Industrial Use			Household Consumption		
Washington Energy Sector	1972	1982	1982/1972	1972	1982	1982/1972
Petroleum	142	1,522	10.7	153	1,198	7.8
Electricity	333	1,564	4.7	196	806	4.1
Natural gas	156	874	5.6	56	200	3.6
Total energy	632	3,960	6.3	405	2,204	5.4
Total gross expenditures	25,994	88,534	3.4	12,000	40,408	3.4
Total energy outlays as a % of gross expenditures	2.4%	4.5%	---	3.4%	5.5%	---

3. Multipliers in the Washington Economy

There is no topic in input-output analysis that commands more attention than multipliers. This is because of their practicality in making estimates of economic impacts. Such assessments are needed by planners to guide them in making choices.

Some applications of previous Washington input-output studies are illustrative of the role of multipliers. What would be the economic impact upon output, income, and employment associated with the construction of a Northern Tier petroleum pipeline? What is the economic impact of the construction of a navy base at the Port of Everett, the closure of an aluminum mill, or an increase in log exports? How many jobs are related to port activity? What would be the impact upon electric power usage related to irrigation of the East High or the job impact of a professional sports team leaving Seattle? Although every case involves extensive research, each uses input-output multipliers as a critical phase of the investigation.

The Multiplier Concept

Multipliers are predicated upon a domino theory of economic change. They translate the consequences of change in one variable upon others, taking into account sometimes very complicated and roundabout linkages. Multipliers are usually expressed as a single number, but they are in fact ratios. Each ratio has a numerator and denominator. This is a deceptively simple statement. Often overlooked is the exact definition of the terms in a multiplier ratio, and the underlying interindustry relationships that the ratio summarizes. The conceptual structure of multipliers may be quite varied and complicated.

In this report we present several multipliers that we believe are useful for each of the fifty-one industrial sectors of the input-output table. These include output, VA, earnings, and job multipliers. These multipliers trace the ripple effects of an autonomous change in demand for Washington output (such as a change in regional exports) through their direct, indirect, and induced consumption effects. In technical jargon these are "Type II" multipliers, which means they include household spending responses to income earned in industry, as well as industry responses to household spending functions.

A Technical Digression on Multiplier Models

The basic theory underlying the regional multiplier concept is that there exists an identifiable pattern to the regional purchases by the industrial sectors of an economy. If this pattern of procurement can be identified, then a matrix of purchase coefficients, R(t), can be constructed. Each column vector of the direct purchases matrix shows the percent (or cents) of the gross revenue dollar used to purchase operating inputs from regional suppliers. Symbolically,

$$(1) \qquad R(t) \equiv \begin{vmatrix} r_{11} & r_{12} & \cdots & r_{1n} \\ r_{21} & r_{22} & \cdots & r_{2n} \\ \vdots & \vdots & & \vdots \end{vmatrix}$$

The purchase coefficient matrix for Washington State, derived from the Washington Gross Flows Table for 1982, is shown in Appendix Table II. This coefficient matrix forms the empirical basis for estimating interindustry interactions. Conceptually, the output levels of each industry are assumed to respond to demands for their product, and their operating inputs vary proportionately to their output. The sources of industry demand are either (a) the demands by other regional industries for operating inputs, called intermediate demands, or (b) final demands such as the purchases by consumers, governments, investors, or exports. These sources of demand may be expressed notationally by

(2) $$X(t) = R(t)\,X(t) + Y(t)$$

or Industry output = Intermediate demand + Final demand

where

$X(t)$ is a vector of industry outputs,
$R(t)$ is the empirically identified purchase coefficient matrix, and
$Y(t)$ is a vector of exogenously determined final demands.

Simple matrix algebra leads to the conclusion that industry output levels are uniquely related to the vector of final demands placed on the industries of the region, such that

(3) $$X(t) = \underbrace{[I - R(t)]^{-1}}_{\text{Output Multiplier Matrix} \equiv B}\,Y(t)$$

in which I is an identity matrix, and $[I - R(t)]^{-1}$ is a matrix of output multipliers. The elements of the output multiplier matrix, usually called the B matrix (in contrast to the R(t) matrix), show the direct and indirect impact of changes upon each row sector per dollar change in final demand for the output of the column sector. The B matrix is

$$B \equiv \begin{vmatrix} b_{11} & b_{12} & \cdots & b_{1n} \\ b_{21} & b_{22} & \cdots & b_{2n} \\ \vdots & \vdots & & \vdots \end{vmatrix} .$$

The Matter of Closure

Within this analytical framework, a number of additional considerations affect the size of multipliers. One of these concerns the degree of "closure" of the input-output model. If the elements of the direct requirements (R) matrix describe the purchase coefficients of industrial sectors only, the derived B matrix will describe the direct and indirect output requirements created per dollar of final demand for the output of each industry. Such a B multiplier matrix is designed to a Type I output multiplier matrix.

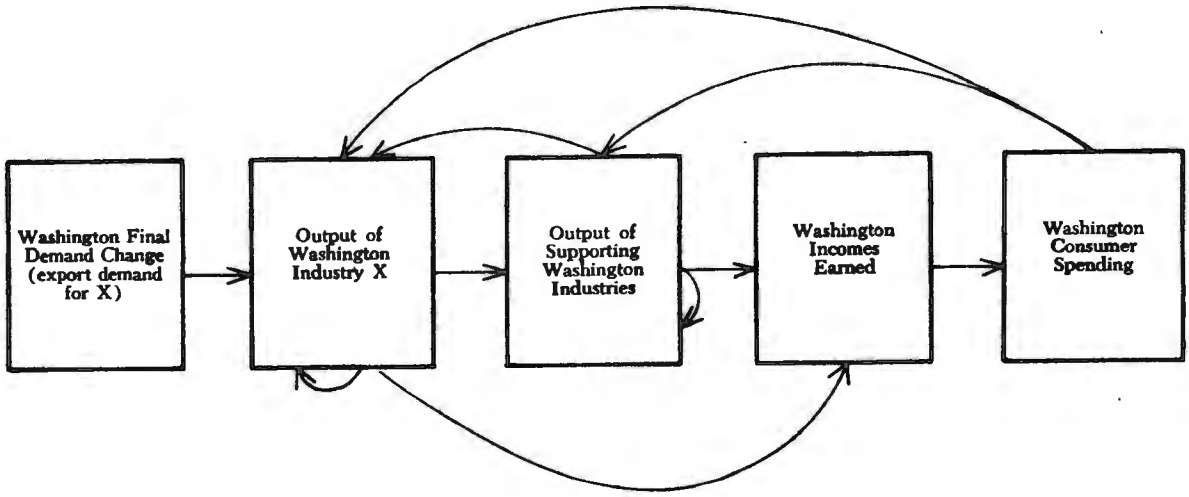
The B matrix may be expanded to include the impact upon industrial output associated with the spending by households out-of-income payments to them in their role as factors of production. Inclusion of households assumes that there is a systematic linkage between industry output and household income, and a further regularity between household spending and income.

Expansion of the direct coefficient matrix to include a row of household income coefficients, and a column of household purchase coefficients, produces a B matrix with households endogenous. Such an output multiplier matrix describes the direct, indirect, and induced consumption effects upon the output levels of industry per dollar of final demand. In this variant, the term "final demand" excludes regional household expenditures since these are endogenous to the model. In impact models, these are designated "Type II" output multipliers. Such multipliers are commonly implied by the term "ripple effect." Enveloping a wider range of spending repercussions, Type II multipliers are necessarily larger than those of Type I.

In consideration of their importance in impact analysis, only Type II multipliers are presented in this report. It is sometimes plausible to include as endogenous still other elements and demand (such as state and local government spending or investment spending), thus narrowing the meaning of the term "final demand" to export demands only. Adopting the assumption that government spending is automatically responsive to industry output, or that investment spending is a simple function of industrial output, is not general practice. Inclusion of such sources of demand within the multiplier process would, of course, magnify the size of multipliers.

The range of spending reactions incorporated with Type II multipliers is shown in Figure 2. An external source of demand (such as an increase in export demand) has a direct influence upon the output of some specific exporting industry. To produce that output, the impacted industry makes purchases from supporting sectors, and perhaps there are some intra-sector purchases as well. The supporting sectors in turn make purchases from each other, and possibly also from the export industry. As output levels of many industries rise in response to the initial impact, income payments rise, too, and portions of these are used by consumers to purchase outputs from Washington industries, extending the output reactions further. The effects of all these demand repercussions are accumulated in the matrix of output multipliers.

Figure 2: Range of Spending Reactions with Type II Multipliers



What limits the size of multipliers? Some industry outlays are for imports, which constitute a "leakage" to the respending effects within Washington State. Portions of the VA taking place within industries are distributed as earnings to factors of production within the state, but portions are paid to out-of-state factors of production (dividends, interest, rent), are tax payments, or are retained as business savings. Of the VA paid to Washington households, only a portion is spent for Washington goods. Washington residents also purchase imported goods, pay taxes, and save a portion of their income, leakages that still further limit the multiplying process.

Alternative Income/Expenditure Functions

Multiplier interaction models that include households require both a household consumption function and a household income function. Two relatively simple consumption functions are utilized in estimating multipliers presented in this report. One makes consumption a function of GSP, the other a function of personal income, or

(5) $$C_i = c_i\,(GSP)$$

and

(6) $$C_i = c_i\,(YP).$$

Equation (5) specifies that Washington consumer expenditures for regionally provided goods and services vary proportionately with GSP, while (6) implies such consumption is related to personal income. For various reasons neither of these functions is satisfactory in terms of modern consumption theory, but both yield good empirical fits.

In principle, the choice of the independent variable in the consumption function (the income term) should be dictated by reference to the income-determining function used within the model. Two income-determining functions were used in this report, specifically

(7) $$VA_i = \Sigma v_i(t)\, X_i(t)$$

and

(8) $$EARN_i = \Sigma e_i(t)\, X_i(t),$$

which posit that VA and earnings within an industry are directly dependent upon the output levels of industry. Earnings are defined as labor and proprietors' income as measured by the Bureau of Economic Analysis (Appendix Table V).

The consumption function described in equation (5) is logically paired with the income equation (7) since VA in all industries is a measure of GSP. This combination of equations makes households endogenous using consistent variables and is used as the basis for estimating VA multipliers.

A different approach is used in the closure of the model to estimate earnings and jobs multipliers. Equations (6) and (8) are paired. This formulation makes earnings dependent upon output, and consumption dependent upon personal income. This closure process carries the weight of precedence. It is used in RIM II regional modeling by the U.S. Department of Commerce. There is an element of arbitrariness since personal income is only partially determined by labor and proprietors' earnings.

Identifying the best operational approach to making households endogenous with present data bases is difficult. The consumer spending coefficients should be calculated based on the expenditures of the class of consumers whose income is model-driven. Alternatively, the income determining function should be consistent with the income variable used as the base for the consumption coefficients. Personal income (or even better, disposable income) may be a good base for estimating consumption coefficients, but personal income is not model-driven since it is not disaggregated industrially. Earnings are a major component of personal income and are a measure available by industry, but consumer expenditures linked exclusively to earnings are not observable.

The conventional formulations used in this report for the closure of the input-output model with respect to households are not wholly satisfactory. Happily, experimentation with several forms of closure indicates the differences are often quite small.

Alternative Multiplier Variables

Estimates of multipliers for four industry variables are included in this report: output multipliers, value added multipliers, earnings multipliers, and jobs multipliers. The output multipliers are presented in matrix form in Appendix Tables III and IV; one set makes households endogenous using equations (5) and (7), the other equations (6) and (8). Each column of these tables shows the gross output of the row industry associated directly, indirectly, and through induced consumption expenditure, derived from the delivery of $1.00 of output to final users by the industry designated at the top of the column.

It should be noted that aggregated output multipliers are not presented. Readers may, if they wish, summate the columns, but this writer believes aggregated output multipliers serve no useful purpose. What significance can be attached to the sum of transactions of disparate industries? The sales of aeroplanes combined with the sales of wood products (and so forth) is not a useful measure, and we suggest the practice of providing aggregated column multipliers should be abandoned.

Individual elements of the output multiplier matrix *are* important. These are industry-specific. They are useful because many other interesting variables are linked to industry-specific output. In fact, all other multiplier variables are derivatives of the elements (b_{ij}'s) of the output multiplier matrix. The connecting theory is

(9) $$\text{VA MULT} = \sum_{1}^{52} v_i \, b_{ij} \qquad (b_{ij} \text{ from Appendix Table III})$$

(10) $$\text{EARN MULT} = \sum_{1}^{52} e_i \, b_{ij} \qquad (b_{ij} \text{ from Appendix Tables III and IV})$$

(11) $$\text{JOBS MULT} = \sum_{1}^{52} j_i \, b_{ij} \qquad (b_{ij} \text{ from Appendix Tables III and IV})$$

where v_i = value added per dollar output in i^{th} industry,
e_i = earnings (labor and proprietors') per dollar output in i^{th} industry, and
j_i = jobs (full and part time) per dollar output in i^{th} industry.

The VA coefficients (V_i/X_i) for each sector are derived from the gross flows table. The earnings and jobs coefficients are based on the Bureau of Economic Analysis (BEA) earnings and jobs data; their derivation is shown in Appendix Table V.

Alternative Multiplier Expressions

Multipliers are ratios and will assume different meaning depending on the base of the ratio. Two forms of expression for multipliers shown in columns (2) and (3), Tables 10, 11, and 12, are

$$\text{(12)} \quad \text{MULT} = \frac{\text{Total impact}}{\text{Final demand for ith industry}} = \text{Total impact per \$ of final demand, and}$$

$$\text{(13)} \quad \text{MULT} = \frac{\text{Total impact}}{\text{Direct impact on ith industry}} = \text{Total impact per unit of direct impact.}$$

The first column of each multiplier table shows the direct coefficients (v_i, e_i, j_i) expressed per million dollars of output. Column (2) reports the total impact per million dollars of final demand, using the term export demand to rivet the reader's attention to that element of final demand considered the key element of regional economic change in export base theory. Column (3) is the ratio of the total impact to direct impact.

Although mathematically interchangeable, the particular form of multiplier expression chosen in practical work depends on the units in which some direct impact is expressed. If, for example, the total job impact of a million dollar export order is being evaluated, then the multiplier "total job impact per million dollars" is appropriate. On the other hand, if twenty-two jobs are directly created by an export order, then the total job impact is estimated from the "total jobs per direct job" multiplier.

If the size of the order and the number of direct jobs are both known, the total impact can be appraised using both bits of information. They may, however, yield different results if the production methods (direct jobs per million dollars of output) for the particular case under examination differ from the industry norms used to derive the multipliers. If the two approaches yield inconsistent impacts, then the multipliers described in this study are inappropriate to the particular instance. The reason why this might occur is that the production techniques applicable to the particular order may not be typical for the sector in which the establishment is classified. In that situation, a new direct coefficients matrix reflecting the input-structure specific to the order should be estimated and new multipliers computed. Alternatively, the existing multipliers may be applied to the direct regional expenditures associated with completing the order. Use of specialists proficient in input-output techniques is advised.

Under ideal conditions, it is a matter of indifference which multiplier formulation is used. However, readers should be aware that the size of multipliers in column (3) of the multiplier tables is particularly sensitive to the direct ratios in column (1). Total impacts associated with changes in final demand [column (2)] are less affected by an error of measurement in the direct coefficients simply because such an error becomes overwhelmed in the mass ("off-setting errors are the forecaster's best friend"). The size of column (3) multipliers is immediately sensitive to the single statistic that enters into its

Table 10: Value Added Multipliers
C=f(VA), VA=f(X)

I/O NAME & NUMBER	Multipliers: direct, indirect, and induced Direct Value Added per mil. $ of Output	Total Value Added per mil. $ of Direct Exports	Total Value Added per $ of Direct Value Added
FIELD CROPS 1	$644 thous	$1,316 thous	$2.04
VEGGIES & FRUIT 2	780	1,463	1.88
LIVESTOCK 3	318	1,285	4.04
MISC. AGRI. PROD. 4	853	1,542	1.81
FISHING 5	596	1,252	2.10
MEAT PRODUCTS 6	103	717	6.98
DAIRY PRODUCTS 7	143	1,279	8.97
CANNING 8	331	1,172	3.54
GRAIN MILL 9	164	674	4.11
BEVERAGES 10	323	1,123	3.48
OTHER FOODS 11	498	1,199	2.41
TEXTILE MILL 12	440	870	1.98
APPAREL 13	450	879	1.95
MINING 14	689	1,271	1.84
FORESTRY 15	857	1,542	1.80
LOGGING 16	224	1,269	5.66
SAWMILL 17	297	1,330	4.48
PLYWOOD 18	259	1,237	4.78
MISC. WOOD 19	335	1,010	3.02
FURNITURE 20	512	1,147	2.24
PULPMILL 21	259	996	3.84
PAPERMILL 22	305	1,133	3.72
MISC. PAPER 23	302	1,231	4.08
PRINT & PUBLISH 24	568	1,231	2.17
INDUS. CHEMICALS 25	634	1,267	2.00
OTHER CHEMICALS 26	319	806	2.53
PETROLEUM 27	122	230	1.89
GLASS 28	448	1,199	2.67
CEMENT ETC. 29	470	1,193	2.54
FERROUS METALS 30	529	1,147	2.17
NONFERROUS 31	234	651	2.79
ALUMINUM 32	229	829	3.62
STRUCTURAL METALS 33	406	889	2.19
LIGHT METALS 34	414	964	2.33
FARM CONSTR. MACH 35	397	885	2.23
MACHINE TOOLS 36	629	1,199	1.90
INDUS. EQUIPMENT 37	550	1,085	1.97
ELECTRICAL MACH 38	576	1,120	1.95
AEROSPACE 39	302	567	1.88
MOTOR VEH/RR CARS 40	416	795	1.91
SHIPBUILDING 41	667	1,173	1.76
OTHER MANUF. 42	623	1,146	1.84
TRANSPORTATION 43	518	1,050	2.03
ELECTRIC UTIL 44	653	1,420	2.17
GAS UTIL 45	153	459	3.00
OTHER UTIL 46	823	1,549	1.88
COMMUNICATIONS 47	785	1,401	1.79
CONSTRUCTION 48	501	1,117	2.23
TRADE 49	733	1,422	1.94
F.I.R.E. 50	707	1,492	2.11
SERVICES 51	681	1,382	2.03
AVERAGE	466	1,110	2.79

Table 11A: Earnings Multipliers
C=f(VA), VA=f(X)

I/O NAME & NUMBER	Multipliers: direct, indirect, and induced Direct Earnings per mil. $ of Output	Total Earnings per mil. $ of Direct Exports	Total Earnings per $ of Direct Earnings
FIELD CROPS 1	$301 thous	$630 thous	$2.09
VEGGIES & FRUIT 2	414	744	1.80
LIVESTOCK 3	194	670	3.45
MISC. AGRI. PROD. 4	640	978	1.53
FISHING 5	574	913	1.59
MEAT PRODUCTS 6	82	402	4.88
DAIRY PRODUCTS 7	83	680	8.17
CANNING 8	159	610	3.84
GRAIN MILL 9	98	367	3.73
BEVERAGES 10	131	544	4.15
OTHER FOODS 11	242	607	2.50
TEXTILE MILL 12	360	568	1.58
APPAREL 13	407	630	1.55
MINING 14	693	990	1.43
FORESTRY 15	46	374	8.05
LOGGING 16	235	689	2.93
SAWMILL 17	297	835	2.81
PLYWOOD 18	256	760	2.97
MISC. WOOD 19	375	757	2.02
FURNITURE 20	317	656	2.07
PULPMILL 21	211	580	2.75
PAPERMILL 22	191	641	3.36
MISC. PAPER 23	192	698	3.63
PRINT & PUBLISH 24	373	731	1.96
INDUS. CHEMICALS 25	307	620	2.02
OTHER CHEMICALS 26	216	479	2.21
PETROLEUM 27	18	69	3.92
GLASS 28	259	633	2.45
CEMENT ETC. 29	303	698	2.31
FERROUS METALS 30	281	584	2.08
NONFERROUS 31	280	487	1.74
ALUMINUM 32	159	346	2.17
STRUCTURAL METALS 33	282	535	1.90
LIGHT METALS 34	188	476	2.53
FARM CONSTR. MACH 35	313	571	1.83
MACHINE TOOLS 36	503	797	1.59
INDUS. EQUIPMENT 37	360	638	1.77
ELECTRICAL MACH 38	264	540	2.05
AEROSPACE 39	308	447	1.45
MOTOR VEH/RR CARS 40	114	304	2.68
SHIPBUILDING 41	414	664	1.60
OTHER MANUF. 42	305	565	1.85
TRANSPORTATION 43	385	658	1.71
ELECTRIC UTIL 44	125	460	3.69
GAS UTIL 45	38	159	4.22
OTHER UTIL 46	211	545	2.58
COMMUNICATIONS 47	376	688	1.83
CONSTRUCTION 48	448	779	1.74
TRADE 49	417	774	1.86
F.I.R.E. 50	487	907	1.86
SERVICES 51	623	991	1.59
AVERAGE	291	617	2.63

Table 11B: Earnings Multipliers
C=f(YP), EARN=f(X)

I/O NAME & NUMBER	Multipliers: direct, indirect, and induced Direct Earnings per mil. $ of Output	Total Earnings per mil. $ of Direct Exports	Total Earnings per $ of Direct Earnings
FIELD CROPS 1	$301 thous	$492 thous	$1.63
VEGGIES & FRUIT 2	414	602	1.46
LIVESTOCK 3	194	550	2.83
MISC. AGRI. PROD. 4	640	879	1.37
FISHING 5	574	863	1.50
MEAT PRODUCTS 6	82	343	4.16
DAIRY PRODUCTS 7	83	564	6.77
CANNING 8	159	500	3.15
GRAIN MILL 9	98	308	3.13
BEVERAGES 10	131	429	3.27
OTHER FOODS 11	242	490	2.02
TEXTILE MILL 12	360	516	1.43
APPAREL 13	407	593	1.46
MINING 14	693	957	1.38
FORESTRY 15	46	118	2.54
LOGGING 16	235	577	2.46
SAWMILL 17	297	748	2.52
PLYWOOD 18	256	673	2.63
MISC. WOOD 19	375	722	1.93
FURNITURE 20	317	563	1.78
PULPMILL 21	211	503	2.38
PAPERMILL 22	191	548	2.87
MISC. PAPER 23	192	598	3.11
PRINT & PUBLISH 24	373	639	1.71
INDUS. CHEMICALS 25	307	490	1.60
OTHER CHEMICALS 26	216	419	1.94
PETROLEUM 27	18	35	1.98
GLASS 28	259	523	2.02
CEMENT ETC. 29	303	606	2.00
FERROUS METALS 30	281	473	1.68
NONFERROUS 31	280	464	1.66
ALUMINUM 32	159	354	2.23
STRUCTURAL METALS 33	282	470	1.67
LIGHT METALS 34	188	379	2.01
FARM CONSTR. MACH 35	313	516	1.65
MACHINE TOOLS 36	503	730	1.45
INDUS. EQUIPMENT 37	360	555	1.54
ELECTRICAL MACH 38	264	423	1.61
AEROSPACE 39	308	433	1.41
MOTOR VEH/RR CARS 40	114	201	1.77
SHIPBUILDING 41	414	568	1.37
OTHER MANUF. 42	305	449	1.47
TRANSPORTATION 43	385	589	1.53
ELECTRIC UTIL 44	125	254	2.04
GAS UTIL 45	38	95	2.53
OTHER UTIL 46	211	331	1.57
COMMUNICATIONS 47	376	546	1.45
CONSTRUCTION 48	448	726	1.62
TRADE 49	417	649	1.56
F.I.R.E. 50	487	801	1.64
SERVICES 51	623	932	1.50
AVERAGE	291	525	2.08

