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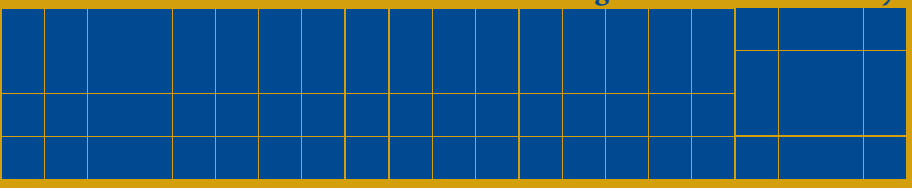
Concepts and Methods of the U.S. Input-Output Accounts

Measuring the Nation's Economy.



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BUREAU OF ECONOMIC ANALYSIS

U.S. DEPARTMENT OF COMMERCE

Concepts and Methods of the Input-Output Accounts

Karen J. Horowitz
Mark A. Planting

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PREFACE

The "Input-Output Handbook" describes the concepts and methods that underlie the preparation of the benchmark input-output (I-O) accounts of the United States. The handbook is intended to provide new employees with a grounding in the basics of I-O accounting, background on the development and uses of the accounts, and an introduction to the process of preparing the I-O estimates and tables. It is also intended to provide existing employees with information that will broaden their understanding of particular aspects of the work. The handbook does not provide detailed descriptions of methodology or of database operations. The descriptions of methodology that are presented in the handbook are primarily based on the 1997 benchmark accounts, though some updates and indications of future changes are included. Thus, the handbook is intended to be a living reference, whereby additional or updated information can be added as available and appropriate.[1]

The handbook opens with a table of contents that provides brief outlines of the principal topics covered in each of the 12 chapters. At the end of the handbook, there is a glossary of I-O terms and a bibliography of selected references.

This handbook was prepared under the direction of Mark A. Planting and Karen J. Horowitz, senior economists in the Industry Accounts Directorate (IAD) of the Bureau of Economic Analysis (BEA). General supervision was provided by Sumiye Okubo, Associate Director for Industry Accounts, and Ann M. Lawson, Chief of the Current Industry Analysis Division. The handbook was written by Mr. Planting and Ms. Horowitz, with significant contributions from Gerald F. Donahoe, formerly of BEA. Substantive and editorial review was provided by Douglas R. Fox, formerly of BEA. Special appreciation is given to the many members of the IAD staff who provided numerous worthwhile comments and suggestions.

1. In April 2009, BEA replaced the term "multiplier" with "requirement" in its total requirements tables. The change was made to clarify the concept and uses of requirements coefficients. Total requirements coefficients are based on the concept of gross output and differ significantly from macro-economic multipliers used to assess the effects of fiscal stimulus on gross domestic product.

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TABLE OF CONTENTS

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CHAPTER 1: OVERVIEW OF THE U.S. INPUT-OUTPUT ACCOUNTS

The U.S. input-output (I-O) accounts are a primary component of the U.S. economic accounts. This chapter discusses the structure of the I-O accounts, the principles upon which the accounts are based, and some of their uses as an analytical tool and as a data source for other accounts. It also describes the history of the accounts, critical milestones in their development, and present and future improvements.

The mission of the Bureau of Economic Analysis (BEA) is to promote a better understanding of the U.S. economy by providing timely, relevant, and accurate economic accounts. BEA produces economic accounts statistics that enable government and business decision-makers, researchers, and the American public to track and understand the performance of our economy. Accurate measurement of the economy is critical for formulating and implementing policies and for assessing their effectiveness. Without accurate measurements, we are similar to a ship without a compass or chart, steering a course without knowledge of where we are, in which direction we are heading, or under what conditions we are trying to navigate the surrounding seas. Economic statistics provide us with the compass and chart.

"The fundamental aim of national economic accounting is to provide a coherent and comprehensive picture of the nation's economy. More specifically, national economic accountants want to answer two questions. First, what is the output of the economy—its size, its composition, and its use? Second, what is the economic process or mechanism by which this output is produced and distributed?"[1]

The input-output (I-O) accounts are an integral and essential element of the U.S. economic accounts. First, they are the building blocks for other economic accounts. Prominent among these are BEA's national income and product accounts (NIPAs), which feature the estimates of gross domestic product (GDP). Second, the I-O accounts provide detailed statistics on economic processes and relationships. They incorporate a complete, balanced set of economic statistics, and they present a full accounting of industry and final-use transactions.

Specifically, the I-O accounts provide:

- A set of data on the nation's economy that are closely related to the statistics collected by business—for example, sales and cost of sales;
- Information on the output of the economy by industry;
- A consistent set of measures, or accounts, for all sectors of the economy;

[1] U.S. Bureau of Economic Analysis, *An Introduction to National Economic Accounting, Methodology Paper Series MP-1*, Washington DC: U.S. Government Printing Office, March 1985. This paper and other BEA methodologies are available on BEA's website at www.bea.gov/bea/mp.htm.