Table 12A: Jobs Multipliers
C=f(GSP), VA=f(X)

I/O NAME & NUMBER	Multipliers: direct, indirect, and induced Direct Jobs per mil. $ of Output	Total Jobs Created per mil. $ of Exports	Total Jobs Created per Direct Job
FIELD CROPS 1	14.0	35.3	2.52
VEGGIES & FRUIT 2	33.7	55.6	1.65
LIVESTOCK 3	32.5	63.4	1.95
MISC. AGRI. PROD. 4	66.9	90.3	1.35
FISHING 5	112.8	135.4	1.20
MEAT PRODUCTS 6	3.7	30.3	8.20
DAIRY PRODUCTS 7	2.4	52.0	21.67
CANNING 8	9.4	43.7	4.65
GRAIN MILL 9	4.3	21.0	4.89
BEVERAGES 10	4.9	29.8	6.09
OTHER FOODS 11	10.7	34.5	3.22
TEXTILE MILL 12	24.0	38.2	1.59
APPAREL 13	34.4	49.5	1.44
MINING 14	18.1	37.3	2.06
FORESTRY 15	9.1	30.9	3.40
LOGGING 16	8.2	36.4	4.44
SAWMILL 17	13.8	45.1	3.27
PLYWOOD 18	12.1	41.4	3.42
MISC. WOOD 19	17.8	40.8	2.29
FURNITURE 20	20.1	42.0	2.09
PULPMILL 21	6.2	27.8	4.49
PAPERMILL 22	5.7	31.8	5.58
MISC. PAPER 23	6.6	35.2	5.33
PRINT & PUBLISH 24	19.2	42.2	2.20
INDUS. CHEMICALS 25	9.1	29.2	3.21
OTHER CHEMICALS 26	9.7	26.4	2.72
PETROLEUM 27	0.4	3.8	9.60
GLASS 28	12.1	34.1	2.82
CEMENT ETC. 29	13.1	36.3	2.77
FERROUS METALS 30	10.5	29.7	2.83
NONFERROUS 31	9.3	20.7	2.23
ALUMINUM 32	4.0	18.8	4.69
STRUCTURAL METALS 33	10.3	25.6	2.49
LIGHT METALS 34	7.9	25.6	3.24
FARM CONSTR. MACH 35	10.6	26.6	2.51
MACHINE TOOLS 36	18.8	37.8	2.01
INDUS. EQUIPMENT 37	14.5	32.3	2.23
ELECTRICAL MACH 38	11.8	29.9	2.53
AEROSPACE 39	8.5	17.4	2.05
MOTOR VEH/RR CARS 40	3.6	16.1	4.47
SHIPBUILDING 41	13.8	30.4	2.20
OTHER MANUF. 42	15.7	32.7	2.08
TRANSPORTATION 43	14.6	31.8	2.18
ELECTRIC UTIL 44	3.4	24.2	7.12
GAS UTIL 45	1.3	8.4	6.47
OTHER UTIL 46	18.4	40.8	2.22
COMMUNICATIONS 47	12.8	33.8	2.64
CONSTRUCTION 48	17.3	38.2	2.21
TRADE 49	30.2	54.1	1.79
F.I.R.E. 50	40.0	68.0	1.70
SERVICES 51	44.9	69.6	1.55
AVERAGE	16.8	37.9	3.60

Table 12B: Jobs Multipliers
C=f(YP), EARN=f(X)

I/O NAME & NUMBER	Multipliers: direct, indirect, and induced Direct Jobs per mil. $ of Output	Total Jobs Created per mil. $ of Exports	Total Jobs Created per Direct Job
FIELD CROPS 1	14.0	25.9	1.85
VEGGIES & FRUIT 2	33.7	45.8	1.36
LIVESTOCK 3	32.5	55.3	1.70
MISC. AGRI. PROD. 4	66.9	83.6	1.25
FISHING 5	112.8	132.0	1.17
MEAT PRODUCTS 6	3.7	26.3	7.10
DAIRY PRODUCTS 7	2.4	44.2	18.43
CANNING 8	9.4	36.2	3.85
GRAIN MILL 9	4.3	17.0	3.95
BEVERAGES 10	4.9	22.0	4.48
OTHER FOODS 11	10.7	26.5	2.48
TEXTILE MILL 12	24.0	34.6	1.44
APPAREL 13	34.4	46.8	1.36
MINING 14	18.1	35.1	1.94
FORESTRY 15	9.1	13.6	1.49
LOGGING 16	8.2	28.9	3.52
SAWMILL 17	13.8	39.2	2.84
PLYWOOD 18	12.1	35.7	2.95
MISC. WOOD 19	17.8	38.4	2.16
FURNITURE 20	20.1	35.8	1.78
PULPMILL 21	6.2	22.6	3.64
PAPERMILL 22	5.7	25.5	4.47
MISC. PAPER 23	6.6	28.4	4.30
PRINT & PUBLISH 24	19.2	35.9	1.87
INDUS. CHEMICALS 25	9.1	20.4	2.24
OTHER CHEMICALS 26	9.7	22.3	2.30
PETROLEUM 27	0.4	1.4	3.56
GLASS 28	12.1	26.6	2.20
CEMENT ETC. 29	13.1	30.0	2.29
FERROUS METALS 30	10.5	22.2	2.11
NONFERROUS 31	9.3	19.3	2.07
ALUMINUM 32	4.0	13.5	3.37
STRUCTURAL METALS 33	10.3	21.3	2.07
LIGHT METALS 34	7.9	19.0	2.40
FARM CONSTR. MACH 35	10.6	22.9	2.16
MACHINE TOOLS 36	18.8	33.3	1.77
INDUS. EQUIPMENT 37	14.5	26.8	1.85
ELECTRICAL MACH 38	11.8	21.9	1.86
AEROSPACE 39	8.5	16.6	1.95
MOTOR VEH/RR CARS 40	3.6	9.0	2.51
SHIPBUILDING 41	13.8	23.7	1.72
OTHER MANUF. 42	15.7	24.8	1.58
TRANSPORTATION 43	14.6	27.2	1.86
ELECTRIC UTIL 44	3.4	10.0	2.94
GAS UTIL 45	1.3	4.1	3.16
OTHER UTIL 46	18.4	26.5	1.44
COMMUNICATIONS 47	12.8	24.1	1.88
CONSTRUCTION 48	17.3	34.6	2.00
TRADE 49	30.2	45.6	1.51
F.I.R.E. 50	40.0	60.8	1.52
SERVICES 51	44.9	65.6	1.46
AVERAGE	16.8	31.5	2.73

denominator. In short, the column (2) multipliers tend to be less sensitive to measurement error.

Value Added Multipliers

VA (or GSP) multipliers for the Washington economy are presented in Table 10, columns (2) and (3). These multipliers are conceptually comparable to those reported in prior Washington input-output studies. They are based on an endogenous household sector assuming V = f(X), C = f(V). For convenience, the multipliers are expressed per million dollars of exports in column (2) and also per dollar of direct VA [column (3)]. The direct impacts are shown in column (1).

For example, the direct impact of a million dollars of Field Crop exports upon its own VA is $644 thousand. After taking into account the ripple effects of its purchases from its suppliers (and so forth), we find that the VA in all sectors of the Washington economy becomes $1,316 thousand, or 2.04 times as much as the direct VA impact.

The multipliers in column (3) average $2.79, but range from as little as $1.76 in Shipbuilding to as much as $8.97 in Dairy Products. The Shipbuilding multiplier is small because the direct VA impact is substantial; the Dairy Products multiplier is high because relatively little VA is created in that sector directly and it has significant repercussions upon supporting industries.

As we earlier cautioned, the VA multipliers may overstate the actual repercussions upon GSP in the short run because VA is assumed to be the driver of consumption in this model. The overstatement will be most in industries (such as Forestry) where the direct VA accrues mainly to corporate entities or governments and hence has relatively small induced consumption effects. The same may also be true of public utilities where large portions of direct VA are distributed in the form of interest payments or dividends to out-of-state income recipients.

Earnings and Jobs Multipliers

Earnings multipliers are shown in Tables 11A and 11B, while job multipliers appear in Tables 12A and 12B. As noted earlier, alternative multipliers reflect different specification of the household sector. The multipliers based on the theory that VA = f(X) and C = f(V), hereafter called the VA model, are in Tables 11A and 12A. An alternative set of multipliers, which are prone to understatement, are based on a model in which EARN = f(X), and C = f(YP); these appear in Tables 11B and 12B. Typical differences between the results of these alternative models are reflected in their average (unweighted) multiplier values and are shown in Table 13.

Table 13: Average (Unweighted) Value of Multipliers Using Alternative Closure Models

	Total impact per million $ of exports upon		Total impact per direct impact upon	
Household sector model	Earnings	Jobs	Earnings	Jobs
VA model	$617 thous.	37.9	$2.63	3.60
EARN model	$525 thous.	31.5	$2.08	2.73
EARN/VA	85%	83%	79%	76%

The difference between the sector averages due to alternative specifications of the household sector is fairly small. In general, the range between the "high" estimates of the VA model and the "low" estimates of the EARN model provides a narrow bracket for the "true" multiplier. The correlation between the alternative sets of job multipliers is .97, and that for the earnings multipliers is .85.

The best single estimate of the earnings and jobs multiplier for a sector is probably obtained by taking the average of the two estimates. Using the average as the "standard" will provide a close approximation to the "true" multipliers. These are presented in Table 14. Until further improvements in our databases take place, and more sophisticated input-output models are developed to take into account more complex interactions, the multipliers in Table 14 are the best estimates of the class of multipliers (Type II) they represent. Encouraging their use as a standard for the assessment of impacts may discourage the arbitrary selection of the "high" or "low" multipliers.

Use of Multipliers: A Simple Illustration

In 1986, Boeing announced a firm order from all Nippon Airways for $1.5 billion of aircraft. What are its probable impacts upon the Washington economy? Assuming the procurement patterns for Aerospace as shown in the gross flows table are applicable, the following impact assessment may be made.

Direct impacts upon aerospace	**Estimate**	**Source of estimate**
Output	$1,500 million	Given datum
Earnings (.308 x 1,500)	$462 million	Earnings coeff. from Table 11
Jobs (8.5 x 1,500)	12,750 jobs	Jobs coeff. from Table 12
Total impact upon Washington economy	**Estimate**	**Source of estimate**
Output	Not applicable	Transactions not additive
GSP (.567 x 1,500)	$850 million	Table 10 multiplier
Earnings (440 x 1,500)	$660 million	Table 14 Multiplier
Jobs (17 x 1,500)	25,500 jobs	Table 14 multiplier

These total impacts are over the lifetime of the contract, not on a per-year basis. If deliveries are scheduled over five years on an even flow basis, the per annum effects may be readily deduced. The job estimates are assuming 1982 productivity rates; these should be adjusted to reflect expected productivity changes. If capacity restraints dictate additional investment by Aerospace, by other industrial sectors, or by households (housing), or additional expenditures (e.g., infrastructure), these added impacts would have to be taken into account by additional analysis. The Washington Projection and Simulation Model (WPSM), a more encompassing econometric/I-O model, is a systematic approach to taking into account these additional considerations.

Most impact analyses are not as simple as that shown in this illustration. Frequently the direct impacts to be assessed are themselves ascertained with only great difficulty and expense. Moreover, impacts may alter the production techniques of industries and require recalculation of the multipliers. Estimating the "with" and "without" project impacts upon an economy can be a Herculean undertaking. Input-output models facilitate taking account of complicated feedbacks, yet are but a tool combined with other analysis to provide the best possible economic assessments.

Table 14: Standard Earnings and Jobs Multipliers for Sectors of the Washington Economy *(direct, indirect, and induced effects)*

I/O NAME & NUMBER	Total impact per million $ of direct final demand upon: Earnings	Jobs	Total impact per direct impact upon: Earnings	Jobs
FIELD CROPS 1	$561 thous	30.6	$1.86	2.19
VEGGIES & FRUIT 2	673	50.7	1.63	1.51
LIVESTOCK 3	610	59.3	3.14	1.83
MISC. AGRI. PROD. 4	929	87.0	1.45	1.30
FISHING 5	888	133.7	1.55	1.19
MEAT PRODUCTS 6	373	28.3	4.52	7.65
DAIRY PRODUCTS 7	622	48.1	7.47	20.05
CANNING 8	555	40.0	3.50	4.25
GRAIN MILL 9	338	19.0	3.43	4.42
BEVERAGES 10	487	25.9	3.71	5.29
OTHER FOODS 11	548	30.5	2.26	2.85
TEXTILE MILL 12	542	36.4	1.51	1.52
APPAREL 13	612	48.2	1.50	1.40
MINING 14	974	36.2	1.40	2.00
FORESTRY 15	246	22.2	5.30	2.45
LOGGING 16	633	32.6	2.70	3.98
SAWMILL 17	792	42.2	2.67	3.06
PLYWOOD 18	716	38.5	2.80	3.19
MISC. WOOD 19	740	39.6	1.97	2.23
FURNITURE 20	609	38.9	1.92	1.94
PULPMILL 21	542	25.2	2.56	4.07
PAPERMILL 22	595	28.6	3.12	5.03
MISC. PAPER 23	648	31.8	3.37	4.82
PRINT & PUBLISH 24	685	39.1	1.83	2.04
INDUS. CHEMICALS 25	555	24.8	1.81	2.73
OTHER CHEMICALS 26	449	24.3	2.08	2.51
PETROLEUM 27	52	2.6	2.95	6.58
GLASS 28	578	30.4	2.24	2.51
CEMENT ETC. 29	652	33.1	2.15	2.53
FERROUS METALS 30	529	25.9	1.88	2.47
NONFERROUS 31	475	20.0	1.70	2.15
ALUMINUM 32	350	16.1	2.20	4.03
STRUCTURAL METALS 33	502	23.5	1.78	2.28
LIGHT METALS 34	428	22.3	2.27	2.82
FARM CONSTR. MACH 35	543	24.8	1.74	2.34
MACHINE TOOLS 36	764	35.5	1.52	1.89
INDUS. EQUIPMENT 37	596	29.6	1.66	2.04
ELECTRICAL MACH 38	481	25.9	1.83	2.20
AEROSPACE 39	440	17.0	1.43	2.00
MOTOR VEH/RR CARS 40	253	12.6	2.22	3.49
SHIPBUILDING 41	616	27.0	1.49	1.96
OTHER MANUF. 42	507	28.7	1.66	1.83
TRANSPORTATION 43	624	29.5	1.62	2.02
ELECTRIC UTIL 44	357	17.1	2.86	5.03
GAS UTIL 45	127	6.3	3.37	4.82
OTHER UTIL 46	438	33.7	2.07	1.83
COMMUNICATIONS 47	617	28.9	1.64	2.26
CONSTRUCTION 48	753	36.4	1.68	2.11
TRADE 49	712	49.8	1.71	1.65
F.I.R.E. 50	854	64.4	1.75	1.61
SERVICES 51	962	67.6	1.54	1.51
AVERAGE	571	34.7	2.35	3.16
MEDIAN	578	30.4	1.92	2.28

Misuse of Multipliers

There are many misconceptions about multipliers. Here are a few warnings that readers should consider.

1. There is no such thing as "the" multiplier for an industry. There are different multipliers depending upon the form in which the multiplier is expressed, the variable under consideration, the range of repercussions encompassed by the multiplier model, and the particular theory (or theories) of interaction used to construct them.

2. Multipliers for a variable can be made to look large or small depending on the unit of expression chosen for the denominator of the multiplier ratio. Jobs multipliers that express total jobs per direct job will be smaller (other things being equal) than multipliers that express jobs per million dollars of output exported.

3. It is often assumed that large multipliers mean large total economic impacts, forgetting that the size of impacts depends on both the size of the multiplier and the magnitude of the disturbance to be multiplied. Sectors with large multipliers are sometimes those in which significant market changes, such as changes in exports, are unlikely.

4. The size of the multiplier depends on the scope of interactions incorporated in the multiplier model. Multipliers with households endogenous will be larger than those that exclude the repercussions associated with household spending. Multipliers that include government spending or investment spending reactions will be larger still.

5. Avoid the pyramiding of multiplier impacts. Multipliers should be used to assess the impact of an event that is external to the multiplier process itself. Good examples include evaluating the impacts of changes in exports, federal expenditures, and investment outlays. The following is an example of a possible misuse: if ABC Company hires a hundred employees to service an internal market, do not ask how many jobs are indirectly created; its expansion may be part of a ripple effect originating elsewhere. To apply multipliers to this company's activity contributes to a pyramiding or duplication of impact. One highly regarded regional economist once quipped: "If all the jobs claimed to be created by economic developers were added, the total would be many times the entire labor force."

6. Impacts often have displacement effects. The positive multiplier effects of public undertakings should consider the negative offsets by taxpayers who finance them. The Iowa State Education Association claims that ". . . every dollar paid in salaries for all school employees generates an additional $2.50 in the local community." That may be an accurate statement, but those same paid salaries diminish taxpayers' spendable income by a like amount, probably having corresponding offsetting negative spending effects. Multipliers can provide a useful perspective, but are sometimes misleading, too.

7. Multipliers in static models are timeless. Production adjustments may take place in anticipation of changes in market demand; on the other hand, reaction lags may result in delayed multiplier responses. Furthermore, inventories serve as a shock absorber enabling producers to spread over time the impact of changing market conditions. These and other complications make the time period before the full multiplier effects become operative quite uncertain.

8. Ready-made multipliers, such as those included in this report, are representative for establishments within each sector but are not applicable to any

particular instance. For example, the multipliers for Printing and Publishing are descriptive for the industry as a whole but not for particular establishments within that sector. Analysts should use their judgment as to whether the multipliers in this study are applicable to a particular case.

9. Multipliers in this study are applicable to the Washington economy, and not to its subdivisions (counties or cities). As a general rule, the smaller the economic area, the greater will be the import propensities of producers and consumers, and hence the smaller will be the multipliers. There are reduction techniques for estimating multipliers from a national or from a state input-output table for smaller areas, and those methods should be applied as circumstances warrant.*

10. Empirical estimates of multipliers are based on interindustry relationships observed in a particular historical context (in this case, 1982). However, the relative (rank ordering) of multipliers for different industries is fairly persistent over the four input-output studies for Washington State. Not enough is yet known to appraise their cyclical sensitivity.

An enumeration of some of the common pitfalls associated with the use of multipliers may be helpful to readers, but in each potential application there is no substitute for sound economic analysis. That kind of analysis arises out of an understanding of the theoretical structure of input-output models in particular and economic analysis in general. Ready-made recipes are seldom applicable to particular instances that economists are called upon to analyze.**

*U.S. Department of Commerce, Bureau of Economic Analysis, *RIMS II Regional Input-Output Modeling System* (1981).

**Readers are referred to the following for more formal analysis: Ronald E. Miller and Peter D. Blair, *Input-Output Analysis: Foundations and Extensions* (Prentice Hall, 1985); Harry W. Richardson, *Input-Output and Regional Economics* (John Wiley & Sons, 1972); Wassily W. Leontieff, *The Structure of American Economy, 1919-1939*, second edition (Oxford University Press, 1953).

4. The Stability of Multipliers

Multipliers estimated from I/O studies are reflections of the prevailing interindustry linkages. Those in this study are based upon the interindustry gross flows table for 1982. How consistent are these multipliers, compared with those of earlier studies? Can the multipliers taken at a particular point in time be extrapolated to the future? The issue of stability is important if industry multipliers are to be useful for predictive purposes.

By multiplier stability is meant the consistency of sector multipliers observed over time. In addition to simple measurement error, there are several sources of temporal change operating to influence the magnitude of multipliers. Changes in the technical methods of production, changes in the geographic patterns of procurement, changes in product mix within sectors, and changes in the span of processing within establishments may take place. Such changes become manifest in the direct production coefficients from which multipliers are derived. Changes in direct coefficients are themselves functions of still more complex forces such as changes in technology, relative costs, economies of scale, and regulatory mandates. The critical question is whether the combination of dynamic forces making for changing regional direct coefficients undermine the usefulness of multipliers for the purposes of impact analysis.

An Overview of Direct Coefficients

The proximate causes of changes in sector multipliers are changes in propensities to import, ratios of value added to output, or changes in patterns of regional procurement. For Type II multipliers such shifts may take place in either the industrial sectors or the household sector.

Table 15 provides a temporal overview of the ratios of local procurement to output (RX/X), value added to output (VA/X), and imports to output (M/X), for industry and household sectors. Although these are shown as aggregative ratios (rather than for individual sectors), the table allows us to scan for probable proximate causes of multiplier change.

Table 15: Regional Procurement, Value Added, and Import Ratios for 51 Industry Sectors Plus Households
Washington State, various years

	RX/X	VA/X	M/X
1963	.354	.430	.217
1967	.342	.420	.237
1972	.342	.438	.219
1982	~~.314~~ .337	~~.337~~ .401	~~.401~~ .262

There appears to be a tendency for the value added to gross output ratios (VA/X) to decline, for the import propensities (M/X) to increase, and for some diminution in the regional procurement ratios (RX/X). The movements are not continuous, possibly reflecting the peculiarities of the business cycle in individual years. Overall, however, these developments seem consistent with the hypothesis that Washington is broadening

its trade relationships with the rest of the world. As the economy has grown, the propensity to import appears to have risen, and the degree of in-state processing appears to have lessened. Admittedly, only four observations over varied cyclical conditions make such conclusions quite tentative.

Value Added Multipliers Over Time

Changes of the kind observed in the aggregative direct coefficients lead one to expect that the Type II value added multipliers would decline. Indeed, this has happened. In Table 16 the value added multipliers for individual sectors are shown for each input-output study year. The average (unweighted mean) and median multiplier values have consistently declined over time. Even for individual sectors, declines have outnumbered increases between each time interval. No sector multiplier shows a consistent rise over time, and only eleven were higher in 1982 when compared with 1963. On the other hand, thirty-nine sectors showed a net decline over the covered interval, and nine registered a consistent decline over successive observations.