- A cross check for the variety of data used to estimate the national accounts;
- A cross check for the product and income accounts; and
- Estimates of final consumption that incorporate the best information available and that are in balance with industry output and inputs.

Composition of the I-O accounts

I-O analysis, sometimes referred to as "inter-industry analysis," is an economic tool that measures the relationships between various industries in the economy. The tables that make up the I-O accounts, which are typically presented in matrix form, provide a detailed "snapshot" of the economy. More specifically, I-O tables show the commodity inputs that are used by each industry to produce its output, the commodities produced by each industry, and the use of commodities by final consumers.

The core of the I-O accounts consists of two basic national-accounting tables—a "make" table and a "use" table (see tables 1.1 and 1.2 at the end of this chapter). The I-O accounts also include four "requirements," or analytical, tables that are calculated from the make and use tables.

The *make table* shows the production of commodities by industries. The rows present the industries, and the columns display the commodities that the industries produce. Looking across a row, all the commodities produced by that industry are identified, and the sum of the entries is that industry's output. Looking down a column, all the industries producing that commodity are identified, and the sum of the entries is the output of that commodity.

The *use table* shows the uses of commodities by intermediate and final users. In contrast to the make table, the rows in the use table present the commodities or products, and the columns display the industries and final users that utilize them.[2] The sum of the entries in a row is the output of that commodity. The columns show the products consumed by each industry and the three components of "value added"—compensation of employees, taxes on production and imports less subsidies, and gross operating surplus. Value added is the difference between an industry's output and the cost of its intermediate inputs, and total value added is equal to GDP. The sum of the entries in a column is that industry's output.

The use table is sometimes referred to as a "recipe" matrix because it shows the components that are necessary for producing the output of each industry. For example, for the bakery products industry, the use table shows the amount (in dollars) of flour, eggs, yeast, and other inputs that are necessary to produce baked goods and the secondary products of the industry, such as flour mixes and frozen food. For ease of analysis, these relationships are generally assumed to remain stable over time and through a range of output levels. In addition, the use table shows the detailed commodities that are purchased by final consumers. In the use table,

[2] The rows and columns of the make and use tables are reversed in order to simplify the matrix algebra used to calculate the requirements tables.

GDP is shown both as the sum of final uses and as the sum of industry value added.

Two sets of the make and use tables are prepared. The "featured," or "standard," make and use tables are based on the North American Industry Classification System and so provide data that are more consistent with other economic accounts and industry statistics. The "supplementary" make and use tables are derived from the standard tables by reassigning, or "redefining," some secondary products to the industry in which they are the primary products (see Chapter 4, "Classification and Secondary Products"). The estimates in these tables are used to calculate the requirements tables.[3]

The *direct requirements table* shows the amount of a commodity that is required by an industry to produce a dollar of the industry's output. Total requirements tables show the relationship between final uses and gross output. There are three *total requirements tables*. The *commodity-by-commodity total requirements table* shows the production required, both directly and indirectly, of the commodity at the beginning of each row per dollar of delivery to final use of the commodity at the top of the column. The *industry-by-commodity total requirements table* shows the production required, both directly and indirectly, from the industry at the beginning of the row per dollar of delivery to final use of the commodity at the top of the column. The *industry-by-industry total requirements table* shows the production required, both directly and indirectly, from the industry at the beginning of the row per dollar of delivery to final use of the industry at the top of the column.

Fundamental I-O principles

The preparation of the I-O accounts is a complex process that involves the collection and integration of data from a variety of sources in a way that provides a meaningful picture of economic activity. In their work, the I-O analysts are guided by three fundamental economic principles or assumptions that provide structure and purpose to the formulation and calculation of the tables.

1. Under the *principle of homogeneity*, each industry's output is produced using a unique set of inputs. Thus, in the use table, each industry should be defined so that it has a unique production function. In reality, though, industries produce a variety of products, as is shown in the make table, and these products may require substantially different inputs. As a result, it is not possible to completely achieve homogeneity, but the goal is to approach it as closely as possible.
2. Under the *principle of proportionality*, the ratio of each input to one unit of output remains constant over a wide range of output levels.

[3] After the 2002 benchmark is completed, we are proposing to provide another set of tables that follow the recommendations of the 1993 SNA. These tables will include two supply tables, one before and one after redefinitions, in basic prices and two use tables, one before and one after redefinitions, in purchasers' prices.