A two-way analysis of variance, using both industry and time as variables, provides persuasive evidence that differences among sector multipliers not only tend to be persistent, but also that their levels tend to change systematically over the periods covered by the I/O studies. The favorable implications of this analysis are that the size distribution of sectoral multipliers is far from random. Less favorable from the perspective of estimating future impacts is the finding that there is also a highly significant time trend in multipliers. While this means the multipliers for 1982 are likely to be the best estimates of the immediately surrounding time period, the time trend raises the question of whether multipliers for future time periods should be trend adjusted. Since "time" as an explanatory variable yields no clue as to the economic factors generating trends in the value of multipliers, we must turn to the proximate determinants of the time-trends themselves. As noted earlier, there is some evidence that propensities to import have risen over time. That development, so pronounced over the past decade, casts an element of uncertainty about the values of multipliers in the longer-term future.

Table 16: Value Added Multipliers for Washington State 1963, 1967, 1972, and 1982 (C=f[GSP])

I/O Name & Number	1963	1967	1972	1982
Field Crops 1	1.19	1.40	1.38	1.32
Vegetables 2	1.59	1.52	1.53	1.46
Livestock 3	0.92	1.13	1.13	1.28
Other Agri. 4	1.44	1.47	1.32	1.54
Fisheries 5	1.49	1.25	1.36	1.25
Meat Products 6	0.88	0.71	0.78	0.72
Dairy Products 7	1.23	1.21	1.14	1.28
Canning 8	1.39	1.17	1.31	1.17
Grain Mills 9	0.71	0.51	0.87	0.67
Beverages 10	1.35	1.23	1.19	1.12
Other Foods 11	1.39	1.24	1.14	1.20
Textiles 12	0.73	1.05	1.13	0.87
Apparel 13	0.94	0.78	0.83	0.88
Mining 14	1.18	1.24	1.22	1.27
Forestry 15	1.74	1.64	1.62	1.54
Logging 16	1.61	1.57	1.50	1.27
Sawmills 17	1.64	1.47	1.44	1.33
Plywood 18	1.27	1.08	1.25	1.24
Other Wood 19	1.19	1.20	1.00	1.01
Furniture 20	1.32	1.20	1.14	1.15
Pulp Mills 21	1.46	1.17	1.18	1.00
Paper Mills 22	1.36	1.31	1.10	1.13
Paperboard 23	1.23	1.33	1.20	1.23
Printing 24	1.37	1.32	1.31	1.23
Industrial Chem. 25	1.56	1.15	1.32	1.27
Other Chemicals 26	0.84	1.11	1.02	0.81
Petroleum 27	0.54	0.65	0.40	0.23
Glass 28	1.37	1.44	1.41	1.20
Cement 29	1.37	1.40	1.24	1.19
Ferrous Metals 30	1.45	1.29	1.29	1.15
Non-Ferr. Metals 31	0.65	0.55	1.16	0.65
Aluminum 32	0.82	0.68	0.75	0.83
Structural Metals 33	1.26	1.23	1.05	0.90
Light Metals 34	0.75	0.69	0.92	0.96
Farm Mach. 35	1.17	0.88	1.04	0.88
Machine Tools 36	1.29	1.26	1.14	1.20
Industrial Equip. 37	1.15	1.13	1.06	1.08
Electrical Mach. 38	1.22	1.15	1.01	1.12
Aerospace 39	0.99	0.82	0.86	0.57
Motor Vehicles 40	0.78	0.76	0.57	0.80
Ship Building 41	1.34	1.16	1.21	1.17
Other Mfg. 42	1.18	1.15	1.10	1.15
Transportation 43	1.52	1.25	1.41	1.05
Electric Util. 44	1.57	1.35	1.50	1.42
Gas Util. 45	0.83	1.54	0.94	0.46
Other Util. 46	1.47	1.00	1.60	1.55
Communications 47	1.67	1.55	1.51	1.40
Construction 48	1.19	1.65	1.12	1.12
Trade 49	1.69	1.64	1.55	1.42
F.I.R.E. 50	1.68	1.55	1.54	1.50
Services 51	1.54	1.28	1.51	1.38
Value Added 52	1.77	1.73	1.67	1.62
Average	1.26	1.20	1.19	1.12
Median	1.32	1.23	1.19	1.17

Appendix Table I

The Washington Interindustry Gross Flows Table, 1982

(Insert, back cover)

Appendix Table II

Direct Requirements Table

The direct requirements table is derived from the transactions table. Each column of the table shows the inputs procured by each Washington sector designated at the top of the table from each row sector, per dollar of total output. Each column adds to 1 (or 100%).

Row Designations

1 . . . 51	Washington supplying industries
52	Subtotal
53	Value added ratio
54	Imports from rest-of-U.S.
55	Imports - foreign

Column Designations

1 . . . 51	Washington purchasing industries
52	Subtotal
53	Washington personal consumption expenditures (PCE)
54	Washington state and local governments (S&L)
55	Federal government (FED)
56	Washington gross private domestic investment (GPDI)
57	Exports to rest-of-U.S. (EXP-U.S.)
58	Exports - foreign (EXP-FOR)
59	Final demand (= PCE + S&L + FED + GPDI) + EXP)
60	Total gross output

Direct Requirements Table

	1	2	3	4	5	6	7	8
1	0.0432	0.0026	0.3275	0.0000	0.0000	0.0055	0.0000	0.0000
2	0.0000	0.0132	0.0033	0.0000	0.0000	0.0000	0.0000	0.1882
3	0.0086	0.0040	0.1092	0.0000	0.0000	0.2997	0.5064	0.0000
4	0.0000	0.0000	0.0000	0.0294	0.0000	0.0000	0.0000	0.0006
5	0.0000	0.0000	0.0000	0.0000	0.0106	0.0000	0.0000	0.0483
6	0.0000	0.0000	0.0000	0.0000	0.0106	0.0165	0.0000	0.0031
7	0.0000	0.0000	0.0000	0.0000	0.0000	0.0009	0.1795	0.0031
8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0026	0.0176
9	0.0000	0.0000	0.0873	0.0000	0.0106	0.0009	0.0000	0.0019
10	0.0009	0.0000	0.0000	0.0000	0.0106	0.0000	0.0000	0.0000
11	0.0000	0.0000	0.0011	0.0000	0.0000	0.0009	0.0026	0.0063
12	0.0000	0.0000	0.0000	0.0000	0.0106	0.0009	0.0000	0.0000
13	0.0000	0.0000	0.0000	0.0000	0.0000	0.0009	0.0000	0.0000
14	0.0009	0.0013	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
15	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
16	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
17	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
18	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
19	0.0000	0.0066	0.0000	0.0000	0.0000	0.0009	0.0000	0.0006
20	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
21	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
22	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
23	0.0000	0.0026	0.0022	0.0000	0.0000	0.0367	0.0256	0.0251
24	0.0000	0.0000	0.0000	0.0000	0.0000	0.0009	0.0000	0.0050
25	0.0518	0.0198	0.0098	0.0074	0.0000	0.0009	0.0013	0.0013
26	0.0000	0.0000	0.0022	0.0074	0.0000	0.0009	0.0000	0.0000
27	0.0311	0.0303	0.0164	0.0221	0.0851	0.0073	0.0064	0.0013
28	0.0000	0.0000	0.0000	0.0000	0.0000	0.0009	0.0026	0.0125
29	0.0000	0.0000	0.0000	0.0000	0.0000	0.0009	0.0000	0.0000
30	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
31	0.0000	0.0000	0.0000	0.0000	0.0106	0.0000	0.0000	0.0000
32	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
33	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
34	0.0009	0.0013	0.0011	0.0000	0.0106	0.0009	0.0000	0.0125
35	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
36	0.0000	0.0000	0.0000	0.0000	0.0000	0.0009	0.0000	0.0006
37	0.0000	0.0000	0.0000	0.0000	0.0000	0.0009	0.0000	0.0000
38	0.0000	0.0000	0.0000	0.0000	0.0106	0.0009	0.0000	0.0000
39	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
40	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
41	0.0000	0.0000	0.0000	0.0000	0.0532	0.0000	0.0000	0.0000
42	0.0000	0.0013	0.0011	0.0000	0.0106	0.0009	0.0026	0.0000
43	0.0078	0.0079	0.0153	0.0074	0.0213	0.0055	0.0064	0.0251
44	0.0095	0.0198	0.0142	0.0074	0.0000	0.0156	0.0051	0.0050
45	0.0000	0.0000	0.0011	0.0000	0.0000	0.0009	0.0077	0.0088
46	0.0095	0.0092	0.0066	0.0074	0.0000	0.0009	0.0013	0.0013
47	0.0026	0.0066	0.0044	0.0074	0.0000	0.0009	0.0026	0.0025
48	0.0069	0.0066	0.0011	0.0000	0.0000	0.0009	0.0013	0.0006
49	0.0345	0.0277	0.0306	0.0221	0.0319	0.0247	0.0333	0.0753
50	0.0078	0.0053	0.0033	0.0074	0.0106	0.0018	0.0038	0.0019
51	0.0138	0.0066	0.0055	0.0074	0.0213	0.0101	0.0269	0.0301
52	0.2297	0.1726	0.6430	0.1324	0.3191	0.4418	0.8179	0.4787
53	0.6442	0.7800	0.3177	0.8529	0.5957	0.1027	0.1462	0.3312
54	0.1209	0.0435	0.0349	0.0147	0.0638	0.4207	0.0359	0.1895
55	0.0052	0.0040	0.0044	0.0000	0.0213	0.0348	0.0000	0.0006

Direct Requirements Table

	9	10	11	12	13	14	15	16
1	0.1344	0.0908	0.0017	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.0000	0.0043	0.0084	0.0000	0.0000	0.0000	0.0000	0.0000
3	0.0000	0.0000	0.0017	0.0200	0.0053	0.0000	0.0000	0.0000
4	0.0000	0.0000	0.0017	0.0000	0.0000	0.0000	0.0033	0.0000
5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
6	0.0066	0.0000	0.0017	0.0000	0.0000	0.0000	0.0000	0.0000
7	0.0000	0.0000	0.0418	0.0000	0.0000	0.0000	0.0000	0.0000
8	0.0000	0.0000	0.0100	0.0000	0.0000	0.0000	0.0000	0.0000
9	0.0000	0.0000	0.0669	0.0000	0.0000	0.0000	0.0000	0.0000
10	0.0000	0.0086	0.0084	0.0000	0.0000	0.0000	0.0000	0.0000
11	0.0033	0.0504	0.0301	0.0000	0.0000	0.0000	0.0000	0.0000
12	0.0000	0.0000	0.0017	0.0000	0.0000	0.0000	0.0000	0.0006
13	0.0000	0.0000	0.0000	0.0000	0.0053	0.0000	0.0000	0.0012
14	0.0033	0.0000	0.0033	0.0000	0.0000	0.0168	0.0000	0.0000
15	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0299	0.2647
16	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0033	0.2204
17	0.0000	0.0000	0.0000	0.0000	0.0000	0.0042	0.0000	0.0000
18	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
19	0.0000	0.0000	0.0017	0.0000	0.0000	0.0000	0.0000	0.0000
20	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
21	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
22	0.0197	0.0000	0.0017	0.0000	0.0053	0.0000	0.0000	0.0000
23	0.0098	0.0216	0.0151	0.0000	0.0053	0.0000	0.0000	0.0012
24	0.0000	0.0043	0.0067	0.0000	0.0000	0.0000	0.0017	0.0000
25	0.0000	0.0014	0.0017	0.0000	0.0000	0.0042	0.0133	0.0006
26	0.0000	0.0014	0.0017	0.0000	0.0000	0.0000	0.0066	0.0006
27	0.0033	0.0029	0.0100	0.0000	0.0000	0.0168	0.0133	0.0115
28	0.0000	0.0793	0.0017	0.0000	0.0000	0.0000	0.0000	0.0000
29	0.0000	0.0000	0.0000	0.0000	0.0000	0.0126	0.0000	0.0006
30	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0006
31	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
32	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
33	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0035
34	0.0066	0.1297	0.0033	0.0000	0.0000	0.0042	0.0000	0.0029
35	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0017	0.0006
36	0.0000	0.0014	0.0000	0.0000	0.0000	0.0000	0.0000	0.0035
37	0.0033	0.0000	0.0017	0.0000	0.0000	0.0000	0.0000	0.0000
38	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0012
39	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
40	0.0000	0.0000	0.0017	0.0000	0.0000	0.0000	0.0000	0.0012
41	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
42	0.0000	0.0000	0.0017	0.0000	0.0000	0.0000	0.0000	0.0012
43	0.0197	0.0144	0.0301	0.0000	0.0053	0.0084	0.0066	0.0863
44	0.0033	0.0029	0.0033	0.0200	0.0053	0.0084	0.0017	0.0012
45	0.0000	0.0086	0.0134	0.0400	0.0053	0.0042	0.0000	0.0000
46	0.0000	0.0014	0.0017	0.0000	0.0000	0.0000	0.0000	0.0006
47	0.0033	0.0014	0.0033	0.0200	0.0106	0.0042	0.0017	0.0012
48	0.0000	0.0043	0.0033	0.0000	0.0053	0.0042	0.0166	0.0380
49	0.0656	0.0360	0.0468	0.0200	0.0212	0.0126	0.0100	0.0144
50	0.0033	0.0043	0.0050	0.0000	0.0053	0.0042	0.0017	0.0035
51	0.0328	0.0403	0.0251	0.0200	0.0370	0.0294	0.0149	0.0230
52	0.3180	0.5101	0.3579	0.1400	0.1164	0.1345	0.1260	0.6835
53	0.1639	0.3228	0.4983	0.4400	0.4497	0.6891	0.8574	0.2244
54	0.5180	0.1441	0.1338	0.3400	0.3704	0.1345	0.0166	0.0869
55	0.0000	0.0231	0.0100	0.0800	0.0635	0.0420	0.0000	0.0052

Direct Requirements Table

	17	18	19	20	21	22	23	24
1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
6	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
7	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
9	0.0000	0.0033	0.0000	0.0000	0.0000	0.0048	0.0029	0.0000
10	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
11	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
12	0.0000	0.0000	0.0020	0.0061	0.0000	0.0000	0.0000	0.0000
13	0.0019	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
14	0.0000	0.0000	0.0000	0.0000	0.0000	0.0008	0.0000	0.0000
15	0.0509	0.0590	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
16	0.3922	0.2885	0.0301	0.0000	0.0366	0.0630	0.0740	0.0000
17	0.0925	0.0328	0.1042	0.0122	0.0845	0.1995	0.0941	0.0000
18	0.0009	0.0787	0.0341	0.0061	0.0141	0.0000	0.0000	0.0000
19	0.0000	0.0000	0.0401	0.0061	0.0000	0.0008	0.0000	0.0000
20	0.0000	0.0000	0.0000	0.0061	0.0000	0.0000	0.0000	0.0000
21	0.0019	0.0000	0.0000	0.0000	0.0000	0.0152	0.0019	0.0000
22	0.0000	0.0000	0.0000	0.0122	0.0028	0.0032	0.0999	0.0809
23	0.0000	0.0000	0.0080	0.0061	0.0113	0.0048	0.1470	0.0023
24	0.0000	0.0033	0.0000	0.0000	0.0000	0.0000	0.0000	0.0092
25	0.0009	0.0033	0.0020	0.0000	0.0563	0.0319	0.0192	0.0012
26	0.0028	0.0328	0.0020	0.0061	0.0000	0.0008	0.0010	0.0012
27	0.0083	0.0131	0.0020	0.0061	0.1127	0.0319	0.0259	0.0012
28	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
29	0.0000	0.0000	0.0040	0.0000	0.0000	0.0008	0.0000	0.0000
30	0.0000	0.0000	0.0020	0.0000	0.0000	0.0000	0.0000	0.0000
31	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
32	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
33	0.0019	0.0098	0.0080	0.0000	0.0000	0.0008	0.0000	0.0000
34	0.0009	0.0000	0.0040	0.0061	0.0028	0.0008	0.0000	0.0035
35	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
36	0.0009	0.0033	0.0020	0.0061	0.0028	0.0008	0.0000	0.0000
37	0.0000	0.0033	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
38	0.0009	0.0033	0.0020	0.0000	0.0000	0.0000	0.0000	0.0000
39	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
40	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
41	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
42	0.0028	0.0000	0.0020	0.0244	0.0000	0.0040	0.0000	0.0000
43	0.0259	0.0262	0.0160	0.0122	0.0282	0.0303	0.0298	0.0116
44	0.0111	0.0131	0.0040	0.0061	0.0423	0.0399	0.0240	0.0035
45	0.0009	0.0164	0.0020	0.0305	0.0986	0.0120	0.0163	0.0023
46	0.0009	0.0033	0.0020	0.0000	0.0197	0.0032	0.0019	0.0000
47	0.0019	0.0033	0.0080	0.0061	0.0028	0.0016	0.0019	0.0116
48	0.0037	0.0066	0.0060	0.0061	0.0085	0.0080	0.0058	0.0023
49	0.0352	0.0492	0.0561	0.0427	0.0563	0.0479	0.0528	0.0324
50	0.0074	0.0066	0.0100	0.0061	0.0056	0.0048	0.0048	0.0046
51	0.0139	0.0066	0.0200	0.0610	0.0085	0.0160	0.0192	0.0786
52	0.6605	0.6656	0.3727	0.2744	0.5944	0.5275	0.6225	0.2462
53	0.2969	0.2590	0.3347	0.5122	0.2592	0.3049	0.3016	0.5676
54	0.0342	0.0754	0.2685	0.2073	0.0676	0.1484	0.0740	0.0879
55	0.0083	0.0000	0.0240	0.0061	0.0789	0.0192	0.0019	0.0983

Direct Requirements Table

	25	26	27	28	29	30	31	32
1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
6	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
7	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
9	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
10	0.0000	0.0000	0.0000	0.0086	0.0000	0.0000	0.0000	0.0000
11	0.0012	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
12	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
13	0.0012	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0005
14	0.0012	0.0000	0.0004	0.0431	0.0484	0.0033	0.0039	0.0000
15	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
16	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
17	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0039	0.0000
18	0.0000	0.0000	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000
19	0.0000	0.0054	0.0000	0.0000	0.0000	0.0000	0.0000	0.0005
20	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
21	0.0023	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
22	0.0012	0.0054	0.0000	0.0000	0.0024	0.0033	0.0000	0.0000
23	0.0047	0.0108	0.0006	0.0431	0.0024	0.0033	0.0000	0.0005
24	0.0012	0.0054	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
25	0.0373	0.0108	0.0013	0.0000	0.0000	0.0098	0.0039	0.0039
26	0.0023	0.0324	0.0000	0.0086	0.0024	0.0033	0.0039	0.0039
27	0.0070	0.0270	0.0143	0.0086	0.0969	0.0033	0.0117	0.0098
28	0.0012	0.0000	0.0000	0.0086	0.0000	0.0000	0.0000	0.0000
29	0.0000	0.0000	0.0004	0.0000	0.1211	0.0000	0.0000	0.0000
30	0.0000	0.0000	0.0000	0.0086	0.0000	0.0131	0.0000	0.0010
31	0.0000	0.0000	0.0002	0.0000	0.0000	0.0000	0.0000	0.0015
32	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1556	0.2195
33	0.0000	0.0000	0.0002	0.0000	0.0000	0.0033	0.0000	0.0005
34	0.0058	0.0054	0.0004	0.0000	0.0024	0.0065	0.0000	0.0005
35	0.0000	0.0000	0.0002	0.0000	0.0000	0.0000	0.0000	0.0005
36	0.0000	0.0000	0.0002	0.0000	0.0024	0.0098	0.0000	0.0015
37	0.0012	0.0000	0.0004	0.0000	0.0000	0.0000	0.0000	0.0010
38	0.0012	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0010
39	0.0058	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
40	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
41	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
42	0.0012	0.0054	0.0011	0.0000	0.0000	0.0000	0.0000	0.0020
43	0.0117	0.0162	0.0032	0.0345	0.0363	0.0196	0.0233	0.0195
44	0.0210	0.0054	0.0026	0.0862	0.0218	0.0588	0.0389	0.1356
45	0.0292	0.0216	0.0076	0.1293	0.0024	0.0196	0.0233	0.0102
46	0.0047	0.0054	0.0002	0.0000	0.0024	0.0000	0.0000	0.0000
47	0.0023	0.0108	0.0004	0.0000	0.0048	0.0000	0.0000	0.0005
48	0.0070	0.0108	0.0002	0.0086	0.0097	0.0131	0.0039	0.0015
49	0.0350	0.0270	0.0065	0.0345	0.0266	0.0458	0.0039	0.0127
50	0.0023	0.0108	0.0004	0.0086	0.0048	0.0033	0.0039	0.0034
51	0.0233	0.0541	0.0004	0.0259	0.0387	0.0196	0.0117	0.0073
52	0.2124	0.2703	0.0417	0.4569	0.4262	0.2386	0.2918	0.4385
53	0.6336	0.3189	0.1218	0.4483	0.4697	0.5294	0.2335	0.2293
54	0.1517	0.4054	0.5962	0.0603	0.0726	0.2320	0.4125	0.1371
55	0.0023	0.0054	0.2402	0.0345	0.0315	0.0000	0.0623	0.1951