That is, there are no economies of scale. In the total requirements tables, each commodity has a unique input structure. Thus, under this principle, if the demand for a given product increases by 50 percent, all of the inputs required for the product will also increase by 50 percent. This principle enables us to calculate the effect of a change in final uses on the output of all industries.

3. Under the *principle of consistency*, economic statistics are organized and presented in a uniform manner. In particular, the classification of the data shown in the I-O accounts should be consistent with that used for the underlying source data and for the national accounts. The use of a common classification system enables users to effectively compare and analyze data across the broad spectrum of U.S. economic statistics.

Uses of the I-O tables

The I-O tables are used to study changes in the structure of the U.S. economy and to assess the impact of specified events on economic activity. In addition, the I-O tables provide the framework for preparing the national and other economic accounts that are used for policy analysis, business planning, and other purposes.

An important use of the I-O tables is in the estimation of the direct and indirect effects that changes in final uses will have on industry and commodity output, on employment, or on income. For example, they are used in emergency planning and in estimating the economic effects of a specific event, such as a strike or a natural disaster. Supplemented with additional information, the I-O tables can be used for broader analyses, such as for estimating the effects that an increase in U.S. exports will have on employment. In the 1970s and 1980s, government agencies and private organizations used I-O analysis to assess the effects that petroleum shortages and the accompanying price hikes would have on production in various industries and on commuting patterns and consumer spending.

In government, The Board of Governors of the Federal Reserve formulates monetary policy on the basis of the descriptions of the course of U.S. economic activity that are provided by the GDP estimates and other economic statistics that are based on the I-O data. Similarly, the administrative and legislative branches of government use these statistics to develop fiscal policy.

In business, macroeconomic and microeconomic forecasting models are built using the data from the NIPAs and the I-O accounts. From these models, the corporations are able to estimate their future earnings and to make decisions about long-term investments.

BEA itself is a primary user of the I-O accounts. The I-O tables serve as both the data source and the framework used to estimate GDP. The benchmark I-O accounts are the most important statistical source for the periodic comprehensive revisions of the NIPAs. For example, the I-O estimates are used to establish the benchmark-year level for GDP that in turn provides the basis for the estimates of GDP for the nonbenchmark years. The benchmark I-O tables also provide the

foundation for the annual I-O accounts, and they are used in deriving the GDP-by-industry estimates.

BEA's Regional Economic Analysis Division relies on data in the I-O accounts to generate its Regional Input-Output Modeling System, or RIMS II, which can be used to analyze the impact of a state or local project or a change in a state or local program on the economy of an area. For example, state or local government planners can use the model to assess the economic impact of a new baseball stadium or airport or of the closing of a military base.

Using the I-O tables, BEA has produced two "satellite accounts" that are consistent with the I-O accounts but that focus on particular aspects of economic activity. One of these accounts covers travel and tourism, and the other, transportation.[4] These satellite accounts facilitate the analyses of the direct and indirect effects of specific events—such as those related to strikes or natural disasters—on the travel and tourism or the transportation industries and commodities.

Other Federal statistical agencies, including the Bureau of Labor Statistics (BLS), also depend on the I-O accounts. For example, BLS uses the I-O data in their projections of industry employment and as the benchmark quantity weights for the producer price index.

Early history

In the 1930s and 1940s, Nobel laureate Wassily W. Leontief developed I-O tables as a tool for economic analysis and created the first modern-day I-O tables for the United States. While teaching at Harvard University, Leontief constructed I-O tables for the U.S. economy for the years 1919, 1929, and 1939.[5] Leontief's I-O model was partly inspired by the Walrasian (Leon Walras, 1834-1910) analysis of general equilibrium via interindustry flows, which in turn was inspired by Quesnay's (Francois Quesnay, 1694-1774) *Tableau Economique*. The economic theories of both Quesnay and Walras were based on the concept of a "closed model." In closed models, all economic sectors are considered both producers and consumers; households are treated as an industry whose output is labor and whose inputs are the commodities it consumes. Such models "do not lend themselves readily to algebraic manipulation since they are completely circular with no exogenous variables."[6] In contrast, Leontief's I-O model recognized that the object of economic

[4] The travel and tourism satellite accounts were first prepared for 1992 and were subsequently updated for 1996-97; see David I. Kass and Sumiye Okubo, "U.S. Travel and Tourism Satellite Accounts for 1996 and 1997," *Survey of Current Business* 80 (July 2000): 8-24. Since then, updated annual estimates for these accounts have been prepared periodically, most recently in Peter Kuhbach and Bradlee A. Herauf, "U.S. Travel and Tourism Satellite Accounts for 2001-2004," *Survey of Current Business* 85 (June 2005):17-29. The transportation satellite accounts were first prepared for 1992 and were subsequently updated for 1996; see Bingsong Fang, Xiaoli Han, Sumiye Okubo, and Ann M. Lawson, "U.S. Transportation Satellite Accounts for 1996," *Survey of Current Business* 80 (May 2000): 14-22.