Direct Requirements Table

	33	34	35	36	37	38	39	40
1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
6	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
7	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
9	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
10	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
11	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
12	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
13	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
14	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000
15	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
16	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
17	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0002	0.0000
18	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000
19	0.0000	0.0019	0.0025	0.0000	0.0000	0.0011	0.0001	0.0020
20	0.0000	0.0000	0.0000	0.0000	0.0000	0.0011	0.0001	0.0040
21	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
22	0.0000	0.0000	0.0000	0.0000	0.0000	0.0011	0.0001	0.0000
23	0.0017	0.0077	0.0000	0.0000	0.0000	0.0011	0.0013	0.0020
24	0.0000	0.0000	0.0025	0.0000	0.0000	0.0000	0.0001	0.0020
25	0.0000	0.0058	0.0049	0.0000	0.0000	0.0000	0.0001	0.0020
26	0.0017	0.0038	0.0025	0.0000	0.0000	0.0022	0.0006	0.0020
27	0.0017	0.0058	0.0025	0.0051	0.0017	0.0011	0.0011	0.0020
28	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
29	0.0000	0.0019	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000
30	0.0430	0.0385	0.0123	0.0102	0.0132	0.0000	0.0001	0.0020
31	0.0086	0.0019	0.0000	0.0051	0.0099	0.0011	0.0003	0.0000
32	0.0344	0.0769	0.0025	0.0000	0.0033	0.0011	0.0002	0.0020
33	0.0309	0.0019	0.0000	0.0051	0.0033	0.0000	0.0009	0.0020
34	0.0086	0.0096	0.0197	0.0051	0.0050	0.0276	0.0017	0.0080
35	0.0000	0.0000	0.0345	0.0000	0.0000	0.0000	0.0000	0.0000
36	0.0052	0.0115	0.0197	0.0406	0.0198	0.0055	0.0034	0.0020
37	0.0017	0.0000	0.0148	0.0000	0.0099	0.0022	0.0008	0.0000
38	0.0000	0.0000	0.0099	0.0000	0.0066	0.0198	0.0020	0.0020
39	0.0172	0.0000	0.0000	0.0000	0.0000	0.0044	0.0224	0.0080
40	0.0017	0.0000	0.0025	0.0000	0.0017	0.0000	0.0000	0.0020
41	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
42	0.0000	0.0154	0.0025	0.0051	0.0017	0.0099	0.0015	0.0040
43	0.0086	0.0077	0.0074	0.0051	0.0050	0.0066	0.0046	0.0040
44	0.0034	0.0038	0.0025	0.0051	0.0017	0.0022	0.0022	0.0040
45	0.0034	0.0019	0.0049	0.0000	0.0000	0.0011	0.0011	0.0020
46	0.0000	0.0019	0.0000	0.0000	0.0017	0.0000	0.0006	0.0020
47	0.0034	0.0058	0.0049	0.0051	0.0050	0.0044	0.0022	0.0040
48	0.0052	0.0019	0.0025	0.0000	0.0033	0.0022	0.0004	0.0020
49	0.0223	0.0212	0.0345	0.0203	0.0330	0.0331	0.0022	0.0239
50	0.0052	0.0038	0.0025	0.0051	0.0017	0.0044	0.0011	0.0020
51	0.0172	0.0385	0.0222	0.0305	0.0330	0.0243	0.0223	0.0120
52	0.2251	0.2692	0.2143	0.1472	0.1601	0.1577	0.0742	0.1036
53	0.4055	0.4135	0.3966	0.6294	0.5495	0.5755	0.3021	0.4163
54	0.2629	0.1962	0.2660	0.2183	0.2409	0.2205	0.5618	0.4761
55	0.1065	0.1212	0.1232	0.0051	0.0495	0.0463	0.0619	0.0040

Direct Requirements Table

	41	42	43	44	45	46	47	48
1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.0000	0.0000	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000
3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0031
5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
6	0.0000	0.0009	0.0005	0.0000	0.0000	0.0000	0.0000	0.0000
7	0.0000	0.0000	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000
8	0.0000	0.0000	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000
9	0.0000	0.0000	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000
10	0.0000	0.0000	0.0009	0.0000	0.0000	0.0000	0.0000	0.0000
11	0.0000	0.0009	0.0005	0.0000	0.0000	0.0000	0.0000	0.0000
12	0.0000	0.0009	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
13	0.0005	0.0009	0.0004	0.0000	0.0000	0.0000	0.0000	0.0000
14	0.0000	0.0000	0.0002	0.0195	0.0000	0.0000	0.0000	0.0061
15	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
16	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
17	0.0011	0.0035	0.0002	0.0000	0.0000	0.0000	0.0000	0.0138
18	0.0011	0.0009	0.0000	0.0000	0.0000	0.0000	0.0000	0.0061
19	0.0037	0.0009	0.0002	0.0000	0.0000	0.0000	0.0000	0.0092
20	0.0026	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0006
21	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
22	0.0000	0.0009	0.0002	0.0004	0.0000	0.0000	0.0031	0.0000
23	0.0000	0.0009	0.0004	0.0012	0.0009	0.0000	0.0005	0.0011
24	0.0005	0.0009	0.0029	0.0012	0.0009	0.0031	0.0031	0.0002
25	0.0005	0.0009	0.0002	0.0004	0.0000	0.0000	0.0000	0.0003
26	0.0011	0.0220	0.0002	0.0004	0.0000	0.0000	0.0005	0.0011
27	0.0026	0.0009	0.1204	0.0004	0.0009	0.0061	0.0016	0.0214
28	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
29	0.0005	0.0009	0.0005	0.0000	0.0000	0.0000	0.0000	0.0429
30	0.0021	0.0000	0.0005	0.0000	0.0000	0.0000	0.0000	0.0122
31	0.0011	0.0009	0.0002	0.0004	0.0000	0.0000	0.0000	0.0012
32	0.0005	0.0088	0.0000	0.0004	0.0000	0.0000	0.0000	0.0002
33	0.0026	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0291
34	0.0016	0.0026	0.0018	0.0008	0.0000	0.0000	0.0000	0.0024
35	0.0011	0.0000	0.0004	0.0004	0.0000	0.0000	0.0000	0.0003
36	0.0011	0.0026	0.0016	0.0004	0.0000	0.0000	0.0000	0.0003
37	0.0011	0.0009	0.0007	0.0004	0.0000	0.0000	0.0000	0.0002
38	0.0016	0.0018	0.0007	0.0004	0.0000	0.0000	0.0063	0.0023
39	0.0026	0.0000	0.0027	0.0000	0.0000	0.0000	0.0000	0.0000
40	0.0005	0.0000	0.0007	0.0000	0.0000	0.0000	0.0000	0.0002
41	0.0016	0.0000	0.0054	0.0000	0.0000	0.0000	0.0000	0.0000
42	0.0011	0.0176	0.0002	0.0004	0.0000	0.0000	0.0021	0.0047
43	0.0032	0.0114	0.0653	0.0023	0.0009	0.0031	0.0031	0.0115
44	0.0053	0.0026	0.0045	0.2027	0.0017	0.0275	0.0047	0.0017
45	0.0005	0.0009	0.0011	0.0008	0.4257	0.0000	0.0005	0.0006
46	0.0011	0.0009	0.0004	0.0004	0.0000	0.0765	0.0010	0.0003
47	0.0011	0.0053	0.0063	0.0039	0.0026	0.0061	0.0068	0.0031
48	0.0063	0.0009	0.0038	0.0062	0.0009	0.0092	0.0052	0.0009
49	0.0190	0.0220	0.0127	0.0039	0.0009	0.0031	0.0058	0.0433
50	0.0005	0.0018	0.0054	0.0039	0.0009	0.0031	0.0063	0.0061
51	0.0085	0.0044	0.0308	0.0097	0.0017	0.0153	0.0476	0.0383
52	0.0783	0.1215	0.2737	0.2608	0.4379	0.1529	0.0983	0.2647
53	0.6667	0.6232	0.5182	0.6530	0.1530	0.8226	0.7845	0.5014
54	0.2534	0.1549	0.1749	0.0823	0.0376	0.0245	0.1109	0.2266
55	0.0016	0.1004	0.0332	0.0039	0.3715	0.0000	0.0063	0.0073

Direct Requirements Table

	49	50	51	52	53	54	55	56
1	0.0000	0.0000	0.0019	0.0055	0.0002	0.0001	0.0212	0.0000
2	0.0000	0.0000	0.0001	0.0036	0.0020	0.0004	0.0084	0.0000
3	0.0000	0.0000	0.0003	0.0095	0.0013	0.0001	0.0000	0.0000
4	0.0000	0.0000	0.0001	0.0003	0.0022	0.0005	0.0000	0.0000
5	0.0000	0.0000	0.0000	0.0009	0.0002	0.0001	0.0000	0.0003
6	0.0000	0.0000	0.0002	0.0004	0.0121	0.0012	0.0000	0.0016
7	0.0000	0.0000	0.0003	0.0020	0.0082	0.0021	0.0000	0.0065
8	0.0000	0.0000	0.0004	0.0005	0.0031	0.0012	0.0000	0.0074
9	0.0000	0.0000	0.0002	0.0016	0.0010	0.0002	0.0000	0.0001
10	0.0000	0.0000	0.0006	0.0003	0.0074	0.0001	0.0000	0.0015
11	0.0000	0.0000	0.0002	0.0008	0.0099	0.0028	0.0000	0.0030
12	0.0000	0.0000	0.0001	0.0001	0.0001	0.0000	0.0000	0.0000
13	0.0001	0.0000	0.0001	0.0002	0.0014	0.0003	0.0000	0.0001
14	0.0000	0.0000	0.0000	0.0015	0.0001	0.0004	0.0098	0.0007
15	0.0001	0.0000	0.0000	0.0062	0.0003	0.0000	0.0000	0.0000
16	0.0000	0.0000	0.0000	0.0122	0.0000	0.0000	0.0000	0.0000
17	0.0000	0.0000	0.0002	0.0073	0.0000	0.0000	0.0000	0.0000
18	0.0000	0.0000	0.0001	0.0011	0.0000	0.0000	0.0000	0.0000
19	0.0001	0.0000	0.0000	0.0012	0.0003	0.0001	0.0020	0.0000
20	0.0001	0.0000	0.0000	0.0002	0.0010	0.0010	0.0024	0.0004
21	0.0000	0.0000	0.0000	0.0003	0.0000	0.0000	0.0000	0.0000
22	0.0053	0.0005	0.0013	0.0034	0.0001	0.0007	0.0000	0.0024
23	0.0020	0.0024	0.0002	0.0045	0.0015	0.0016	0.0000	0.0021
24	0.0171	0.0211	0.0093	0.0056	0.0045	0.0079	0.0000	0.0007
25	0.0003	0.0003	0.0009	0.0030	0.0001	0.0007	0.0000	0.0627
26	0.0008	0.0003	0.0006	0.0013	0.0006	0.0005	0.0000	0.0001
27	0.0053	0.0026	0.0177	0.0172	0.0296	0.0082	0.0024	0.0177
28	0.0001	0.0000	0.0001	0.0009	0.0000	0.0003	0.0000	0.0007
29	0.0001	0.0000	0.0001	0.0039	0.0001	0.0002	0.0000	0.0000
30	0.0000	0.0000	0.0000	0.0018	0.0000	0.0001	0.0000	0.0001
31	0.0000	0.0000	0.0000	0.0004	0.0000	0.0000	0.0000	0.0000
32	0.0000	0.0000	0.0000	0.0064	0.0000	0.0000	0.0000	0.0000
33	0.0001	0.0000	0.0000	0.0028	0.0000	0.0006	0.0159	0.0018
34	0.0003	0.0000	0.0006	0.0029	0.0007	0.0005	0.0049	0.0003
35	0.0000	0.0000	0.0000	0.0003	0.0000	0.0002	0.0079	0.0044
36	0.0003	0.0000	0.0014	0.0015	0.0001	0.0004	0.0006	0.0004
37	0.0001	0.0000	0.0005	0.0005	0.0000	0.0002	0.0020	0.0000
38	0.0001	0.0000	0.0003	0.0011	0.0000	0.0001	0.0026	0.0027
39	0.0000	0.0000	0.0000	0.0027	0.0000	0.0000	0.0031	0.1770
40	0.0001	0.0000	0.0005	0.0002	0.0003	0.0001	0.0065	0.0015
41	0.0000	0.0000	0.0000	0.0004	0.0012	0.0001	0.0039	0.2287
42	0.0013	0.0016	0.0052	0.0024	0.0001	0.0010	0.0069	0.0037
43	0.0133	0.0053	0.0093	0.0154	0.0187	0.0105	0.0045	0.0125
44	0.0147	0.0132	0.0116	0.0177	0.0199	0.0084	0.0000	0.0022
45	0.0021	0.0026	0.0075	0.0099	0.0049	0.0026	0.0000	0.0015
46	0.0020	0.0021	0.0019	0.0018	0.0037	0.0019	0.0000	0.0004
47	0.0133	0.0305	0.0186	0.0080	0.0223	0.0084	0.0039	0.0044
48	0.0047	0.0158	0.0047	0.0047	0.0038	0.3031	0.5453	0.0440
49	0.0150	0.0037	0.0256	0.0206	0.1980	0.0105	0.0491	0.0133
50	0.0133	0.0737	0.0186	0.0101	0.0361	0.0142	0.0000	0.0007
51	0.0676	0.0789	0.0838	0.0397	0.1361	0.0577	0.0000	0.0295
52	0.1796	0.2545	0.2248	0.2467	0.5337	0.4517	0.7033	0.6374
53	0.7333	0.7068	0.6807	0.5145	0.1524	0.4532	0.0000	0.3626
54	0.0771	0.0368	0.0899	0.1979	0.2926	0.0920	0.2246	0.0000
55	0.0100	0.0018	0.0047	0.0409	0.0213	0.0031	0.0721	0.0000

Direct Requirements Table

	57	58	59	60
1	0.0026	0.0551	0.0071	0.0063
2	0.0109	0.0056	0.0046	0.0041
3	0.0008	0.0001	0.0008	0.0050
4	0.0006	0.0000	0.0011	0.0007
5	0.0002	0.0000	0.0002	0.0005
6	0.0221	0.0018	0.0112	0.0060
7	0.0087	0.0000	0.0064	0.0043
8	0.0445	0.0334	0.0164	0.0087
9	0.0029	0.0060	0.0018	0.0017
10	0.0147	0.0008	0.0071	0.0038
11	0.0029	0.0007	0.0055	0.0033
12	0.0016	0.0001	0.0004	0.0003
13	0.0046	0.0004	0.0018	0.0010
14	0.0017	0.0003	0.0011	0.0013
15	0.0016	0.0000	0.0005	0.0033
16	0.0000	0.0732	0.0069	0.0095
17	0.0125	0.0152	0.0046	0.0059
18	0.0083	0.0012	0.0022	0.0017
19	0.0154	0.0001	0.0041	0.0027
20	0.0035	0.0000	0.0016	0.0009
21	0.0071	0.0178	0.0035	0.0019
22	0.0279	0.0285	0.0101	0.0068
23	0.0206	0.0070	0.0068	0.0057
24	0.0042	0.0009	0.0039	0.0047
25	0.0042	0.0061	0.0062	0.0047
26	0.0015	0.0001	0.0007	0.0010
27	0.0645	0.0171	0.0328	0.0253
28	0.0008	0.0003	0.0003	0.0006
29	0.0015	0.0021	0.0007	0.0023
30	0.0061	0.0001	0.0016	0.0017
31	0.0072	0.0056	0.0023	0.0014
32	0.0576	0.0111	0.0156	0.0112
33	0.0092	0.0017	0.0035	0.0032
34	0.0080	0.0011	0.0028	0.0028
35	0.0083	0.0121	0.0040	0.0022
36	0.0020	0.0003	0.0007	0.0011
37	0.0169	0.0159	0.0059	0.0033
38	0.0297	0.0072	0.0086	0.0049
39	0.1637	0.3963	0.0918	0.0488
40	0.0167	0.0029	0.0051	0.0027
41	0.0088	0.0022	0.0196	0.0103
42	0.0215	0.0376	0.0098	0.0062
43	0.1113	0.0588	0.0439	0.0301
44	0.0042	0.0000	0.0106	0.0140
45	0.0015	0.0000	0.0029	0.0062
46	0.0000	0.0000	0.0018	0.0018
47	0.0065	0.0022	0.0127	0.0104
48	0.0000	0.0000	0.0646	0.0356
49	0.1375	0.1605	0.1391	0.0818
50	0.0543	0.0010	0.0307	0.0207
51	0.0369	0.0091	0.0762	0.0586
52	1.0000	1.0000	0.7041	0.4831
53	0.0000	0.0000	0.1365	0.3191
54	0.0000	0.0000	0.1461	0.1711
55	0.0000	0.0000	0.0133	0.0267

Appendix Table III

Total Requirements Table
(Direct, Indirect, Induced)
[C = f(GSP), VA = f(X)]

The total requirements table is the Leontief inverse of a 52 x 52 sector direct requirements matrix.* Each element in this matrix (b_{ij}) shows the output associated with a $1 change in the autonomous expenditures for the activity designated at the top of the column. These consequences are commonly referred to as "ripple effects."

Rows and columns 1 through 51 of the total requirements matrix follow the usual industry designations. Row 52 is the VA multiplier row, and column 52 is the multiplier for autonomous personal consumption.

The most useful multipliers in the matrix are found in row 52, the VA multipliers. These represent the total VA, or gross state product, that would be cumulatively generated over all activities within the state as a result of a $1 increase in the autonomous demand for the output of the designated column activity. Autonomous, for this purpose, is any purchase by final users except Washington PCE (which is endogenous). The VA multiplier is commonly used to estimate the change in GSP associated with a change in export sales, but it may also be applicable to changes in Washington GPDI or autonomous sales to governments.

For example, the VA multiplier for industry 1, Field Crops, is 1.32; it tells us that the GSP for Washington State changes by $1.32 for each $1 change in the autonomous sales of that industry, other things being equal. That $1.32 is composed of its direct effect of 64 cents (from direct requirements table) upon Field Crops VA, plus the VA effects upon other Washington industries that are suppliers of input to Field Crops, the VA in industries that are suppliers-to-suppliers (ad infinitum in diminishing impacts), together with the value added impacts upon all Washington industries of induced consumption by Washington households. These multiplier effects are theoretical, of course, since they are based on a series of assumptions about industry and household behavior.

Turning to the elements of the 51 x 51 portions of the total requirements matrix, one can read the changes in the gross *output* of a designated row industry associated with a change in the (non-PCE) final demand for output of industry designated at the head of the column. Unlike the VA multipliers, there is extensive duplication in the output multipliers. Such measures actually measure the *transactions* that occur, and their magnitudes are significantly affected by the accounting conventions utilized in the input-output study.

Aggregated output multipliers (column totals) are frequently reported in other regional studies. This author believes they are often a source of confusion or misunderstanding and they have little or no value in regional economic analysis. For this reason the column totals are not shown.

*PCE direct coefficients are adjusted to reflect ratios to GSP in the direct requirements matrix prior to inversion.

Total Requirements Table

	1	2	3	4	5	6	7	8
1	1.0542	0.0104	0.4048	0.0063	0.0092	0.1310	0.2520	0.0076
2	0.0026	1.0162	0.0063	0.0030	0.0025	0.0026	0.0055	0.1965
3	0.0210	0.0165	1.1373	0.0126	0.0143	0.3500	0.7060	0.0143
4	0.0021	0.0023	0.0020	1.0327	0.0020	0.0012	0.0021	0.0025
5	0.0004	0.0004	0.0003	0.0004	1.0111	0.0002	0.0005	0.0500
6	0.0113	0.0126	0.0117	0.0132	0.0218	1.0232	0.0114	0.0139
7	0.0097	0.0108	0.0096	0.0114	0.0093	0.0065	1.2284	0.0129
8	0.0031	0.0035	0.0031	0.0036	0.0030	0.0017	0.0063	1.0207
9	0.0035	0.0033	0.1011	0.0030	0.0136	0.0327	0.0637	0.0057
10	0.0080	0.0078	0.0073	0.0082	0.0176	0.0040	0.0072	0.0070
11	0.0099	0.0109	0.0112	0.0115	0.0099	0.0068	0.0138	0.0154
12	0.0001	0.0002	0.0001	0.0001	0.0109	0.0010	0.0001	0.0007
13	0.0014	0.0015	0.0013	0.0015	0.0013	0.0017	0.0013	0.0012
14	0.0023	0.0030	0.0022	0.0013	0.0011	0.0015	0.0021	0.0021
15	0.0008	0.0013	0.0011	0.0009	0.0009	0.0029	0.0030	0.0025
16	0.0015	0.0029	0.0025	0.0015	0.0017	0.0086	0.0084	0.0070
17	0.0015	0.0028	0.0024	0.0015	0.0017	0.0068	0.0068	0.0057
18	0.0002	0.0004	0.0001	0.0001	0.0002	0.0001	0.0002	0.0002
19	0.0005	0.0075	0.0005	0.0005	0.0007	0.0013	0.0005	0.0025
20	0.0009	0.0011	0.0009	0.0011	0.0011	0.0005	0.0009	0.0009
21	0.0002	0.0001	0.0002	0.0001	0.0001	0.0002	0.0003	0.0002
22	0.0031	0.0036	0.0056	0.0034	0.0033	0.0071	0.0086	0.0069
23	0.0043	0.0076	0.0082	0.0046	0.0048	0.0475	0.0437	0.0355
24	0.0110	0.0118	0.0112	0.0123	0.0107	0.0076	0.0120	0.0163
25	0.0579	0.0226	0.0346	0.0094	0.0018	0.0133	0.0244	0.0076
26	0.0013	0.0013	0.0038	0.0091	0.0016	0.0026	0.0030	0.0014
27	0.0717	0.0733	0.0714	0.0666	0.1260	0.0418	0.0692	0.0509
28	0.0009	0.0008	0.0008	0.0009	0.0016	0.0014	0.0040	0.0136
29	0.0010	0.0011	0.0009	0.0007	0.0008	0.0016	0.0009	0.0008
30	0.0004	0.0004	0.0004	0.0003	0.0009	0.0003	0.0004	0.0010
31	0.0001	0.0001	0.0001	0.0001	0.0109	0.0001	0.0001	0.0006
32	0.0005	0.0005	0.0006	0.0004	0.0039	0.0004	0.0006	0.0018
33	0.0006	0.0006	0.0005	0.0004	0.0005	0.0003	0.0005	0.0005
34	0.0036	0.0039	0.0047	0.0026	0.0149	0.0031	0.0039	0.0160
35	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
36	0.0007	0.0007	0.0007	0.0007	0.0010	0.0015	0.0008	0.0016
37	0.0003	0.0003	0.0006	0.0003	0.0004	0.0012	0.0005	0.0003
38	0.0005	0.0005	0.0005	0.0005	0.0115	0.0013	0.0005	0.0010
39	0.0005	0.0003	0.0004	0.0002	0.0004	0.0002	0.0003	0.0002
40	0.0004	0.0005	0.0004	0.0005	0.0005	0.0003	0.0005	0.0004
41	0.0013	0.0015	0.0014	0.0015	0.0552	0.0008	0.0014	0.0040
42	0.0020	0.0034	0.0032	0.0020	0.0132	0.0026	0.0061	0.0030
43	0.0354	0.0376	0.0502	0.0377	0.0492	0.0309	0.0521	0.0572
44	0.0470	0.0618	0.0591	0.0471	0.0338	0.0486	0.0595	0.0453
45	0.0165	0.0159	0.0176	0.0159	0.0156	0.0125	0.0349	0.0328
46	0.0161	0.0158	0.0173	0.0140	0.0050	0.0078	0.0145	0.0082
47	0.0322	0.0388	0.0355	0.0412	0.0287	0.0199	0.0373	0.0317
48	0.0150	0.0150	0.0118	0.0083	0.0075	0.0074	0.0126	0.0097
49	0.2098	0.2193	0.2242	0.2222	0.1996	0.1404	0.2469	0.2424
50	0.0524	0.0538	0.0507	0.0583	0.0535	0.0293	0.0540	0.0445
51	0.1800	0.1876	0.1785	0.1966	0.1813	0.1099	0.2107	0.1889
52	1.3161	1.4630	1.2847	1.5416	1.2520	0.7171	1.2789	1.1724