[5] *The Structure of American Economy, 1919-1939*, Second Edition, Oxford University Press, New York, 1951.

[6] R. O'Connor and E. W. Henry, *Input-Output Analysis and Its Applications*, Hafner Press, New York, 1975.

activity is the satisfaction of final demand. In the I-O system, final demand (household consumption, government consumption and investment, private investment, and exports) is assumed to be determined by outside factors, so the system is called an "open model." As Leontief stated, "Input-output analysis is a practical extension of the classical theory of general independence which views the whole economy of a region, a country, and even the entire world as a single system and sets out to describe and to interpret its operation in terms of directly observable basic structural relationships."[7]

BLS, the first government agency to take an active interest in the practical application of the I-O framework, hired Leontief as a consultant in 1941. The first official U.S. I-O table (a 95-sector table for 1939), which expanded Leontief's earlier work, was published in 1944.[8] BLS used the 1939 I-O table as the basis for a series of studies that explored the extent to which various economic conditions could contribute to the achievement of full employment in the postwar years.[9]

Soon after the BLS study, other governmental organizations, including the U.S. Air Force, began using the I-O framework to analyze their operations and allocation of resources. In preparing an I-O table for 1947, BLS received financial support from the Air Force and the National Security Resources Board. Published in 1952, the table was used for analysis and planning related to the Korean War.

However, during the early 1950s, I-O analysis came under intense criticism, as politicians and economists in the United States noted that the Soviet Union used I-O tables as a tool for economic planning. In this hostile political climate, the U.S. government acted to restrict funding for the production of I-O tables. By 1954, the U.S. I-O program came to a complete halt. Ironically, while U.S. critics espoused the communist dangers of the I-O tables, The People's Republic of China also abandoned the use of I-O tables, claiming that this type of analysis was a tool of the capitalist West.

While the United States and China discarded the I-O framework, the rest of the world continued to explore the benefits of I-O analysis. Other countries, notably the United Kingdom, began experimenting with developing I-O tables for their own economies. Based on the United Kingdom's advances and developments, the United Nations created a standard reporting outline for national accounts, including I-O accounts, now known as the *System of National Accounts* (SNA).[10] Building on several earlier reports that were published in the late 1940s, the first SNA was published in 1953. The SNA framework has since undergone several updates, the latest in 1993.[11]

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[7] W. Leontief, "Input-Output Analysis," *The New Palgrave: A Dictionary of Economics*, Edited by J. Eatwell, M. Milgate, and P. Newman, Vol. 2, 1987.

[8] Martin C. Kohli, "The Leontief-BLS Partnership: a new framework for measurement," *Monthly Labor Review* (June 2001): 29-37.

[9] *Full Employment Patterns, 1950* is probably the best known of these studies.

[10] The SNA is under the joint responsibility of the United Nations, the International Monetary Fund, the Commission of European Communities, the Organisation for Economic Co-operation and Development, and the World Bank.

[11] The next update of the SNA is scheduled for 2008.

BEA responsibility

After the political backlash subsided, the U.S. Government renewed its interest in the I-O framework. In 1959, the Bureau of the Budget, now the Office of Management and Budget, formed the National Accounts Review Committee (NARC) to evaluate the national accounts work of the United States. The NARC found data inconsistencies in the calculation of the national accounts and recommended that I-O accounts be prepared on a regular basis in an effort to improve the accuracy of the national accounts. In its report, NARC recommended that the responsibility for creating the I-O tables be given to the Office of Business Economics (OBE), now BEA, in the Department of Commerce. Since that time, BEA has been in charge of this important task.

In 1964, following the recommendation of NARC, BEA published its first I-O transactions table for the year 1958. BEA constructed the table using data from the 1958 Economic Census (the Census of Manufactures, Census of Mineral Industries, and the Census of Business). Unlike earlier I-O tables, the definitions used in the 1958 table were fully consistent with those of the NIPAs, and the final-demand columns of the transactions table were completely integrated with them. The 1958 table consisted of 85 industries and six final demand components. Since 1958, BEA has prepared tables at about 5-year intervals—matching the years covered by the economic census.

After the release of the 1958 I-O table, feedback from data users provided several helpful suggestions, most notably a request for more industry detail. As a result, BEA greatly expanded the industry detail in subsequent tables. The 1963 I-O table, which was published in 1969, contained 367 industries. The tables continued to grow incrementally, reaching 537 industries/commodities in the 1977 table. These expansions resulted from increased coverage of industries by the economic censuses.