Total Requirements Table

	9	10	11	12	13	14	15	16
1	0.1448	0.1021	0.0291	0.0116	0.0058	0.0053	0.0063	0.0053
2	0.0014	0.0072	0.0133	0.0018	0.0017	0.0025	0.0030	0.0025
3	0.0093	0.0119	0.0428	0.0297	0.0132	0.0104	0.0127	0.0105
4	0.0011	0.0019	0.0037	0.0014	0.0014	0.0020	0.0060	0.0034
5	0.0002	0.0003	0.0008	0.0002	0.0002	0.0003	0.0004	0.0003
6	0.0125	0.0098	0.0126	0.0075	0.0076	0.0109	0.0133	0.0110
7	0.0052	0.0110	0.0615	0.0064	0.0065	0.0094	0.0114	0.0094
8	0.0016	0.0032	0.0135	0.0021	0.0021	0.0030	0.0036	0.0030
9	1.0020	0.0061	0.0744	0.0037	0.0023	0.0025	0.0031	0.0026
10	0.0038	1.0160	0.0152	0.0047	0.0047	0.0068	0.0082	0.0069
11	0.0084	0.0609	1.0409	0.0065	0.0065	0.0095	0.0115	0.0095
12	0.0001	0.0002	0.0019	1.0001	0.0001	0.0001	0.0001	0.0009
13	0.0007	0.0012	0.0012	0.0009	1.0062	0.0013	0.0016	0.0028
14	0.0042	0.0051	0.0050	0.0011	0.0008	1.0190	0.0013	0.0015
15	0.0024	0.0024	0.0022	0.0005	0.0012	0.0016	1.0329	0.3514
16	0.0067	0.0068	0.0059	0.0009	0.0031	0.0037	0.0061	1.2864
17	0.0068	0.0056	0.0052	0.0009	0.0030	0.0060	0.0018	0.0025
18	0.0001	0.0002	0.0002	0.0001	0.0001	0.0001	0.0002	0.0005
19	0.0003	0.0009	0.0024	0.0003	0.0003	0.0005	0.0007	0.0010
20	0.0005	0.0008	0.0009	0.0006	0.0006	0.0009	0.0011	0.0010
21	0.0004	0.0002	0.0002	0.0000	0.0001	0.0001	0.0001	0.0001
22	0.0230	0.0067	0.0089	0.0021	0.0081	0.0028	0.0034	0.0032
23	0.0143	0.0356	0.0253	0.0027	0.0089	0.0038	0.0046	0.0057
24	0.0071	0.0150	0.0178	0.0073	0.0076	0.0102	0.0137	0.0115
25	0.0095	0.0099	0.0057	0.0015	0.0014	0.0057	0.0158	0.0071
26	0.0008	0.0041	0.0031	0.0008	0.0008	0.0011	0.0084	0.0045
27	0.0322	0.0453	0.0527	0.0251	0.0265	0.0556	0.0581	0.0722
28	0.0004	0.0815	0.0034	0.0005	0.0005	0.0007	0.0009	0.0007
29	0.0006	0.0013	0.0009	0.0004	0.0007	0.0154	0.0016	0.0042
30	0.0005	0.0063	0.0006	0.0002	0.0002	0.0005	0.0005	0.0022
31	0.0001	0.0004	0.0001	0.0000	0.0001	0.0001	0.0001	0.0002
32	0.0009	0.0135	0.0009	0.0002	0.0002	0.0008	0.0004	0.0011
33	0.0003	0.0008	0.0005	0.0002	0.0004	0.0005	0.0009	0.0066
34	0.0081	0.1347	0.0075	0.0015	0.0015	0.0065	0.0027	0.0064
35	0.0000	0.0001	0.0001	0.0000	0.0000	0.0001	0.0018	0.0015
36	0.0006	0.0039	0.0008	0.0004	0.0005	0.0007	0.0008	0.0056
37	0.0035	0.0004	0.0022	0.0002	0.0002	0.0002	0.0003	0.0004
38	0.0003	0.0005	0.0005	0.0004	0.0004	0.0004	0.0005	0.0022
39	0.0002	0.0002	0.0002	0.0001	0.0001	0.0001	0.0002	0.0006
40	0.0003	0.0005	0.0022	0.0003	0.0003	0.0004	0.0005	0.0020
41	0.0008	0.0012	0.0014	0.0009	0.0009	0.0013	0.0015	0.0019
42	0.0015	0.0041	0.0039	0.0013	0.0014	0.0019	0.0021	0.0038
43	0.0389	0.0476	0.0622	0.0175	0.0238	0.0346	0.0375	0.1472
44	0.0264	0.0479	0.0386	0.0471	0.0293	0.0423	0.0395	0.0355
45	0.0091	0.0492	0.0396	0.0785	0.0187	0.0207	0.0162	0.0143
46	0.0044	0.0076	0.0074	0.0035	0.0035	0.0048	0.0058	0.0058
47	0.0205	0.0293	0.0321	0.0397	0.0308	0.0324	0.0351	0.0316
48	0.0059	0.0136	0.0113	0.0050	0.0105	0.0114	0.0254	0.0623
49	0.1633	0.1994	0.2179	0.1342	0.1372	0.1786	0.2110	0.1922
50	0.0290	0.0460	0.0474	0.0291	0.0354	0.0465	0.0521	0.0488
51	0.1283	0.1989	0.1870	0.1295	0.1498	0.1882	0.2045	0.2006
52	0.6741	1.1227	1.1989	0.8703	0.8789	1.2711	1.5423	1.2685

Total Requirements Table

	17	18	19	20	21	22	23	24
1	0.0055	0.0056	0.0043	0.0049	0.0041	0.0054	0.0057	0.0053
2	0.0026	0.0024	0.0020	0.0022	0.0020	0.0022	0.0024	0.0024
3	0.0110	0.0102	0.0084	0.0096	0.0082	0.0094	0.0102	0.0102
4	0.0029	0.0027	0.0018	0.0019	0.0017	0.0021	0.0022	0.0020
5	0.0004	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003
6	0.0115	0.0107	0.0087	0.0099	0.0086	0.0098	0.0106	0.0106
7	0.0098	0.0091	0.0075	0.0085	0.0074	0.0084	0.0091	0.0091
8	0.0032	0.0029	0.0024	0.0027	0.0024	0.0027	0.0029	0.0029
9	0.0027	0.0060	0.0022	0.0024	0.0021	0.0071	0.0064	0.0029
20	0.0072	0.0067	0.0054	0.0062	0.0054	0.0061	0.0067	0.0066
11	0.0099	0.0093	0.0075	0.0086	0.0075	0.0085	0.0092	0.0092
12	0.0005	0.0004	0.0023	0.0063	0.0002	0.0002	0.0002	0.0001
13	0.0041	0.0018	0.0014	0.0012	0.0014	0.0019	0.0018	0.0013
14	0.0016	0.0016	0.0013	0.0011	0.0022	0.0031	0.0021	0.0012
15	0.2105	0.1843	0.0414	0.0059	0.0347	0.0658	0.0621	0.0062
16	0.5578	0.4242	0.1185	0.0152	0.1042	0.1967	0.1975	0.0178
17	1.1042	0.0413	0.1237	0.0197	0.0975	0.2246	0.1497	0.0199
18	0.0015	1.0858	0.0388	0.0071	0.0156	0.0007	0.0005	0.0002
19	0.0008	0.0009	1.0423	0.0069	0.0005	0.0014	0.0007	0.0005
20	0.0010	0.0009	0.0007	1.0070	0.0007	0.0008	0.0009	0.0009
21	0.0021	0.0002	0.0003	0.0003	1.0005	0.0158	0.0044	0.0014
22	0.0034	0.0039	0.0038	0.0160	0.0070	1.0070	0.1210	0.0853
23	0.0050	0.0051	0.0133	0.0110	0.0172	0.0100	1.1775	0.0070
24	0.0122	0.0154	0.0098	0.0105	0.0097	0.0106	0.0117	0.0204
25	0.0059	0.0083	0.0044	0.0020	0.0609	0.0369	0.0301	0.0055
26	0.0063	0.0396	0.0052	0.0083	0.0022	0.0033	0.0035	0.0025
27	0.0677	0.0682	0.0400	0.0430	0.1525	0.0799	0.0834	0.0425
28	0.0008	0.0007	0.0006	0.0006	0.0006	0.0007	0.0007	0.0007
29	0.0025	0.0023	0.0060	0.0010	0.0014	0.0026	0.0018	0.0009
30	0.0014	0.0016	0.0032	0.0007	0.0007	0.0008	0.0007	0.0004
31	0.0002	0.0003	0.0002	0.0001	0.0002	0.0002	0.0001	0.0001
32	0.0009	0.0012	0.0013	0.0012	0.0007	0.0007	0.0006	0.0007
33	0.0053	0.0138	0.0103	0.0008	0.0015	0.0028	0.0019	0.0006
34	0.0053	0.0041	0.0067	0.0084	0.0055	0.0041	0.0033	0.0058
35	0.0008	0.0007	0.0002	0.0001	0.0002	0.0003	0.0003	0.0001
36	0.0040	0.0063	0.0036	0.0073	0.0041	0.0026	0.0018	0.0009
37	0.0004	0.0040	0.0004	0.0003	0.0004	0.0004	0.0004	0.0003
38	0.0023	0.0047	0.0030	0.0006	0.0008	0.0010	0.0009	0.0005
39	0.0005	0.0006	0.0004	0.0001	0.0006	0.0005	0.0005	0.0002
40	0.0012	0.0010	0.0005	0.0004	0.0005	0.0007	0.0007	0.0005
41	0.0018	0.0016	0.0012	0.0012	0.0012	0.0014	0.0016	0.0013
42	0.0060	0.0029	0.0044	0.0272	0.0023	0.0069	0.0032	0.0026
43	0.1106	0.0983	0.0551	0.0397	0.0655	0.0820	0.0899	0.0422
44	0.0511	0.0524	0.0354	0.0391	0.0844	0.0854	0.0771	0.0407
45	0.0169	0.0464	0.0167	0.0673	0.1879	0.0386	0.0520	0.0197
46	0.0067	0.0093	0.0067	0.0047	0.0259	0.0088	0.0082	0.0052
47	0.0341	0.0340	0.0331	0.0337	0.0275	0.0293	0.0324	0.0408
48	0.0368	0.0345	0.0185	0.0139	0.0206	0.0249	0.0247	0.0110
49	0.2256	0.2290	0.2017	0.1977	0.1981	0.2126	0.2411	0.2000
50	0.0565	0.0527	0.0479	0.0465	0.0421	0.0470	0.0512	0.0479
51	0.2042	0.1847	0.1602	0.2129	0.1455	0.1741	0.1946	0.2421
52	1.3303	1.2374	1.0105	1.1468	0.9961	1.1334	1.2313	1.2312

Total Requirements Table

	25	26	27	28	29	30	31	32
1	0.0053	0.0035	0.0009	0.0059	0.0050	0.0047	0.0027	0.0034
2	0.0025	0.0016	0.0004	0.0024	0.0023	0.0022	0.0013	0.0016
3	0.0105	0.0067	0.0019	0.0099	0.0098	0.0094	0.0054	0.0068
4	0.0020	0.0013	0.0004	0.0019	0.0019	0.0019	0.0010	0.0013
5	0.0003	0.0002	0.0001	0.0003	0.0003	0.0003	0.0002	0.0002
6	0.0109	0.0070	0.0020	0.0103	0.0103	0.0099	0.0056	0.0071
7	0.0094	0.0060	0.0017	0.0089	0.0088	0.0085	0.0048	0.0061
8	0.0030	0.0019	0.0005	0.0029	0.0028	0.0027	0.0015	0.0020
9	0.0026	0.0017	0.0005	0.0026	0.0024	0.0023	0.0013	0.0017
10	0.0068	0.0044	0.0012	0.0152	0.0064	0.0062	0.0035	0.0045
11	0.0107	0.0060	0.0017	0.0094	0.0089	0.0086	0.0049	0.0062
12	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001
13	0.0025	0.0009	0.0002	0.0012	0.0012	0.0012	0.0008	0.0015
14	0.0028	0.0009	0.0007	0.0475	0.0577	0.0058	0.0061	0.0050
15	0.0012	0.0019	0.0002	0.0035	0.0012	0.0012	0.0012	0.0006
16	0.0029	0.0051	0.0005	0.0102	0.0026	0.0027	0.0030	0.0012
17	0.0027	0.0048	0.0003	0.0082	0.0027	0.0027	0.0051	0.0012
18	0.0002	0.0004	0.0003	0.0002	0.0002	0.0002	0.0001	0.0001
19	0.0005	0.0062	0.0001	0.0006	0.0005	0.0005	0.0004	0.0010
20	0.0009	0.0006	0.0002	0.0009	0.0009	0.0008	0.0005	0.0006
21	0.0025	0.0002	0.0000	0.0003	0.0001	0.0001	0.0001	0.0001
22	0.0049	0.0095	0.0006	0.0082	0.0060	0.0066	0.0015	0.0021
23	0.0097	0.0159	0.0015	0.0554	0.0070	0.0076	0.0023	0.0036
24	0.0119	0.0134	0.0019	0.0109	0.0104	0.0100	0.0055	0.0072
25	1.0404	0.0131	0.0016	0.0030	0.0018	0.0118	0.0056	0.0062
26	0.0037	1.0345	0.0002	0.0102	0.0039	0.0045	0.0055	0.0060
27	0.0454	0.0556	1.0214	0.0511	0.1529	0.0393	0.0362	0.0396
28	0.0019	0.0005	0.0001	1.0101	0.0007	0.0007	0.0004	0.0005
29	0.0010	0.0011	0.0006	0.0018	1.1398	0.0013	0.0007	0.0007
30	0.0006	0.0006	0.0001	0.0093	0.0006	1.0142	0.0004	0.0016
31	0.0001	0.0001	0.0002	0.0001	0.0001	0.0002	1.0004	0.0020
32	0.0010	0.0009	0.0002	0.0005	0.0007	0.0012	0.1997	1.2821
33	0.0006	0.0007	0.0003	0.0007	0.0007	0.0042	0.0004	0.0010
34	0.0083	0.0072	0.0008	0.0037	0.0052	0.0089	0.0014	0.0024
35	0.0001	0.0001	0.0002	0.0001	0.0001	0.0001	0.0002	0.0008
36	0.0008	0.0006	0.0004	0.0009	0.0036	0.0111	0.0007	0.0026
37	0.0015	0.0002	0.0005	0.0003	0.0003	0.0003	0.0004	0.0015
38	0.0017	0.0004	0.0001	0.0005	0.0005	0.0004	0.0005	0.0017
39	0.0063	0.0002	0.0000	0.0002	0.0002	0.0003	0.0002	0.0002
40	0.0004	0.0003	0.0001	0.0004	0.0004	0.0004	0.0002	0.0003
41	0.0013	0.0009	0.0002	0.0014	0.0014	0.0012	0.0008	0.0010
42	0.0032	0.0074	0.0014	0.0020	0.0021	0.0019	0.0014	0.0039
43	0.0386	0.0363	0.0081	0.0653	0.0693	0.0450	0.0426	0.0438
44	0.0596	0.0299	0.0090	0.1431	0.0627	0.1045	0.0993	0.2390
45	0.0667	0.0495	0.0157	0.2428	0.0195	0.0474	0.0516	0.0323
46	0.0102	0.0094	0.0011	0.0049	0.0077	0.0045	0.0026	0.0033
47	0.0310	0.0311	0.0055	0.0289	0.0334	0.0264	0.0152	0.0201
48	0.0146	0.0168	0.0015	0.0176	0.0185	0.0204	0.0086	0.0080
49	0.2025	0.1376	0.0365	0.1976	0.1891	0.1981	0.0924	0.1258
50	0.0449	0.0405	0.0080	0.0510	0.0468	0.0424	0.0270	0.0331
51	0.1839	0.1653	0.0289	0.1843	0.1996	0.1671	0.0964	0.1159
52	1.2669	0.8058	0.2298	1.1991	1.1934	1.1472	0.6509	0.8286

Total Requirements Table

	33	34	35	36	37	38	39	40
1	0.0037	0.0040	0.0037	0.0050	0.0045	0.0046	0.0024	0.0033
2	0.0017	0.0019	0.0017	0.0023	0.0021	0.0022	0.0011	0.0016
3	0.0073	0.0079	0.0073	0.0099	0.0089	0.0092	0.0047	0.0065
4	0.0014	0.0015	0.0014	0.0019	0.0017	0.0018	0.0009	0.0013
5	0.0002	0.0003	0.0002	0.0003	0.0003	0.0003	0.0002	0.0002
6	0.0076	0.0083	0.0076	0.0103	0.0093	0.0096	0.0049	0.0068
7	0.0066	0.0071	0.0065	0.0088	0.0080	0.0083	0.0042	0.0059
8	0.0021	0.0023	0.0021	0.0028	0.0026	0.0027	0.0013	0.0019
9	0.0018	0.0020	0.0018	0.0024	0.0022	0.0022	0.0011	0.0016
10	0.0048	0.0052	0.0047	0.0064	0.0058	0.0060	0.0030	0.0043
11	0.0066	0.0072	0.0066	0.0089	0.0081	0.0083	0.0042	0.0059
12	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
13	0.0009	0.0010	0.0009	0.0012	0.0011	0.0011	0.0006	0.0008
14	0.0012	0.0015	0.0008	0.0011	0.0010	0.0009	0.0006	0.0007
15	0.0007	0.0012	0.0007	0.0007	0.0007	0.0009	0.0005	0.0007
16	0.0015	0.0029	0.0014	0.0012	0.0012	0.0018	0.0011	0.0016
17	0.0014	0.0026	0.0014	0.0012	0.0012	0.0018	0.0011	0.0015
18	0.0001	0.0002	0.0002	0.0001	0.0001	0.0002	0.0002	0.0002
19	0.0004	0.0025	0.0031	0.0004	0.0004	0.0016	0.0003	0.0024
20	0.0007	0.0007	0.0007	0.0009	0.0008	0.0019	0.0005	0.0046
21	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0000	0.0001
22	0.0025	0.0034	0.0025	0.0027	0.0026	0.0039	0.0015	0.0023
23	0.0051	0.0124	0.0030	0.0036	0.0033	0.0049	0.0033	0.0049
24	0.0076	0.0084	0.0103	0.0098	0.0092	0.0095	0.0047	0.0087
25	0.0017	0.0081	0.0065	0.0013	0.0013	0.0014	0.0007	0.0030
26	0.0030	0.0058	0.0037	0.0012	0.0011	0.0037	0.0011	0.0029
27	0.0293	0.0369	0.0294	0.0397	0.0335	0.0340	0.0179	0.0251
28	0.0005	0.0006	0.0005	0.0007	0.0006	0.0006	0.0003	0.0004
29	0.0008	0.0029	0.0006	0.0006	0.0007	0.0007	0.0004	0.0005
30	0.0457	0.0399	0.0144	0.0114	0.0143	0.0014	0.0004	0.0026
31	0.0091	0.0022	0.0004	0.0054	0.0102	0.0013	0.0004	0.0001
32	0.0484	0.1005	0.0058	0.0022	0.0073	0.0049	0.0008	0.0037
33	1.0326	0.0026	0.0006	0.0058	0.0040	0.0005	0.0011	0.0024
34	0.0109	1.0119	0.0228	0.0074	0.0073	0.0304	0.0028	0.0096
35	0.0001	0.0001	1.0358	0.0000	0.0000	0.0000	0.0000	0.0000
36	0.0068	0.0133	0.0225	1.0431	0.0217	0.0069	0.0039	0.0027
37	0.0020	0.0003	0.0157	0.0002	1.0102	0.0025	0.0009	0.0002
38	0.0004	0.0005	0.0109	0.0004	0.0072	1.0207	0.0023	0.0023
39	0.0183	0.0002	0.0002	0.0002	0.0002	0.0047	1.0230	0.0083
40	0.0021	0.0003	0.0029	0.0004	0.0020	0.0004	0.0002	1.0023
41	0.0009	0.0010	0.0009	0.0012	0.0011	0.0011	0.0006	0.0008
42	0.0016	0.0177	0.0046	0.0072	0.0036	0.0125	0.0024	0.0055
43	0.0295	0.0315	0.0269	0.0294	0.0276	0.0299	0.0162	0.0204
44	0.0388	0.0500	0.0280	0.0374	0.0320	0.0318	0.0170	0.0257
45	0.0183	0.0177	0.0191	0.0128	0.0121	0.0138	0.0079	0.0121
46	0.0034	0.0059	0.0035	0.0045	0.0060	0.0044	0.0028	0.0052
47	0.0238	0.0283	0.0257	0.0320	0.0296	0.0299	0.0150	0.0219
48	0.0111	0.0085	0.0080	0.0067	0.0096	0.0086	0.0036	0.0065
49	0.1424	0.1525	0.1545	0.1776	0.1763	0.1809	0.0764	0.1285
50	0.0359	0.0375	0.0329	0.0454	0.0383	0.0423	0.0201	0.0286
51	0.1324	0.1649	0.1387	0.1816	0.1716	0.1670	0.0939	0.1126
52	0.8892	0.9643	0.8853	1.1993	1.0846	1.1203	0.5669	0.7952