Expansion of the I-O accounts

In 1972, BEA expanded the coverage of the I-O accounts by initiating "annual" updates of the "benchmark" I-O tables. The first annual I-O table was published for 1966. The annual tables provided analysts with a more up-to-date picture of the economy, albeit one that showed fewer industries and was based on lower quality data, than that provided by the benchmark table.

Supplemental "bridge" tables for personal consumption expenditures (PCE) and for producers' durable equipment (PDE)[12] were added in the 1967 benchmark to provide detail that was unavailable in the NIPAs.[13] These tables identify the I-O commodity composition of each of the NIPA expenditure categories for PCE and PDE, and they aid I-O users in the preparation of a "bill of goods"

[12] PDE is now termed private equipment and software (PES).

[13] The PCE bridge tables were first included as part of the benchmark I-O accounts in the publication of the 1967 table in the February 1974 issue of the *Survey of Current Business*. Earlier, a presentation of the 1958 PCE bridge table was published separately in the October 1965 *Survey*, and a presentation of the 1963 PCE bridge table was published in the January 1971 *Survey.*

for analysis. For example, the PCE bridge table breaks down the PCE category "off-premises food consumption" into individual food commodities—such as bread, milk, and meat—and the retail margins, the wholesale margins, and the transportation costs used to move the goods from producer to consumer (see the section "NIPA bridge tables" in Chapter 12, "Input-Output Modeling and Applications").

For the 1967 benchmark table, BEA prepared the first supplemental I-O tables for employment and employee compensation by industry. The data in these tables showed the employment, hours, and wages and supplements for each industry, defined on an I-O basis. Thus, these data could be used to extend the I-O analysis to include effects of specified events on employment, hours, and payrolls.

The preparation of the first capital flow table marked another significant expansion of the I-O accounts. The 1963 (published in August 1971) and the 1967 (published in September 1975) capital flow tables expanded the I-O transactions table to show detail on the industries acquiring fixed capital for their own use.[14] Capital flow tables have been produced for most of the subsequent I-O benchmarks. These tables are integral to the development of BEA's series on industry capital stock.

Continued improvements to the I-O accounts

In the publication of the 1972 I-O benchmark in 1979, BEA instituted a major break from past I-O conventions. In conformance with the 1968 SNA guidelines, BEA adopted the I-O framework of the "make" and "use" tables and changed the accounting method for secondary products. Previously, the "transactions" table, which was similar to a use table in that it showed industry inputs to industries and final users, was described as an industry-by-industry table, despite the fact that output was grouped by primary product. Under the old method, the movement of secondary products to the primary-product industry was accomplished by creating "fictitious" transactions or transfers that added output from secondary products to the industry in which the product was primary. The sales of these secondary products appeared in the input column for the primary industry, thereby distorting the inputs and artificially elevating the primary industry's output.[15] For example, the automotive industry produces tractors as a secondary product, so a transaction was created whereby the tractors produced by the automotive industry were treated as sales of autos by the automotive industry to the tractor industry as inputs.

This accounting method also distorted inter-industry relations. The transfer of secondary products into the primary-industry input columns created distortions in measuring the industry output, inter-industry relationships, and input coeffi-

[14] A capital flow table for 1958 was produced by BLS, based on the 1958 I-O table produced by BEA.

[15] The use of transfers required special handling of values when aggregating the tables. Transfers are included as a transaction only when the transfer is between industries. Thus, when two detailed industries are aggregated into one industry, the transfers between them disappear.

cients. For example, input coefficients might appear where none would logically be present. Moreover, the transfers created anomalies that were often hard to explain and difficult to correct. In our automotive example, the table would show that autos were "sold" to the tractor industry, though one would expect all sales by the automotive industry to be for final use. Further, if the inputs to auto output differ significantly from the inputs to tractor output, an analysis of the effect of an increase in the demand for tractors would show an increase in the demand for some inputs that are not actually used to produce tractors.

Beginning with the 1972 tables, BEA began preparing the two core I-O tables—a "make" table showing the production of commodities (both primary and secondary) by industry and a "use" table showing the utilization of commodities by both industry and final users. Instead of "transferring" secondary products, many secondary products were "redefined"—that is, the secondary products and their associated inputs were excluded from the industry that produced them and were included in the industry in which they were primary. These redefinitions were made only when the inputs differed significantly from those of the industry in which the production took place, and the inputs that were moved were those that matched the input structures of the receiving industry (see chapter 4). From 1972 through 1992, the make and use tables that were published were generally those that included the redefinitions. However, beginning with 1997, the "featured" make and use tables are those before the redefinitions. This change was made as part of the integration of the I-O accounts with the GDP-by-industry accounts and the NIPAs, as well as to make the I-O data consistent with most other data sources.

Beginning with the 1977 I-O table, BEA introduced coverage adjustments to account for the fact that some of the data used for the I-O tables are from tax returns, which are subject to taxpayer misreporting (see Chapter 5, "Output"). For the 1977 table, this adjustment added $34.4 billion to output and $21.8 billion to final demand. Similar adjustments have been made to subsequent tables.

Classification and accounting systems

Industry classification systems are essential tools for the development of I-O tables. The early I-O tables prepared by BLS and BEA were based on the Standard Industrial Classification (SIC) system, which dates back to 1941 and which focuses mainly on the manufacturing sector of the economy. In each of the subsequent tables, BEA updated the classifications and definitions. Major revisions were made in the 1972 table, which was published in 1979, to incorporate the 1972 SIC update, and similar revisions were made following the release of the 1977 and 1987 SIC updates. In addition, the methodological, classificational, and definitional changes that were made to the NIPAs were also incorporated into the I-O accounts on a regular basis.[16]

The 1997 I-O tables incorporated a new classification structure known as the North American Industry Classification System (NAICS) (see chapter 4). This classification system was developed jointly by the United States, Canada, and Mexico, with the aim of improving the comparability of their economic statistics. NAICS is based on the assumption that industries should be classified on the basis

of their production processes rather than on the basis of the products produced, which was generally the case under the SIC.

In 2002, the NAICS classifications—particularly in the wholesale trade, construction, and information sectors—were further updated. In addition, progress continues on the new North American Product Classification System, which will likely effect the classifications in future I-O tables.

I-O present and future

A number of changes are under way as we move toward the integration of the benchmark and annual I-O accounts with the GDP-by-industry accounts. Integration means that both sets of accounts will show the same estimates of value added by industry. This integration is designed to improve the quality of both sets of estimates by using the I-O framework.

In June 2004, BEA released its initial set of integrated GDP-by-industry accounts and annual I-O accounts; these accounts contain the same estimates of gross output and value added for 66 industries for 1998-2002 on a NAICS basis.[17] In late 2004, revised estimates for 2001 and 2002 and an initial set of estimates for 2003 were released.[18]

When the 2002 benchmark I-O table is released in 2007, it will be more closely integrated with the GDP-by-industry accounts. As the quality and quantity of data used to make industry inputs improves, the I-O tables can lead to improved measures of value added by industry. In 2004, BEA and the Census Bureau initiated programs to begin collection of annual expense data for industries. These new data will enable improvements to the estimates of value added by industry.

In 2005, BEA began exploring the conversion of the currently published make and use tables to the basic value supply and use tables format recommended by the 1993 SNA. Conversion to this format would greatly improve the consistency and comparability of the U.S. I-O tables with the I-O tables produced by most other countries.

In the future, the I-O framework will continue to play a vital role in economic analysis and development, and the detail and content of the I-O tables will

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[16] The I-O classification system used for the 1958 through the 1982 tables was essentially consistent across all years at the summary (85-industry) level of detail. Additionally, the more detailed tables for those years could be aggregated to be consistent with the detailed tables from prior years. This consistency feature facilitated the analysis of changes in industry structure over time. Beginning with the 1987 benchmark I-O tables and the major revisions due to the introduction of NAICS, the desire for consistency across years has been subordinated to the importance of better depicting the current structure of the U.S. economy and the desire for consistency among U.S. economic statistics.

[17] Brian C. Moyer, Mark A. Planting, Paul V. Kern, and Abigail M. Kish, "Improved Annual Industry Accounts for 1998-2003: Integrated Annual Input-Output Accounts and Gross-Domestic-Product-by-Industry Accounts," *Survey of Current Business* 84 (June 2004): 21-57.

[18] George M. Smith, Matthew J. Gruenberg, Tameka R.L. Harris, and Erich H. Strassner, "Annual Industry Accounts for 2001-2003," *Survey of Current Business* 85 (January 2005): 9-43. See also George M. Smith and Sherlene K.S. Lum, "Annual Industry Accounts: Revised Estimates for 2002-2004," *Survey of Current Business* 85 (December 2005): 18-69.

need to change to keep pace with the ever-evolving U.S. economy. Improvements in the I-O tables will also reflect progress in three interrelated areas. First, technological advancements will enable faster and more accurate analysis of highly complex data sets. Second, more comprehensive surveying techniques will facilitate higher quality data and greater information detail. Third, the integration of an international template for I-O reporting will facilitate international comparisons.