Total Requirements Table

	41	42	43	44	45	46	47	48
1	0.0048	0.0048	0.0046	0.0058	0.0019	0.0063	0.0058	0.0047
2	0.0023	0.0022	0.0023	0.0028	0.0009	0.0030	0.0027	0.0022
3	0.0096	0.0098	0.0090	0.0117	0.0038	0.0127	0.0115	0.0092
4	0.0019	0.0018	0.0017	0.0023	0.0007	0.0025	0.0022	0.0049
5	0.0003	0.0003	0.0003	0.0004	0.0001	0.0004	0.0004	0.0003
6	0.0101	0.0108	0.0096	0.0122	0.0039	0.0133	0.0121	0.0096
7	0.0086	0.0085	0.0080	0.0105	0.0034	0.0114	0.0103	0.0082
8	0.0028	0.0027	0.0027	0.0034	0.0011	0.0037	0.0033	0.0027
9	0.0023	0.0024	0.0024	0.0028	0.0009	0.0031	0.0028	0.0023
10	0.0063	0.0061	0.0066	0.0076	0.0025	0.0083	0.0075	0.0060
11	0.0087	0.0095	0.0085	0.0106	0.0034	0.0115	0.0104	0.0083
12	0.0001	0.0010	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001
13	0.0017	0.0021	0.0014	0.0014	0.0005	0.0015	0.0014	0.0012
14	0.0010	0.0010	0.0012	0.0259	0.0004	0.0019	0.0011	0.0096
15	0.0013	0.0018	0.0007	0.0010	0.0004	0.0009	0.0011	0.0052
16	0.0027	0.0041	0.0014	0.0019	0.0008	0.0016	0.0022	0.0129
17	0.0030	0.0057	0.0015	0.0019	0.0007	0.0017	0.0023	0.0181
18	0.0015	0.0011	0.0002	0.0002	0.0000	0.0002	0.0002	0.0071
19	0.0043	0.0015	0.0006	0.0005	0.0002	0.0006	0.0005	0.0100
20	0.0035	0.0008	0.0008	0.0010	0.0003	0.0011	0.0010	0.0014
21	0.0001	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001
22	0.0026	0.0038	0.0029	0.0037	0.0013	0.0035	0.0065	0.0031
23	0.0035	0.0048	0.0037	0.0058	0.0031	0.0045	0.0047	0.0050
24	0.0098	0.0102	0.0118	0.0124	0.0051	0.0152	0.0144	0.0101
25	0.0017	0.0024	0.0015	0.0020	0.0005	0.0014	0.0015	0.0019
26	0.0022	0.0242	0.0011	0.0017	0.0004	0.0013	0.0018	0.0028
27	0.0358	0.0352	0.1605	0.0406	0.0144	0.0499	0.0415	0.0614
28	0.0007	0.0006	0.0007	0.0008	0.0003	0.0009	0.0008	0.0006
29	0.0015	0.0016	0.0014	0.0014	0.0003	0.0012	0.0009	0.0496
30	0.0027	0.0004	0.0010	0.0004	0.0001	0.0004	0.0003	0.0141
31	0.0012	0.0010	0.0003	0.0006	0.0000	0.0001	0.0001	0.0016
32	0.0015	0.0122	0.0006	0.0012	0.0001	0.0004	0.0004	0.0025
33	0.0033	0.0004	0.0004	0.0006	0.0001	0.0006	0.0005	0.0307
34	0.0037	0.0048	0.0040	0.0034	0.0007	0.0025	0.0025	0.0051
35	0.0011	0.0001	0.0005	0.0006	0.0000	0.0001	0.0000	0.0004
36	0.0018	0.0034	0.0024	0.0012	0.0002	0.0007	0.0007	0.0015
37	0.0013	0.0011	0.0010	0.0007	0.0001	0.0003	0.0003	0.0005
38	0.0020	0.0022	0.0012	0.0010	0.0002	0.0005	0.0069	0.0028
39	0.0029	0.0001	0.0031	0.0001	0.0000	0.0001	0.0001	0.0007
40	0.0009	0.0004	0.0011	0.0005	0.0001	0.0005	0.0005	0.0006
41	1.0028	0.0012	0.0069	0.0014	0.0005	0.0015	0.0014	0.0012
42	0.0028	1.0197	0.0020	0.0024	0.0006	0.0020	0.0042	0.0068
43	0.0264	0.0357	1.0909	0.0304	0.0104	0.0330	0.0306	0.0394
44	0.0355	0.0337	0.0326	1.2887	0.0148	0.0743	0.0402	0.0341
45	0.0128	0.0142	0.0145	0.0158	1.7458	0.0151	0.0152	0.0145
46	0.0055	0.0054	0.0045	0.0058	0.0017	1.0885	0.0064	0.0049
47	0.0266	0.0307	0.0304	0.0356	0.0145	0.0401	1.0379	0.0294
48	0.0127	0.0075	0.0099	0.0153	0.0040	0.0181	0.0128	1.0089
49	0.1717	0.1723	0.1516	0.1888	0.0609	0.2036	0.1882	0.1946
50	0.0389	0.0398	0.0412	0.0513	0.0165	0.0538	0.0530	0.0453
51	0.1526	0.1472	0.1650	0.1859	0.0590	0.2054	0.2221	0.1857
52	1.1732	1.1468	1.0504	1.4204	0.4588	1.5492	1.4014	1.1168

Total Requirements Table

	49	50	51	52
1	0.0060	0.0063	0.0081	0.0066
2	0.0028	0.0029	0.0029	0.0032
3	0.0117	0.0123	0.0120	0.0133
4	0.0023	0.0024	0.0023	0.0026
5	0.0004	0.0004	0.0004	0.0004
6	0.0122	0.0128	0.0121	0.0139
7	0.0105	0.0110	0.0106	0.0119
8	0.0034	0.0036	0.0037	0.0038
9	0.0029	0.0030	0.0030	0.0032
10	0.0076	0.0080	0.0080	0.0086
11	0.0106	0.0111	0.0105	0.0120
12	0.0001	0.0002	0.0002	0.0001
13	0.0016	0.0015	0.0015	0.0016
14	0.0014	0.0016	0.0014	0.0011
15	0.0015	0.0012	0.0010	0.0009
16	0.0032	0.0027	0.0021	0.0015
17	0.0033	0.0027	0.0023	0.0014
18	0.0002	0.0003	0.0003	0.0001
19	0.0006	0.0007	0.0005	0.0005
20	0.0012	0.0011	0.0010	0.0012
21	0.0002	0.0001	0.0001	0.0001
22	0.0103	0.0061	0.0054	0.0032
23	0.0066	0.0074	0.0045	0.0045
24	0.0293	0.0353	0.0217	0.0120
25	0.0020	0.0020	0.0026	0.0014
26	0.0021	0.0017	0.0019	0.0012
27	0.0481	0.0470	0.0594	0.0438
28	0.0009	0.0008	0.0009	0.0009
29	0.0010	0.0016	0.0011	0.0007
30	0.0004	0.0005	0.0004	0.0003
31	0.0001	0.0001	0.0001	0.0001
32	0.0004	0.0004	0.0005	0.0004
33	0.0006	0.0009	0.0005	0.0003
34	0.0028	0.0026	0.0031	0.0025
35	0.0001	0.0001	0.0001	0.0000
36	0.0011	0.0008	0.0023	0.0007
37	0.0003	0.0003	0.0008	0.0002
38	0.0006	0.0007	0.0009	0.0004
39	0.0002	0.0001	0.0001	0.0001
40	0.0006	0.0005	0.0010	0.0005
41	0.0015	0.0015	0.0014	0.0016
42	0.0037	0.0043	0.0077	0.0019
43	0.0429	0.0361	0.0380	0.0300
44	0.0544	0.0553	0.0502	0.0379
45	0.0189	0.0209	0.0282	0.0153
46	0.0077	0.0082	0.0075	0.0059
47	0.0461	0.0672	0.0513	0.0341
48	0.0130	0.0256	0.0130	0.0080
49	1.2019	0.2007	0.2079	0.2080
50	0.0622	1.1300	0.0672	0.0518
51	0.2503	0.2776	1.2642	0.1935
52	1.4218	1.4924	1.3822	1.6221

Appendix Table IV

Total Requirements Table
(Direct, Indirect, Induced)
[C = f(YP), EARN = f(X)]

This total requirements table is an alternative inverse to that shown in Appendix Table III. In this table the induced consumption is driven by earnings rather than value added, and the consumption coefficients are based on personal income. The output multipliers (b_{ij}'s) are generally smaller than those of the value added model.

Total Requirements Table

	1	2	3	4	5	6	7	8
1	1.0511	0.0072	0.4022	0.0041	0.0081	0.1297	0.2494	0.0051
2	0.0011	1.0147	0.0050	0.0019	0.0020	0.0019	0.0042	0.1953
3	0.0148	0.0101	1.1318	0.0082	0.0121	0.3473	0.7008	0.0093
4	0.0009	0.0011	0.0010	1.0319	0.0016	0.0006	0.0011	0.0016
5	0.0002	0.0002	0.0002	0.0003	1.0110	0.0001	0.0003	0.0499
6	0.0048	0.0059	0.0060	0.0086	0.0195	1.0203	0.0060	0.0087
7	0.0041	0.0050	0.0047	0.0073	0.0073	0.0041	1.2237	0.0084
8	0.0013	0.0016	0.0015	0.0024	0.0023	0.0009	0.0048	1.0193
9	0.0020	0.0018	0.0998	0.0020	0.0131	0.0320	0.0625	0.0046
10	0.0039	0.0037	0.0037	0.0053	0.0161	0.0022	0.0038	0.0038
11	0.0043	0.0051	0.0063	0.0074	0.0079	0.0044	0.0091	0.0109
12	0.0001	0.0001	0.0001	0.0001	0.0109	0.0010	0.0001	0.0006
13	0.0006	0.0007	0.0007	0.0010	0.0010	0.0014	0.0007	0.0006
14	0.0018	0.0025	0.0018	0.0009	0.0009	0.0013	0.0017	0.0017
15	0.0004	0.0009	0.0008	0.0006	0.0007	0.0027	0.0026	0.0022
16	0.0008	0.0022	0.0019	0.0010	0.0014	0.0083	0.0078	0.0065
17	0.0008	0.0021	0.0018	0.0010	0.0014	0.0065	0.0062	0.0052
18	0.0001	0.0004	0.0001	0.0001	0.0002	0.0001	0.0001	0.0002
19	0.0003	0.0073	0.0003	0.0004	0.0006	0.0012	0.0003	0.0023
20	0.0004	0.0005	0.0005	0.0007	0.0009	0.0003	0.0005	0.0004
21	0.0002	0.0001	0.0002	0.0001	0.0001	0.0002	0.0003	0.0002
22	0.0016	0.0021	0.0042	0.0023	0.0027	0.0065	0.0073	0.0057
23	0.0022	0.0055	0.0064	0.0031	0.0041	0.0466	0.0419	0.0339
24	0.0054	0.0060	0.0063	0.0083	0.0087	0.0052	0.0073	0.0118
25	0.0572	0.0219	0.0340	0.0089	0.0016	0.0130	0.0239	0.0071
26	0.0007	0.0007	0.0033	0.0087	0.0013	0.0023	0.0025	0.0009
27	0.0512	0.0522	0.0536	0.0519	0.1187	0.0329	0.0520	0.0346
28	0.0005	0.0004	0.0004	0.0006	0.0014	0.0012	0.0036	0.0133
29	0.0007	0.0008	0.0006	0.0005	0.0006	0.0015	0.0007	0.0006
30	0.0003	0.0003	0.0003	0.0002	0.0008	0.0002	0.0003	0.0009
31	0.0001	0.0001	0.0001	0.0001	0.0109	0.0001	0.0001	0.0006
32	0.0003	0.0004	0.0005	0.0002	0.0039	0.0003	0.0004	0.0017
33	0.0004	0.0005	0.0003	0.0002	0.0005	0.0003	0.0004	0.0003
34	0.0024	0.0027	0.0037	0.0017	0.0145	0.0026	0.0029	0.0150
35	0.0000	0.0000	0.0001	0.0000	0.0001	0.0000	0.0001	0.0001
36	0.0003	0.0004	0.0004	0.0005	0.0009	0.0013	0.0005	0.0013
37	0.0002	0.0002	0.0005	0.0002	0.0004	0.0012	0.0004	0.0002
38	0.0003	0.0003	0.0003	0.0004	0.0114	0.0012	0.0004	0.0008
39	0.0004	0.0002	0.0003	0.0001	0.0003	0.0002	0.0003	0.0002
40	0.0002	0.0002	0.0002	0.0003	0.0004	0.0002	0.0003	0.0003
41	0.0006	0.0007	0.0007	0.0010	0.0549	0.0005	0.0008	0.0034
42	0.0011	0.0025	0.0024	0.0014	0.0129	0.0022	0.0054	0.0023
43	0.0213	0.0231	0.0380	0.0276	0.0442	0.0248	0.0403	0.0459
44	0.0293	0.0436	0.0437	0.0344	0.0274	0.0409	0.0446	0.0312
45	0.0093	0.0086	0.0113	0.0108	0.0131	0.0094	0.0289	0.0271
46	0.0134	0.0130	0.0149	0.0120	0.0040	0.0066	0.0122	0.0060
47	0.0163	0.0224	0.0216	0.0297	0.0230	0.0130	0.0239	0.0190
48	0.0112	0.0111	0.0085	0.0057	0.0062	0.0058	0.0094	0.0067
49	0.1126	0.1193	0.1394	0.1524	0.1646	0.0983	0.1650	0.1647
50	0.0282	0.0289	0.0296	0.0410	0.0448	0.0188	0.0336	0.0252
51	0.0896	0.0945	0.0997	0.1317	0.1488	0.0708	0.1345	0.1167
52	0.4919	0.6016	0.5496	0.8792	0.8632	0.3426	0.5642	0.4995

Total Requirements Table

	9	10	11	12	13	14	15	16
1	0.1435	0.0995	0.0264	0.0104	0.0050	0.0045	0.0006	0.0028
2	0.0007	0.0059	0.0120	0.0012	0.0013	0.0021	0.0003	0.0013
3	0.0066	0.0067	0.0375	0.0274	0.0115	0.0089	0.0011	0.0055
4	0.0006	0.0009	0.0027	0.0009	0.0011	0.0017	0.0038	0.0024
5	0.0001	0.0002	0.0007	0.0002	0.0002	0.0003	0.0000	0.0002
6	0.0097	0.0043	0.0071	0.0050	0.0058	0.0093	0.0012	0.0057
7	0.0028	0.0063	0.0567	0.0043	0.0050	0.0080	0.0010	0.0049
8	0.0009	0.0017	0.0120	0.0014	0.0016	0.0026	0.0003	0.0016
9	0.0014	0.0048	0.0731	0.0031	0.0019	0.0022	0.0003	0.0013
10	0.0021	1.0126	0.0118	0.0031	0.0036	0.0058	0.0007	0.0036
11	0.0060	0.0562	1.0361	0.0044	0.0050	0.0081	0.0010	0.0050
12	0.0001	0.0001	0.0018	1.0001	0.0001	0.0001	0.0000	0.0008
13	0.0004	0.0005	0.0006	0.0006	1.0060	0.0011	0.0002	0.0022
14	0.0040	0.0047	0.0046	0.0009	0.0007	1.0189	0.0003	0.0011
15	0.0022	0.0021	0.0018	0.0004	0.0011	0.0015	1.0322	0.3511
16	0.0064	0.0063	0.0053	0.0007	0.0029	0.0035	0.0048	1.2859
17	0.0065	0.0050	0.0046	0.0007	0.0028	0.0059	0.0005	0.0020
18	0.0001	0.0001	0.0002	0.0001	0.0001	0.0001	0.0001	0.0005
19	0.0002	0.0007	0.0022	0.0002	0.0003	0.0004	0.0003	0.0008
20	0.0003	0.0004	0.0004	0.0004	0.0005	0.0008	0.0001	0.0005
21	0.0004	0.0002	0.0002	0.0000	0.0001	0.0001	0.0000	0.0001
22	0.0224	0.0054	0.0076	0.0015	0.0077	0.0024	0.0007	0.0020
23	0.0134	0.0338	0.0235	0.0019	0.0083	0.0033	0.0007	0.0040
24	0.0047	0.0103	0.0131	0.0052	0.0061	0.0088	0.0033	0.0070
25	0.0092	0.0093	0.0052	0.0012	0.0012	0.0055	0.0145	0.0065
26	0.0005	0.0036	0.0026	0.0006	0.0006	0.0010	0.0073	0.0040
27	0.0235	0.0281	0.0353	0.0174	0.0209	0.0506	0.0200	0.0556
28	0.0002	0.0811	0.0030	0.0003	0.0004	0.0006	0.0001	0.0004
29	0.0004	0.0010	0.0006	0.0003	0.0006	0.0154	0.0010	0.0040
30	0.0004	0.0062	0.0005	0.0001	0.0002	0.0004	0.0003	0.0021
31	0.0001	0.0003	0.0001	0.0000	0.0000	0.0001	0.0000	0.0002
32	0.0008	0.0133	0.0008	0.0002	0.0002	0.0007	0.0001	0.0010
33	0.0002	0.0007	0.0004	0.0001	0.0003	0.0004	0.0006	0.0065
34	0.0076	0.1337	0.0065	0.0010	0.0012	0.0062	0.0005	0.0055
35	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0018	0.0015
36	0.0005	0.0036	0.0006	0.0003	0.0004	0.0006	0.0002	0.0054
37	0.0034	0.0003	0.0021	0.0001	0.0001	0.0002	0.0001	0.0003
38	0.0002	0.0003	0.0003	0.0003	0.0003	0.0004	0.0002	0.0020
39	0.0002	0.0002	0.0002	0.0000	0.0001	0.0001	0.0001	0.0006
40	0.0002	0.0003	0.0020	0.0002	0.0002	0.0004	0.0001	0.0018
41	0.0005	0.0006	0.0008	0.0006	0.0007	0.0011	0.0002	0.0013
42	0.0011	0.0034	0.0032	0.0010	0.0012	0.0017	0.0005	0.0031
43	0.0329	0.0358	0.0503	0.0122	0.0200	0.0312	0.0114	0.1359
44	0.0188	0.0330	0.0236	0.0405	0.0245	0.0380	0.0066	0.0212
45	0.0060	0.0433	0.0335	0.0758	0.0168	0.0189	0.0029	0.0086
46	0.0033	0.0053	0.0050	0.0025	0.0027	0.0042	0.0007	0.0035
47	0.0137	0.0159	0.0186	0.0337	0.0265	0.0285	0.0055	0.0187
48	0.0043	0.0104	0.0081	0.0036	0.0095	0.0105	0.0185	0.0592
49	0.1217	0.1178	0.1355	0.0977	0.1107	0.1548	0.0303	0.1135
50	0.0186	0.0257	0.0269	0.0200	0.0288	0.0406	0.0071	0.0292
51	0.0896	0.1230	0.1103	0.0956	0.1252	0.1661	0.0365	0.1275
52	0.3082	0.4286	0.4899	0.5161	0.5927	0.9566	0.1175	0.5771

Total Requirements Table

	17	18	19	20	21	22	23	24
1	0.0036	0.0037	0.0035	0.0028	0.0024	0.0033	0.0034	0.0032
2	0.0017	0.0015	0.0016	0.0013	0.0011	0.0012	0.0013	0.0014
3	0.0070	0.0063	0.0068	0.0054	0.0047	0.0052	0.0056	0.0060
4	0.0022	0.0019	0.0015	0.0011	0.0011	0.0013	0.0013	0.0012
5	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
6	0.0073	0.0066	0.0071	0.0055	0.0049	0.0054	0.0059	0.0063
7	0.0063	0.0057	0.0061	0.0047	0.0042	0.0046	0.0050	0.0054
8	0.0020	0.0018	0.0020	0.0015	0.0014	0.0015	0.0016	0.0017
9	0.0017	0.0051	0.0018	0.0014	0.0013	0.0061	0.0053	0.0019
10	0.0046	0.0042	0.0044	0.0035	0.0031	0.0034	0.0037	0.0039
11	0.0064	0.0058	0.0061	0.0048	0.0043	0.0047	0.0051	0.0054
12	0.0004	0.0003	0.0022	0.0062	0.0001	0.0002	0.0002	0.0001
13	0.0036	0.0014	0.0012	0.0007	0.0010	0.0013	0.0013	0.0008
14	0.0013	0.0013	0.0012	0.0008	0.0019	0.0027	0.0018	0.0009
15	0.2102	0.1840	0.0413	0.0056	0.0345	0.0655	0.0618	0.0059
16	0.5574	0.4238	0.1184	0.0147	0.1038	0.1963	0.1970	0.0173
17	1.1038	0.0409	0.1235	0.0192	0.0971	0.2241	0.1492	0.0195
18	0.0014	1.0857	0.0388	0.0071	0.0156	0.0007	0.0004	0.0001
19	0.0006	0.0008	1.0422	0.0068	0.0004	0.0013	0.0005	0.0004
20	0.0006	0.0006	0.0006	1.0066	0.0004	0.0005	0.0005	0.0005
21	0.0021	0.0001	0.0003	0.0003	1.0004	0.0158	0.0044	0.0013
22	0.0025	0.0030	0.0034	0.0150	0.0061	1.0060	0.1199	0.0843
23	0.0037	0.0038	0.0127	0.0096	0.0160	0.0086	1.1759	0.0056
24	0.0086	0.0119	0.0084	0.0068	0.0065	0.0068	0.0076	1.0166
25	0.0055	0.0079	0.0043	0.0016	0.0605	0.0364	0.0296	0.0050
26	0.0059	0.0393	0.0051	0.0079	0.0019	0.0029	0.0031	0.0021
27	0.0547	0.0554	0.0349	0.0293	0.1410	0.0661	0.0685	0.0288
28	0.0005	0.0004	0.0005	0.0004	0.0004	0.0004	0.0004	0.0004
29	0.0023	0.0021	0.0059	0.0008	0.0012	0.0024	0.0015	0.0007
30	0.0013	0.0016	0.0032	0.0006	0.0006	0.0007	0.0006	0.0004
31	0.0002	0.0003	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001
32	0.0008	0.0011	0.0012	0.0011	0.0006	0.0006	0.0004	0.0006
33	0.0052	0.0137	0.0103	0.0007	0.0014	0.0027	0.0018	0.0005
34	0.0045	0.0034	0.0064	0.0076	0.0048	0.0033	0.0025	0.0050
35	0.0008	0.0006	0.0002	0.0001	0.0002	0.0003	0.0003	0.0001
36	0.0038	0.0061	0.0035	0.0071	0.0040	0.0024	0.0015	0.0007
37	0.0003	0.0039	0.0003	0.0002	0.0003	0.0003	0.0003	0.0002
38	0.0022	0.0046	0.0029	0.0004	0.0006	0.0008	0.0008	0.0004
39	0.0004	0.0006	0.0004	0.0001	0.0006	0.0005	0.0004	0.0001
40	0.0010	0.0008	0.0005	0.0003	0.0004	0.0005	0.0005	0.0003
41	0.0013	0.0012	0.0010	0.0007	0.0008	0.0009	0.0010	0.0008
42	0.0055	0.0024	0.0042	0.0266	0.0018	0.0063	0.0026	0.0020
43	0.1017	0.0896	0.0516	0.0303	0.0576	0.0725	0.0797	0.0328
44	0.0399	0.0413	0.0309	0.0272	0.0745	0.0735	0.0641	0.0288
45	0.0124	0.0419	0.0149	0.0626	0.1839	0.0338	0.0468	0.0149
46	0.0050	0.0076	0.0060	0.0029	0.0243	0.0070	0.0062	0.0034
47	0.0239	0.0241	0.0291	0.0230	0.0185	0.0185	0.0207	0.0301
48	0.0344	0.0321	0.0176	0.0114	0.0185	0.0224	0.0219	0.0085
49	0.1638	0.1684	0.1773	0.1326	0.1435	0.1471	0.1701	0.1350
50	0.0412	0.0376	0.0418	0.0303	0.0285	0.0307	0.0336	0.0317
51	0.1468	0.1283	0.1374	0.1523	0.0948	0.1132	0.1286	0.1816
52	0.7477	0.6737	0.7223	0.5635	0.5028	0.5483	0.5975	0.6386