Table 1.1 Make table: Industries producing commodities

INDUSTRIES	COMMODITIES: Agriculture, forestry, fishing, and hunting	Mining	Utilities	Construction	Manufacturing	Wholesale trade	Retail trade	Transportation and warehousing	Information	Finance, insurance, real estate, rental, and leasing	Professional and business services	Educational services, health care, and social assistance	Arts, entertainment, recreation, accommodation, and food services	Other services, except govern-ment	Government	Other	Scrap, used and second-hand goods	TOTAL INDUSTRY OUTPUT
Agriculture, forestry, fishing, and hunting	■																	
Mining		■																
Utilities			■															
Construction				■														
Manufacturing					■													
Wholesale trade						■												
Retail trade							■											
Transportation and warehousing								■										
Information									■									
Finance, insurance, real estate, rental, and leasing										■								
Professional and business services											■							
Educational services, health care, and social assistance												■						
Arts, entertainment, recreation, accommodation, and food services													■					
Other services, except government														■				
Government															■			
TOTAL COMMODITY OUTPUT																		

■ Total industry output

■ Total commodity output

■ Primary product of the industry

Table 1.2 Use table: Commodities used by industries and final uses

		INDUSTRIES																FINAL USES (GDP)							TOTAL COMMODITY
		Agriculture, forestry, fishing, and hunting	Mining	Utilities	Construction	Manufacturing	Wholesale trade	Retail trade	Transportation and warehousing	Information	Finance, insurance, real estate, rental, and leasing	Professional and business services	Educational services, health care, and social	Arts, entertainment, recreation,	Other services, except government	Government	Total Intermediate	Personal consumption expenditures	Private fixed investment	Change in private inventories	Exports of goods and services	Imports of goods and services	Government consumption expenditures and gross	Total final uses (GDP)	
COMMODITIES	Agriculture, forestry, fishing, and hunting																								
	Mining																								
	Utilities																								
	Construction																								
	Manufacturing																								
	Wholesale trade																								
	Retail trade																								
	Transportation and warehousing																								
	Information																								
	Finance, insurance, real estate, rental, and leasing																								
	Professional and business services																								
	Educational services, health care, and social assistance																								
	Arts, entertainment, recreation, accommodation, and food services																								
	Other services, except government																								
	Government																								
	Other																								
	Scrap, used and secondhand goods																								
	Total Intermediate																								
VALUE ADDED	Compensation of employees																								
	Taxes on production and imports, less subsidies																								
	Gross operating surplus																								
	Total value added																								
TOTAL INDUSTRY OUTPUT																									

Total industry output

Total commodity output

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CHAPTER 2: BUSINESS ACCOUNTS, NATIONAL ACCOUNTS, AND INPUT-OUTPUT ACCOUNTS

Most of the estimates in the national income and product accounts and the input-output (I-O) accounts are derived from information recorded in business accounting statements. This chapter describes the basic business accounting statements and illustrates the steps followed to convert a business income statement into a production account on a national income basis and on an I-O basis. It then illustrates how the accounts for individual firms can be consolidated to derive the I-O use table.

The aggregate transactions in the national and industry accounts take place among and within four individual sectors—business, households, government, and foreign—of the nation's economy. Business is by far the largest sector, accounting for about 87 percent of U.S. production. Thus, in order to accurately estimate the output of the economy, it is imperative to correctly measure the production activities of business. An understanding of the relationship between business accounting practices and the principles of national accounting and input-output (I-O) accounting is essential to understanding the process by which the data collected from business are translated into the statistics presented in these accounts.

Two basic business accounting statements of the company's financial condition are the balance sheet and the income statement.[1] The balance sheet is an important data source for the NIPA investment accounts, but it is not directly used for the I-O accounts. The income statement provides detailed data on company revenues and expenses that are critical for preparing the national accounts statement of production and the I-O statement of output.

The examples used in this chapter are designed to illustrate the fundamental relationships between financial accounting and national income and I-O accounting presentations. They are not meant to represent the variety of accounting presentations made by companies in accordance with current financial practices.

Balance sheet

The balance sheet provides a statement of the company's financial position at a specific point in time, usually the end of the company's fiscal year (see table 2.1). In the balance sheet, the assets of the company are equal to the liabilities plus the stockholders' equity. Assets are the physical, financial, and other holdings of the company. They comprise current assets—such as cash, inventories, and

[1] The income statement is sometimes known as the "statement of income and retained earnings." Businesses also use another accounting statement—the change in financial position (sometimes known as the "cash-flow" statement). All three of these statements and their relationship to the national income and product accounts are discussed in *An Introduction to National Economic Accounting, Methodology Paper Series, MP-1* (see BEA's website at www.bea.gov/bea/mp.htm).

accounts receivable; investments, such as security holdings; and fixed assets (the stock of plant and equipment net of accumulated depreciation). Liabilities are debts owed to the company's creditors. They comprise current liabilities—such as accounts payable, and long-term liabilities, such as 20-year company bonds. Stockholders' equity, sometimes known as owners' equity, is conceptually derived as a residual or balancing item—that is, as assets minus liabilities. It consists of capital stock and retained earnings.