Total Requirements Table

	25	26	27	28	29	30	31	32
1	0.0024	0.0021	0.0002	0.0034	0.0029	0.0023	0.0022	0.0017
2	0.0011	0.0009	0.0001	0.0012	0.0014	0.0011	0.0010	0.0008
3	0.0046	0.0039	0.0003	0.0049	0.0057	0.0044	0.0043	0.0033
4	0.0009	0.0008	0.0001	0.0010	0.0011	0.0009	0.0009	0.0006
5	0.0002	0.0001	0.0000	0.0002	0.0002	0.0001	0.0001	0.0001
6	0.0048	0.0041	0.0003	0.0051	0.0059	0.0046	0.0045	0.0035
7	0.0042	0.0035	0.0003	0.0044	0.0051	0.0040	0.0039	0.0030
8	0.0013	0.0011	0.0001	0.0014	0.0016	0.0013	0.0013	0.0010
9	0.0012	0.0010	0.0001	0.0014	0.0014	0.0011	0.0011	0.0008
10	0.0030	0.0026	0.0002	0.0120	0.0037	0.0029	0.0028	0.0022
11	0.0054	0.0036	0.0003	0.0049	0.0051	0.0040	0.0039	0.0030
12	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001	0.0001	0.0000
13	0.0018	0.0005	0.0000	0.0006	0.0007	0.0006	0.0007	0.0011
14	0.0023	0.0007	0.0006	0.0471	0.0574	0.0054	0.0060	0.0047
15	0.0009	0.0017	0.0001	0.0032	0.0009	0.0008	0.0012	0.0004
16	0.0022	0.0048	0.0003	0.0096	0.0022	0.0022	0.0029	0.0008
17	0.0021	0.0045	0.0002	0.0077	0.0023	0.0022	0.0050	0.0008
18	0.0001	0.0004	0.0002	0.0001	0.0002	0.0002	0.0001	0.0001
19	0.0003	0.0061	0.0000	0.0004	0.0004	0.0004	0.0004	0.0009
20	0.0004	0.0004	0.0000	0.0004	0.0005	0.0004	0.0004	0.0003
21	0.0025	0.0002	0.0000	0.0002	0.0001	0.0001	0.0000	0.0000
22	0.0035	0.0089	0.0002	0.0070	0.0050	0.0053	0.0013	0.0013
23	0.0077	0.0150	0.0009	0.0537	0.0056	0.0059	0.0019	0.0024
24	0.0066	0.0109	0.0005	0.0064	0.0067	0.0055	0.0046	0.0040
25	1.0398	0.0128	0.0014	0.0024	0.0014	0.0113	0.0055	0.0059
26	0.0031	1.0343	0.0001	0.0098	0.0035	0.0041	0.0054	0.0057
27	0.0262	0.0466	1.0162	0.0348	0.1392	0.0228	0.0328	0.0281
28	0.0015	0.0003	0.0000	1.0097	0.0004	0.0003	0.0003	0.0002
29	0.0007	0.0009	0.0005	0.0016	1.1396	0.0011	0.0006	0.0005
30	0.0005	0.0005	0.0001	0.0092	0.0005	1.0141	0.0004	0.0015
31	0.0001	0.0001	0.0002	0.0001	0.0001	0.0002	1.0004	0.0020
32	0.0008	0.0008	0.0001	0.0004	0.0006	0.0011	0.1997	1.2820
33	0.0004	0.0006	0.0003	0.0006	0.0006	0.0041	0.0004	0.0009
34	0.0072	0.0067	0.0005	0.0027	0.0044	0.0079	0.0012	0.0017
35	0.0000	0.0000	0.0002	0.0001	0.0001	0.0001	0.0002	0.0008
36	0.0005	0.0005	0.0003	0.0006	0.0034	0.0108	0.0007	0.0024
37	0.0014	0.0002	0.0005	0.0002	0.0002	0.0002	0.0004	0.0015
38	0.0015	0.0003	0.0000	0.0003	0.0003	0.0003	0.0004	0.0016
39	0.0063	0.0002	0.0000	0.0002	0.0002	0.0002	0.0002	0.0002
40	0.0002	0.0002	0.0000	0.0003	0.0003	0.0002	0.0002	0.0002
41	0.0006	0.0006	0.0001	0.0008	0.0009	0.0007	0.0007	0.0005
42	0.0024	0.0070	0.0012	0.0013	0.0015	0.0012	0.0013	0.0034
43	0.0254	0.0302	0.0045	0.0541	0.0600	0.0337	0.0403	0.0359
44	0.0430	0.0222	0.0046	0.1289	0.0508	0.0902	0.0963	0.2290
45	0.0600	0.0464	0.0139	0.2371	0.0148	0.0416	0.0505	0.0283
46	0.0076	0.0082	0.0004	0.0027	0.0058	0.0023	0.0021	0.0017
47	0.0160	0.0241	0.0015	0.0161	0.0228	0.0136	0.0126	0.0112
48	0.0111	0.0151	0.0006	0.0146	0.0160	0.0174	0.0080	0.0059
49	0.1114	0.0952	0.0121	0.1199	0.1243	0.1198	0.0764	0.0710
50	0.0222	0.0299	0.0020	0.0317	0.0306	0.0230	0.0230	0.0195
51	0.0992	0.1259	0.0062	0.1121	0.1393	0.0943	0.0816	0.0649
52	0.4903	0.4187	0.0347	0.5232	0.6059	0.4732	0.4639	0.3536

Total Requirements Table

	33	34	35	36	37	38	39	40
1	0.0022	0.0019	0.0025	0.0035	0.0027	0.0020	0.0021	0.0010
2	0.0010	0.0008	0.0011	0.0016	0.0012	0.0009	0.0010	0.0004
3	0.0044	0.0036	0.0048	0.0068	0.0052	0.0040	0.0040	0.0019
4	0.0009	0.0007	0.0009	0.0013	0.0010	0.0008	0.0008	0.0004
5	0.0001	0.0001	0.0002	0.0002	0.0002	0.0001	0.0001	0.0001
6	0.0046	0.0037	0.0050	0.0071	0.0054	0.0041	0.0042	0.0020
7	0.0039	0.0032	0.0043	0.0061	0.0047	0.0035	0.0036	0.0017
8	0.0013	0.0010	0.0014	0.0020	0.0015	0.0011	0.0012	0.0005
9	0.0011	0.0009	0.0012	0.0016	0.0013	0.0010	0.0010	0.0005
10	0.0029	0.0023	0.0032	0.0044	0.0034	0.0026	0.0026	0.0012
11	0.0040	0.0032	0.0044	0.0062	0.0047	0.0036	0.0037	0.0017
12	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
13	0.0006	0.0005	0.0006	0.0008	0.0006	0.0005	0.0005	0.0002
14	0.0010	0.0011	0.0006	0.0008	0.0007	0.0005	0.0005	0.0003
15	0.0005	0.0009	0.0005	0.0005	0.0004	0.0005	0.0004	0.0004
16	0.0011	0.0024	0.0011	0.0009	0.0008	0.0013	0.0010	0.0011
17	0.0011	0.0021	0.0011	0.0009	0.0008	0.0013	0.0010	0.0010
18	0.0001	0.0002	0.0002	0.0001	0.0001	0.0001	0.0002	0.0001
19	0.0003	0.0023	0.0030	0.0003	0.0003	0.0015	0.0003	0.0022
20	0.0004	0.0003	0.0004	0.0006	0.0005	0.0015	0.0005	0.0042
21	0.0000	0.0001	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000
22	0.0018	0.0024	0.0019	0.0020	0.0017	0.0027	0.0014	0.0012
23	0.0041	0.0109	0.0022	0.0025	0.0020	0.0032	0.0031	0.0033
24	0.0049	0.0045	0.0081	0.0071	0.0058	0.0047	0.0041	0.0045
25	0.0014	0.0077	0.0063	0.0010	0.0009	0.0008	0.0007	0.0025
26	0.0028	0.0054	0.0035	0.0009	0.0008	0.0032	0.0011	0.0025
27	0.0197	0.0225	0.0213	0.0297	0.0212	0.0167	0.0158	0.0098
28	0.0003	0.0003	0.0003	0.0005	0.0004	0.0003	0.0003	0.0001
29	0.0006	0.0026	0.0005	0.0004	0.0005	0.0005	0.0004	0.0003
30	0.0456	0.0398	0.0144	0.0113	0.0143	0.0013	0.0004	0.0025
31	0.0091	0.0022	0.0004	0.0054	0.0102	0.0013	0.0004	0.0001
32	0.0483	0.1004	0.0057	0.0021	0.0072	0.0048	0.0007	0.0036
33	1.0325	0.0025	0.0005	0.0057	0.0039	0.0003	0.0011	0.0023
34	0.0103	1.0110	0.0223	0.0069	0.0066	0.0294	0.0027	0.0087
35	0.0001	0.0001	1.0357	0.0000	0.0000	0.0000	0.0000	0.0000
36	0.0066	0.0131	0.0224	1.0430	0.0215	0.0066	0.0039	0.0025
37	0.0020	0.0002	0.0156	0.0002	1.0102	0.0024	0.0009	0.0001
38	0.0003	0.0004	0.0108	0.0003	0.0071	1.0205	0.0023	0.0022
39	0.0182	0.0002	0.0002	0.0002	0.0002	0.0047	1.0230	0.0083
40	0.0020	0.0002	0.0028	0.0003	0.0019	0.0002	0.0002	1.0021
41	0.0006	0.0005	0.0006	0.0008	0.0007	0.0005	0.0005	0.0003
42	0.0012	0.0170	0.0042	0.0067	0.0031	0.0117	0.0023	0.0048
43	0.0229	0.0217	0.0214	0.0225	0.0192	0.0180	0.0148	0.0099
44	0.0305	0.0375	0.0210	0.0288	0.0214	0.0169	0.0152	0.0125
45	0.0149	0.0126	0.0163	0.0093	0.0079	0.0078	0.0072	0.0068
46	0.0022	0.0040	0.0024	0.0032	0.0043	0.0020	0.0025	0.0032
47	0.0163	0.0171	0.0194	0.0242	0.0200	0.0164	0.0134	0.0099
48	0.0094	0.0059	0.0065	0.0049	0.0073	0.0054	0.0032	0.0037
49	0.0968	0.0840	0.1161	0.1300	0.1180	0.0988	0.0668	0.0557
50	0.0245	0.0205	0.0234	0.0335	0.0238	0.0218	0.0177	0.0105
51	0.0900	0.1012	0.1030	0.1373	0.1174	0.0907	0.0849	0.0449
52	0.4702	0.3790	0.5164	0.7296	0.5552	0.4233	0.4333	0.2008

Total Requirements Table

	41	42	43	44	45	46	47	48
1	0.0027	0.0022	0.0031	0.0012	0.0004	0.0016	0.0026	0.0035
2	0.0013	0.0010	0.0016	0.0006	0.0002	0.0007	0.0012	0.0016
3	0.0053	0.0046	0.0059	0.0024	0.0009	0.0031	0.0051	0.0068
4	0.0010	0.0008	0.0011	0.0005	0.0002	0.0006	0.0010	0.0045
5	0.0002	0.0001	0.0002	0.0001	0.0000	0.0001	0.0002	0.0002
6	0.0055	0.0053	0.0063	0.0025	0.0009	0.0032	0.0053	0.0071
7	0.0047	0.0038	0.0052	0.0021	0.0008	0.0028	0.0046	0.0061
8	0.0015	0.0012	0.0018	0.0007	0.0003	0.0009	0.0015	0.0020
9	0.0013	0.0011	0.0016	0.0006	0.0002	0.0007	0.0013	0.0017
10	0.0034	0.0027	0.0046	0.0016	0.0006	0.0020	0.0033	0.0044
11	0.0048	0.0047	0.0056	0.0021	0.0008	0.0028	0.0046	0.0061
12	0.0001	0.0010	0.0001	0.0000	0.0000	0.0000	0.0001	0.0001
13	0.0012	0.0014	0.0011	0.0003	0.0001	0.0004	0.0006	0.0009
14	0.0007	0.0006	0.0010	0.0252	0.0002	0.0011	0.0006	0.0095
15	0.0010	0.0014	0.0005	0.0004	0.0002	0.0003	0.0006	0.0050
16	0.0023	0.0035	0.0011	0.0009	0.0005	0.0006	0.0015	0.0126
17	0.0025	0.0051	0.0012	0.0009	0.0004	0.0006	0.0016	0.0178
18	0.0014	0.0011	0.0001	0.0001	0.0000	0.0001	0.0001	0.0071
19	0.0042	0.0013	0.0005	0.0002	0.0001	0.0002	0.0003	0.0099
20	0.0031	0.0004	0.0005	0.0002	0.0001	0.0003	0.0005	0.0012
21	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001
22	0.0016	0.0025	0.0021	0.0015	0.0006	0.0012	0.0049	0.0025
23	0.0020	0.0030	0.0027	0.0026	0.0021	0.0012	0.0025	0.0042
24	0.0059	0.0055	0.0090	0.0041	0.0025	0.0066	0.0086	0.0080
25	0.0013	0.0019	0.0011	0.0010	0.0002	0.0004	0.0008	0.0016
26	0.0018	0.0237	0.0008	0.0008	0.0001	0.0004	0.0012	0.0026
27	0.0215	0.0180	0.1501	0.0100	0.0049	0.0182	0.0204	0.0535
28	0.0004	0.0003	0.0005	0.0002	0.0001	0.0002	0.0004	0.0005
29	0.0013	0.0014	0.0013	0.0009	0.0001	0.0007	0.0006	0.0495
30	0.0026	0.0003	0.0009	0.0002	0.0000	0.0002	0.0002	0.0141
31	0.0012	0.0010	0.0003	0.0005	0.0000	0.0000	0.0000	0.0016
32	0.0014	0.0121	0.0005	0.0009	0.0000	0.0001	0.0002	0.0024
33	0.0032	0.0002	0.0004	0.0003	0.0001	0.0004	0.0003	0.0306
34	0.0029	0.0038	0.0034	0.0016	0.0002	0.0007	0.0013	0.0046
35	0.0011	0.0000	0.0005	0.0005	0.0000	0.0000	0.0000	0.0004
36	0.0016	0.0032	0.0023	0.0007	0.0001	0.0002	0.0004	0.0014
37	0.0012	0.0010	0.0010	0.0006	0.0000	0.0001	0.0001	0.0004
38	0.0019	0.0021	0.0011	0.0007	0.0001	0.0002	0.0067	0.0027
39	0.0028	0.0001	0.0031	0.0000	0.0000	0.0000	0.0001	0.0007
40	0.0008	0.0002	0.0010	0.0001	0.0000	0.0001	0.0002	0.0005
41	1.0022	0.0006	0.0065	0.0003	0.0001	0.0004	0.0006	0.0009
42	0.0021	1.0189	0.0015	0.0010	0.0002	0.0007	0.0033	0.0064
43	0.0166	0.0239	1.0839	0.0094	0.0039	0.0112	0.0161	0.0340
44	0.0231	0.0188	0.0236	1.2622	0.0066	0.0468	0.0220	0.0272
45	0.0078	0.0082	0.0109	0.0051	1.7424	0.0041	0.0078	0.0118
46	0.0036	0.0031	0.0031	0.0017	0.0004	1.0842	0.0036	0.0038
47	0.0154	0.0173	0.0223	0.0118	0.0071	0.0154	1.0215	0.0232
48	0.0101	0.0043	0.0081	0.0097	0.0022	0.0123	0.0090	1.0074
49	0.1039	0.0906	0.1026	0.0436	0.0158	0.0531	0.0879	0.1569
50	0.0220	0.0194	0.0290	0.0152	0.0053	0.0164	0.0280	0.0359
51	0.0895	0.0712	0.1194	0.0508	0.0171	0.0654	0.1289	0.1507
52	0.5678	0.4490	0.5886	0.2540	0.0947	0.3309	0.5459	0.7256

	49	50	51	52
1	0.0032	0.0039	0.0068	0.0058
2	0.0015	0.0018	0.0023	0.0028
3	0.0061	0.0075	0.0093	0.0117
4	0.0012	0.0015	0.0018	0.0023
5	0.0002	0.0002	0.0003	0.0004
6	0.0064	0.0078	0.0093	0.0123
7	0.0055	0.0067	0.0082	0.0105
8	0.0018	0.0022	0.0029	0.0034
9	0.0015	0.0018	0.0024	0.0028
10	0.0040	0.0049	0.0063	0.0076
11	0.0055	0.0068	0.0081	0.0106
12	0.0001	0.0001	0.0002	0.0001
13	0.0009	0.0009	0.0012	0.0014
14	0.0010	0.0012	0.0011	0.0010
15	0.0011	0.0009	0.0009	0.0008
16	0.0026	0.0022	0.0018	0.0013
17	0.0027	0.0022	0.0020	0.0013
18	0.0001	0.0002	0.0002	0.0001
19	0.0004	0.0005	0.0004	0.0004
20	0.0007	0.0007	0.0008	0.0010
21	0.0002	0.0001	0.0001	0.0001
22	0.0089	0.0050	0.0048	0.0028
23	0.0047	0.0058	0.0036	0.0040
24	0.0243	0.0310	0.0193	0.0106
25	0.0014	0.0014	0.0023	0.0012
26	0.0016	0.0012	0.0017	0.0011
27	0.0296	0.0312	0.0507	0.0386
28	0.0005	0.0005	0.0007	0.0008
29	0.0007	0.0013	0.0009	0.0006
30	0.0002	0.0004	0.0003	0.0002
31	0.0001	0.0001	0.0001	0.0001
32	0.0003	0.0003	0.0004	0.0003
33	0.0005	0.0008	0.0004	0.0003
34	0.0017	0.0017	0.0026	0.0022
35	0.0000	0.0000	0.0000	0.0000
36	0.0008	0.0006	0.0021	0.0006
37	0.0002	0.0002	0.0007	0.0002
38	0.0004	0.0006	0.0008	0.0004
39	0.0001	0.0001	0.0001	0.0001
40	0.0004	0.0003	0.0009	0.0005
41	0.0008	0.0009	0.0011	0.0014
42	0.0029	0.0036	0.0073	0.0017
43	0.0302	0.0253	0.0320	0.0265
44	0.0384	0.0417	0.0426	0.0334
45	0.0124	0.0154	0.0252	0.0135
46	0.0052	0.0061	0.0063	0.0052
47	0.0317	0.0549	0.0444	0.0301
48	0.0096	0.0227	0.0114	0.0071
49	1.1141	0.1259	0.1664	0.1834
50	0.0404	1.1114	0.0569	0.0456
51	0.1686	0.2080	1.2256	0.1706
52	0.6494	0.8010	0.9324	1.2603

Appendix Table V

Jobs and Earnings

The Bureau of Economic Analysis (BEA) of the U.S. Department of Commerce regularly publishes estimates of employment and income, by industry, for Washington State. The employment variable is a measure of full-time and part-time jobs, which is inclusive of wage and salary workers, self-employed proprietors, and unpaid family workers. Earnings is a measure of wage and salary disbursements, other labor income, and proprietors' income. Both jobs and earnings are reportedly on a place-of-work basis.

The jobs and earnings estimates published by BEA are reclassified in this table into Washington I/O industry sectors. For sectors in which greater disaggregation than BEA provided was required, the allocation to sectors is based upon employment payrolls, VA, or output relationships obtained from the various industrial censuses or Employment Security Department data. In Sector 5, Fisheries, a substantial portion of reported earnings is believed to be attributable to Alaskan fisheries; the reported earnings have been adjusted downward to reflect estimated earnings from Washington landings.*

In several sectors, BEA earnings exceed VA in production, possibly indicative of negative property income during the recession year of 1982, errors of measurement, or misclassification.

*BEA reported (August 1986) that earnings in Washington fisheries were $95 million in 1982. However, the value of the Washington catch as reported by the Washington Department of Fisheries was $94 million (before expenses). BEA estimates are apparently inclusive of the earnings of Washington fishermen in Alaska and other off-shore fisheries, and equate place-of-work with residence in this industry.

Jobs and Earnings Data

I/O Name & No	Direct Jobs (Thous)	Direct Earnings (Mil)	Direct Earnings per Job (Dollars)	Sector Output Total (Mil)	Direct Jobs per Mil $ of Output	Direct Earnings per Mil $ of Output
Field Crops 1	16.2	$349	$21,543	$1,158	14.0	$301
Vegetables 2	25.6	$314	$12,266	$759	33.7	$414
Livestock 3	29.8	$178	$5,973	$916	32.5	$194
Other Agri. 4	9.1	$87	$9,560	$136	66.9	$640
Fisheries 5	10.6	$54	$5,094	$94	112.8	$574
Meat Products 6	4.0	$90	$22,500	$1,091	3.7	$82
Dairy Prod. 7	1.9	$65	$34,211	$780	2.4	$83
Canning 8	15.0	$253	$16,867	$1,594	9.4	$159
Grain Mills 9	1.3	$30	$23,077	$305	4.3	$98
Beverages 10	3.4	$91	$26,765	$694	4.9	$131
Other Foods 11	6.4	$145	$22,656	$598	10.7	$242
Textiles 12	1.2	$18	$15,000	$50	24.0	$360
Apparel 13	6.5	$77	$11,846	$189	34.4	$407
Mining 14	4.3	$165	$38,372	$238	18.1	$693
Forestry 15	5.5	$28	$5,091	$603	9.1	$46
Logging 16	14.3	$408	$28,531	$1,738	8.2	$235
Sawmills 17	14.9	$321	$21,544	$1,081	13.8	$297
Plywood 18	3.7	$78	$21,081	$305	12.1	$256
Other Wood 19	8.9	$187	$21,011	$499	17.8	$375
Furniture 20	3.3	$52	$15,758	$164	20.1	$317
Pulp Mills 21	2.2	$75	$34,091	$355	6.2	$211
Paper Mills 22	7.1	$239	$33,662	$1,253	5.7	$191
Paperboard 23	6.9	$200	$28,986	$1,041	6.6	$192
Printing 24	16.6	$323	$19,458	$865	19.2	$373
Industrial Chem. 25	7.8	$263	$33,718	$857	9.1	$307
Other Chem. 26	1.8	$40	$22,222	$185	9.7	$216
Petroleum 27	1.8	$82	$45,556	$4,629	0.4	$18
Glass 28	1.4	$30	$21,429	$116	12.1	$259
Cement 29	5.4	$125	$23,148	$413	13.1	$303
Ferrous Metals 30	3.2	$86	$26,875	$306	10.5	$281
Non-Ferr. Metals 31	2.4	$72	$30,000	$257	9.3	$280
Aluminum 32	8.2	$326	$39,756	$2,050	4.0	$159
Structural Metal 33	6.0	$164	$27,333	$582	10.3	$282
Light Metals 34	4.1	$98	$23,902	$520	7.9	$188
Farm Mach. 35	4.3	$127	$29,535	$406	10.6	$313
Machine Tools 36	3.7	$99	$26,757	$197	18.8	$503
Indus. Equip. 37	8.8	$218	$24,773	$606	14.5	$360
Electrical Mach. 38	10.7	$239	$22,336	$907	11.8	$264
Aerospace 39	76.0	$2,750	$36,184	$8,936	8.5	$308
Motor Vehicles 40	1.8	$57	$31,667	$502	3.6	$114
Ship Building 41	26.1	$783	$30,000	$1,890	13.8	$414
Other Mfg. 42	17.8	$347	$19,494	$1,136	15.7	$305
Transportation 43	80.7	$2,123	$26,307	$5,517	14.6	$385
Electric Cos. 44	8.6	$320	$37,209	$2,565	3.4	$125
Gas Cos. 45	1.5	$43	$28,667	$1,144	1.3	$38
Other Util. 46	6.0	$69	$11,500	$327	18.3	$211
Communications 47	24.5	$719	$29,347	$1,912	12.8	$376
Construction 48	112.9	$2,926	$25,917	$6,532	17.3	$448
Trade 49	453.3	$6,259	$13,808	$15,000	30.2	$417
F.I.R.E. 50	151.9	$1,852	$12,192	$3,800	40.0	$487
Services 51	481.5	$6,686	$13,886	$10,736	44.8	$623
Subtotal	1730.9	$30,730	$17,754	$88,534		
FedCivilian	40.2	$854	$21,244			
FedMilitary	78.1	$983	$12,586			
State & Local	226.3	$3,935	$17,388			
TOTAL	2075.5	$36,502	$17,587			

The Washington State Input-Output Study for 1982

Addendum: June 19, 1987

The output multipliers shown in Appendix III have been updated. Text **Table 10, Value Added Multipliers,** is revised by this insert. These changes are not significant and do not alter the findings of the report in any noticeable way.

Table 10: Value Added Multipliers
C=f(VA), VA=f(X)

I/O NUMBER & NAME	Direct Value Added per mil. $ of Output	Total Value Added per mil. $ of Direct Exports	Total Value Added per $ of Direct Value Added
FIELD CROPS 1	$644 thous	$1,349 thous	$2.09
VEGGIES & FRUIT 2	780	1,499	1.92
LIVESTOCK 3	318	1,317	4.15
MISC. AG PRODUCTS 4	853	1,580	1.85
FISHING 5	596	1,283	2.15
MEAT PRODUCTS 6	103	735	7.16
DAIRY PRODUCTS 7	146	1,311	8.97
CANNING 8	331	1,202	3.63
GRAIN MILL 9	164	691	4.22
BEVERAGES 10	323	1,151	3.57
OTHER FOODS 11	498	1,229	2.47
TEXTILE MILL 12	440	892	2.03
APPAREL 13	450	901	2.00
MINING 14	689	1,300	1.89
FORESTRY 15	857	1,581	1.84
LOGGING 16	224	1,300	5.79
SAWMILL 17	297	1,363	4.59
PLYWOOD 18	259	1,268	4.90
MISC. WOOD 19	335	1,036	3.10
FURNITURE 20	512	1,175	2.29
PULPMILL 21	259	1,021	3.94
PAPERMILL 22	305	1,162	3.81
MISC. PAPER 23	302	1,262	4.18
PRINT & PUBLISH 24	568	1,262	2.22
INDUS. CHEMICALS 25	634	1,298	2.05
OTHER CHEMICALS 26	319	826	2.59
PETROLEUM 27	122	236	1.94
GLASS 28	448	1,229	2.74
CEMENT ETC. 29	470	1,223	2.60
FERROUS METALS 30	529	1,176	2.22
NONFERROUS 31	234	667	2.86
ALUMINUM 32	229	849	3.70
STRUCTURAL METALS 33	406	911	2.25
LIGHT METALS 34	414	988	2.39
FARM CONSTR. MACH 35	397	907	2.29
MACHINE TOOLS 36	629	1,229	1.95
INDUS. EQUIPMENT 37	550	1,112	2.02
ELECTRICAL MACH 38	576	1,148	1.99
AEROSPACE 39	302	581	1.92
MOTOR VEH/RR CARS 40	416	815	1.96
SHIPBUILDING 41	667	1,202	1.80
OTHER MANUF. 42	623	1,175	1.89
TRANSPORTATION 43	518	1,077	2.08
ELECTRIC UTIL 44	653	1,456	2.23
GAS UTIL 45	153	470	3.07
OTHER UTIL 46	823	1,588	1.93
COMMUNICATIONS 47	785	1,436	1.83
CONSTRUCTION 48	501	1,145	2.28
TRADE 49	733	1,457	1.99
F.I.R.E. 50	707	1,530	2.16
SERVICES 51	681	1,417	2.08
AVERAGE	466	1,138	2.85

Washington Interindustry Gross Flows Table, 1982

(millions of dollars)

Output → / Input ↓

	1 Field and Seed Crops	2 Vegetables and Fruits	3 Livestock and Products	4 Other Agriculture	5 Fisheries	6 Meat Products	7 Dairy Products	8 Canning and Preserving	9 Grain Mill Products	10 Beverages	11 Other Foods	12 Textiles	13 Apparel	14 Mining	15 Forestry	16 Logging	17 Sawmills
1. Field and Seed Crops	50	2	300			6			41	63	1						
2. Vegetables and Fruits		10	3					300		3	5						
3. Livestock and Products	10	3	100			327	395				1	1	1				
4. Other Agriculture				4				1			1				2		
5. Fisheries					1			77									
6. Meat Products					1	18		5	2		1						
7. Dairy Products						1	140	5			25						
8. Canning and Preserving							2	28			6						
9. Grain Mill Products			80		1	1		3			40						
10. Beverages	1				1					6	5						
11. Other Foods			1			1	2	10	1	35	18						
12. Textiles					1	1					1					1	
13. Apparel						1							1			2	2
14. Mining	1	1							1		2			4			
15. Forestry															18	460	55
16. Logging															2	383	424
17. Sawmills														1			100
18. Plywood																	1
19. Other Wood Products		5				1		1			1						
20. Furniture and Fixtures																	
21. Pulp Mills																	2
22. Paper Mills									6		1		1				
23. Paperboard, Other Paper		2	2			40	20	40	3	15	9		1			2	
24. Printing and Publishing						1		8		3	4				1		
25. Industrial Chemicals	60	15	9	1		1	1	2		1	1			1	8	1	1
26. Other Chemicals			2	1		1				1	1				4	1	3
27. Petroleum	36	23	15	3	8	8	5	2	1	2	6			4	8	20	9
28. Glass Products						1	2	20		55	1						
29. Cement, Stone and Clay						1								3		1	
30. Iron and Steel																1	
31. Other Nonferrous Metals					1												
32. Aluminum																	
33. Structural Metal Products																6	2
34. Other Fabricated Metals	1	1	1		1	1		20	2	90	2			1		5	1
35. Nonelect. Motive Equip.															1	1	
36. Machine Tools and Shops						1		1		1						6	1
37. Nonelect. Indust. Equip.						1			1		1						
38. Electrical Machinery					1	1										2	1
39. Aerospace																	
40. Motor Vehicles											1					2	
41. Ship and Boat Building					5												
42. Other Manufacturing		1	1		1	1	2				1					2	3
43. Transportation Services	9	6	14	1	2	6	5	40	6	10	18		1	2	4	150	28
44. Electric Companies	11	15	13	1		17	4	8	1	2	2	1	1	2	1	2	12
45. Gas Companies			1			1	6	14		6	8	2	1	1			1
46. Other Utilities	11	7	6	1		1	1	2		1	1					1	1
47. Communications	3	5	4	1		1	2	4	1	1	2	1	2	1	1	2	2
48. Construction	8	5	1			1	1	1		3	2		1	1	10	66	4
49. Trade	40	21	28	3	3	27	26	120	20	25	28	1	4	3	6	25	38
50. Fin., Ins., Real Estate	9	4	3	1	1	2	3	3	1	3	3		1	1	1	6	8
51. Services	16	5	5	1	2	11	21	48	10	28	15	1	7	7	9	40	15
Subtotal: Washington Purchases	266	131	589	18	30	482	638	763	97	354	214	7	22	32	76	1188	714
Value Added	746	592	291	116	56	112	114	528	50	224	298	22	85	164	517	390	321
Imports from Rest of U.S.	140	33	32	2	6	459	28	302	158	100	80	17	70	32	10	151	37
Imports from Foreign Countries	6	3	4	0	2	38	0	1	0	16	6	4	12	10	0	9	9
TOTAL GROSS INPUT	1158	759	916	136	94	1091	780	1594	305	694	598	50	189	238	603	1738	1081
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17

	18 Plywood	19 Other Wood Products	20 Furniture and Fixtures	21 Pulp Mills	22 Paper Mills	23 Paperboard, Other Paper	24 Printing and Publishing	25 Industrial Chemicals	26 Other Chemicals	27 Petroleum	28 Glass Products	29 Cement, Stone and Clay	30 Iron and Steel	31 Other Nonferrous Metals	32 Aluminum	33 Structural Metal Products	34 Other Fabricated Metals
1. Field and Seed Crops																	
2. Vegetables and Fruits																	
3. Livestock and Products																	
4. Other Agriculture																	
5. Fisheries																	
6. Meat Products																	
7. Dairy Products																	
8. Canning and Preserving																	
9. Grain Mill Products	1				6	3											
10. Beverages											1						
11. Other Foods								1									
12. Textiles		1	1														
13. Apparel								1							1		
14. Mining					1			1		2	5	20	1	1			
15. Forestry	18																
16. Logging	88	15		13	79	77											
17. Sawmills	10	52	2	30	250	98								1			
18. Plywood	24	17	1	5						1							
19. Other Wood Products		20	1		1				1						1		1
20. Furniture and Fixtures			1														
21. Pulp Mills					19	2		2									
22. Paper Mills			2	1	4	104	70	1	1			1	1				
23. Paperboard, Other Paper		4	1	4	6	153	2	4	2	3	5	1	1		1	1	4
24. Printing and Publishing	1						8	1	1								
25. Industrial Chemicals	1	1		20	40	20	1	32	2	6			3	1	8		3
26. Other Chemicals	10	1	1		1	1	1	2	6		1	1	1	1	8	1	2
27. Petroleum	4	1	1	40	40	27	1	6	5	66	1	40	1	3	20	1	3
28. Glass Products								1			1						
29. Cement, Stone and Clay		2			1					2		50					1
30. Iron and Steel		1									1		4		2	25	20
31. Other Nonferrous Metals										1					3	5	1
32. Aluminum														40	450	20	40
33. Structural Metal Products	3	4			1					1			1		1	18	1
34. Other Fabricated Metals		2	1	1	1		3	5	1	2		1	2		1	5	5
35. Nonelect. Motive Equip.										1					1		
36. Machine Tools and Shops	1	1	1	1	1					1		1	3		3	3	6
37. Nonelect. Indust. Equip.	1							1		2					2	1	
38. Electrical Machinery	1	1						1							2		
39. Aerospace								5								10	
40. Motor Vehicles																1	
41. Ship and Boat Building																	
42. Other Manufacturing		1	4		5			1	1	5					4		8
43. Transportation Services	8	8	2	10	38	31	10	10	3	15	4	15	6	6	40	5	4
44. Electric Companies	4	2	1	15	50	25	3	18	1	12	10	9	18	10	278	2	2
45. Gas Companies	5	1	5	35	15	17	2	25	4	35	15	1	6	6	21	2	1
46. Other Utilities	1	1		7	4	2		4	1	1		1					1
47. Communications	1	4	1	1	2	2	10	2	2	2		2			1	2	3
48. Construction	2	3	1	3	10	6	2	6	2	1	1	4	4	1	3	3	1
49. Trade	15	28	7	20	60	55	28	30	5	30	4	11	14	1	26	13	11
50. Fin., Ins., Real Estate	2	5	1	2	6	5	4	2	2	2	1	2	1	1	7	3	2
51. Services	2	10	10	3	20	20	68	20	10	2	3	16	6	3	15	10	20
Subtotal: Washington Purchases	203	186	45	211	661	648	213	182	50	193	53	176	73	75	899	131	140
Value Added	79	167	84	92	382	314	491	543	59	564	52	194	162	60	470	236	215
Imports from Rest of U.S.	23	134	34	24	186	77	76	130	75	2760	7	30	71	106	281	153	102
Imports from Foreign Countries	0	12	1	28	24	2	85	2	1	1112	4	13	0	16	400	62	63
TOTAL GROSS INPUT	305	499	164	355	1253	1041	865	857	185	4629	116	413	306	257	2050	582	520
	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34

	35 Nonelect. Motive Equip.	36 Machine Tools and Shops	37 Nonelect. Indust. Equip.	38 Electrical Machinery	39 Aerospace	40 Motor Vehicles	41 Ship and Boat Building	42 Other Manufacturing	43 Transportation Services	44 Electric Companies	45 Gas Companies	46 Other Utilities	47 Communications	48 Construction	49 Trade	50 Fin., Ins., Real Estate	51 Services
1. Field and Seed Crops																	20
2. Vegetables and Fruits									1								1
3. Livestock and Products																	3
4. Other Agriculture														20			1
5. Fisheries																	
6. Meat Products								1	3								2
7. Dairy Products									1								3
8. Canning and Preserving									1								4
9. Grain Mill Products									1								2
10. Beverages									5								6
11. Other Foods								1	3								2
12. Textiles								1									1
13. Apparel							1	1	2						2		1
14. Mining					1				1	50				40			
15. Forestry															1		
16. Logging																	
17. Sawmills					2		2	4	1					90			2
18. Plywood					1		2	1						40			1
19. Other Wood Products	1			1	1	1	7	1	1					60	1		
20. Furniture and Fixtures				1	1	2	5							4	2		
21. Pulp Mills																	
22. Paper Mills				1	1			1	1	1			6		80	2	14
23. Paperboard, Other Paper				1	12	1		1	2	3	1		1	7	30	9	2
24. Printing and Publishing	1				1	1	1	1	16	3	1	1	6	1	256	80	100
25. Industrial Chemicals	2				1	1	1	1	1	1				2	4	1	10
26. Other Chemicals	1			2	5	1	2	25	1	1			1	7	12	1	6
27. Petroleum	1	1	1	1	10	1	5	1	664	1	1	2	3	140	80	10	190
28. Glass Products															1		1
29. Cement, Stone and Clay					1		1	1	3					280	1		1
30. Iron and Steel	5	2	8		1	1	4		3					80			
31. Other Nonferrous Metals		1	6	1	3		2	1	1	1				8			
32. Aluminum	1		2	1	2	1	1	10		1				1			
33. Structural Metal Products		1	2		8	1	5							190	2		
34. Other Fabricated Metals	8	1	3	25	15	4	3	3	10	2				16	5		6
35. Nonelect. Motive Equip.	14						2		2	1				2			
36. Machine Tools and Shops	8	8	12	5	30	1	2	3	9	1				2	4		15
37. Nonelect. Indust. Equip.	6		6	2	7		2	1	4	1				1	1		5
38. Electrical Machinery	4		4	18	18	1	3	2	4	1			12	15	1		3
39. Aerospace				4	200	4	5		15								
40. Motor Vehicles	1		1			1	1		4					1	1		5
41. Ship and Boat Building							3		30								
42. Other Manufacturing	1	1	1	9	13	2	2	20	1	1			4	31	20	6	56
43. Transportation Services	3	1	3	6	41	2	6	13	360	6	1	1	6	75	200	20	100
44. Electric Companies	1	1	1	2	20	2	10	3	25	520	2	9	9	11	220	50	125
45. Gas Companies	2			1	10	1	1	1	6	2	487		1	4	31	10	80
46. Other Utilities			1		5	1	2	1	2	1		25	2	2	30	8	20
47. Communications	2	1	3	4	20	2	2	6	35	10	3	2	13	20	200	116	200
48. Construction	1		2	2	4	1	12	1	21	16	1	3	10	6	70	60	50
49. Trade	14	4	20	30	20	12	36	25	70	10	1	1	11	283	225	14	275
50. Fin., Ins., Real Estate	1	1	1	4	10	1	1	2	30	10	1	1	12	40	200	280	200
51. Services	9	6	20	22	199	6	16	5	170	25	2	5	91	250	1014	300	900
Subtotal: Washington Purchases	87	29	97	143	663	52	148	138	1510	669	501	50	188	1729	2694	967	2413
Value Added	161	124	333	522	2700	209	1260	708	2859	1675	175	269	1500	3275	11000	2686	7308
Imports from Rest of U.S.	108	43	146	200	5020	239	479	176	965	211	43	8	212	1480	1156	140	965
Imports from Foreign Countries	50	1	30	42	553	2	3	114	183	10	425	0	12	48	150	7	50
TOTAL GROSS INPUT	406	197	606	907	8936	502	1890	1136	5517	2565	1144	327	1912	6532	15000	3800	10736
	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51

	Washington Interindustry Sales Total	Washington Personal Consumption Expenditures	Washington State and Local Government Expenditures	Gross Private Domestic Investment	Federal Expenditures	Exports to Rest of U.S.	Exports—Foreign	Final Demand Total	TOTAL GROSS OUTPUT	Standard Industrial Classification Code	
1. Field and Seed Crops	483	10	1	108		62	494	675	1158	Field and Seed Crops	1.
2. Vegetables and Fruits	323	79	4	43		260	50	436	759	Vegetables and Fruits	2.
3. Livestock and Products	841	53	1			20	1	75	916	Livestock and Products	3.
4. Other Agriculture	29	87	5			15		107	136	Other Agriculture	4.
5. Fisheries	78	9	1		2	4		16	94	Fisheries	5.
6. Meat Products	33	490	11		11	530	16	1058	1091	Meat Products	6.
7. Dairy Products	175	332	20		44	209		605	780	Dairy Products	7.
8. Canning and Preserving	41	127	11		50	1065	300	1553	1594	Canning and Preserving	8.
9. Grain Mill Products	138	41	2		1	69	54	167	305	Grain Mill Products	9.
10. Beverages	25	300	1		10	351	7	669	694	Beverages	10.
11. Other Foods	75	400	27		20	70	6	523	598	Other Foods	11.
12. Textiles	8	3				38	1	42	50	Textiles	12.
13. Apparel	15	55	3		1	111	4	174	189	Apparel	13.
14. Mining	132	4	4	50	5	40	3	106	238	Mining	14.
15. Forestry	552	13				38		51	603	Forestry	15.
16. Logging	1081						657	657	1738	Logging	16.
17. Sawmills	645					300	136	436	1081	Sawmills	17.
18. Plywood	94					200	11	211	305	Plywood	18.
19. Other Wood Products	107	11	1	10		369	1	392	499	Other Wood Products	19.
20. Furniture and Fixtures	16	40	10	12	3	83		148	164	Furniture and Fixtures	20.
21. Pulp Mills	25					170	160	330	355	Pulp Mills	21.
22. Paper Mills	300	5	7		16	669	256	953	1253	Paper Mills	22.
23. Paperboard, Other Paper	396	60	15		14	493	63	645	1041	Paperboard, Other Paper	23.
24. Printing and Publishing	497	180	75		5	100	8	368	865	Printing and Publishing	24.
25. Industrial Chemicals	265	5	7		425	100	55	592	857	Industrial Chemicals	25.
26. Other Chemicals	117	24	5		1	37	1	68	185	Other Chemicals	26.
27. Petroleum	1522	1198	78	12	120	1546	153	3107	4629	Petroleum	27.
28. Glass Products	83	2	3		5	20	3	33	116	Glass Products	28.
29. Cement, Stone and Clay	349	6	2			37	19	64	413	Cement, Stone and Clay	29.
30. Iron and Steel	158		1		1	145	1	148	306	Iron and Steel	30.
31. Other Nonferrous Metals	35					172	50	222	257	Other Nonferrous Metals	31.
32. Aluminum	570	1				1379	100	1480	2050	Aluminum	32.
33. Structural Metal Products	247	1	6	81	12	220	15	335	582	Structural Metal Products	33.
34. Other Fabricated Metals	257	30	5	25	2	191	10	263	520	Other Fabricated Metals	34.
35. Nonelect. Motive Equip.	25		2	40	30	200	109	381	406	Nonelect. Motive Equip.	35.
36. Machine Tools and Shops	132	5	4	3	3	47	3	65	197	Machine Tools and Shops	36.
37. Nonelect. Indust. Equip.	46	1	2	10		404	143	560	606	Nonelect. Indust. Equip.	37.
38. Electrical Machinery	96	2	1	13	18	712	65	811	907	Electrical Machinery	38.
39. Aerospace	243			16	1200	3921	3556	8693	8936	Aerospace	39.
40. Motor Vehicles	19	13	1	33	10	400	26	483	502	Motor Vehicles	40.
41. Ship and Boat Building	38	50	1	20	1550	211	20	1852	1890	Ship and Boat Building	41.
42. Other Manufacturing	209	5	10	35	25	515	337	927	1136	Other Manufacturing	42.
43. Transportation Services	1361	754	100	23	85	2666	528	4156	5517	Transportation Services	43.
44. Electric Companies	1564	806	80		15	100		1001	2565	Electric Companies	44.
45. Gas Companies	874	200	25		10	35		270	1144	Gas Companies	45.
46. Other Utilities	156	150	18		3			171	327	Other Utilities	46.
47. Communications	707	900	80	20	30	155	20	1205	1912	Communications	47.
48. Construction	417	155	2887	2775	298			6115	6532	Construction	48.
49. Trade	1827	8000	100	250	90	3293	1440	13173	15000	Trade	49.
50. Fin., Ins., Real Estate	893	1458	135		5	1300	9	2907	3800	Fin., Ins., Real Estate	50.
51. Services	3519	5500	550		200	885	82	7217	10736	Services	51.
Subtotal: Washington Purchases	21838	21565	4302	3579	4320	23957	8973	66696	88534	Subtotal: Washington Purchases	
Value Added	45554	6159	4316		2458			12933	58487	Value Added	
Imports from Rest of U.S.	17517	11822	876	1143				13841	31358	Imports from Rest of U.S.	
Imports from Foreign Countries	3625	862	30	367				1259	4884	Imports from Foreign Countries	
TOTAL GROSS INPUT	88534	40408	9524	5089	6778	23957	8973	94729	183263	TOTAL GROSS INPUT	

The interindustry gross flows table provides estimates of the goods and services transacted among Washington industries and between Washington industries and the rest of the world. Read down each column for the purchases of operating inputs by the sector named at the top. All input flows are measured in terms of the value received by the producers of those inputs, not what purchasers paid; the difference is reflected in the trade and transportation inputs charged to the purchaser.

Read across rows for a description of the markets in which output is sold.

The gross value of the output of each industry is accounted for in terms of the total inputs associated with its production. Total gross input includes the value created by the resources engaged in production in each sector. Value added a measure of the revenue available to meet labor costs, depreciation, taxes, and property income. The sum of value added in all sectors is the Washington gross state product.

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