Table 2.1 Sample End-of-Year Balance Sheet

ASSETS		LIABILITIES AND STOCKHOLDERS' EQUITY	
Current assets	100	Current liabilities	50
Investments	20	Long-term liabilities	10
Fixed assets	25	Stockholders' equity	85
		Capital stock	80
		Retained earnings	5
TOTAL	**145**	**TOTAL**	**145**

Income statement

The income statement summarizes a company's income and the disposition of that income over a specified period of time. Typically, the company prepares an income statement for each quarter of the year and for the company's fiscal year.

BEA relies heavily on the data used to compile income statements to construct the I-O tables. The income statement shows profits and losses from the company's operating revenues, and it matches these revenues with the costs directly associated with earning them. Net income is also derived from the accounting of revenues and costs. Although the formats of income statements may vary, they generally provide information on the following: Revenues from operations, operating costs or expenses, and nonoperating income and expenses (see table 2.2).[2]

There are a few important items to note from the sample income statement. First, entries are made for inventories in order to calculate the change in inventories—the difference between beginning-of-year and end-of-year levels. The flows into and out of inventories during the year must be accounted for in order to correctly compute gross income on sales as revenues minus cost of goods sold.[3]

[2] Income statements come in a variety of forms depending on the type of business and the reporting requirements of the company. The sample in table 2.2 shows typical elements found in the income statements for a variety of businesses.

[3] For a company engaged in wholesale or retail trade, the composition of cost of goods sold is slightly different. Purchases of services and inventories of materials and supplies are excluded from the calculation of cost of goods sold; instead, these entries are included separately as "other costs."

Table 2.2 Sample Yearly Income Statement

REVENUE:		
Sales, net of discounts		300
Costs and expenses:		
Purchased goods and services	150	
Materials and supplies inventory		
Plus: Beginning-of-year	30	
Less: End-of-year	20	
Finished-product and work-in-process inventory		
Plus: Beginning-of-year	20	
Less: End-of-year	25	
Equals: Cost of goods sold		155
OPERATING EXPENSES:		
Wages and salaries	100	
Depreciation	10	
Business and property taxes	5	
Total operating expenses		115
INCOME FROM OPERATIONS (GROSS INCOME LESS OPERATING EXPENSES)		30
OTHER INCOME (EXPENSES):		
Interest earned	8	
Interest paid	-4	
Gain or loss on disposal of assets	-2	
Total		2
INCOME (INCOME FROM OPERATIONS PLUS OTHER INCOME)		32

Second, the entries for operating expenses provide detailed information on expenses that are directly incurred as part of the company's operations. These expenses are included in the value-added components of the I-O accounts. To compute income from operations, the operating expenses are subtracted from gross income on sales.[4]

Third, the entries in the "other income (expenses)" category cover income and expenses that are not related to the productive activities of the firm. These entries include gains and losses from nonoperating sources, such as investments, and holding gains or losses on the sale of assets.

[4] The terms "cost of goods sold" and "operating expenses" are used differently in the accounting example and the I-O accounts. For the I-O accounts, cost of goods sold generally refers to the cost of goods sold by wholesalers and retailers, and operating expenses includes materials and supplies, purchased services, compensation, taxes, and depreciation.

Both of these business accounting statements, as well as the national accounts statements, which will be discussed next in this chapter, take advantage of double-entry bookkeeping practices.[5] In double-entry bookkeeping, entries involving different aspects of the same transaction or activity are made in both the balance sheet and the income statement. For example, if a company's income statement shows that it realized net income during the year, the company's end-of-year balance sheet will reflect a higher level of investments or a lower level of liabilities, either of which would result in higher stockholders' equity. Accounting entries for inventories, which are important information for the I-O tables, are included in current assets in the balance sheet, and they also appear in the cost-of-goods-sold schedule of the income statement.

From income statement to T-accounts

National economic accountants use a format known as "T-accounts" to present and analyze concepts and relationships.[6] Some business accounting statements, such as the balance sheet, use similar formats, but these have not typically been referred to as T-accounts in the accounting literature. The standard format for T-accounts places "debits" in the left-hand column and "credits" in the right-hand column. In the income statement, expenses and dispositions of income are debits, and revenues received by the firm are credits. In national income accounting, the left-hand entries are commonly referred to as "uses," and the right-side entries, as "sources."[7]

One of the main goals of national economic accounting is to measure the nation's production, or gross domestic product (GDP). GDP is generally measured as the sum of goods and services sold to final users and of the change in private inventories. It can also be measured as the sum of the incomes generated in the production of these goods and services, or gross domestic income (GDI). Additionally, production can be measured as the sum of the value added by each entity (for example, company) in the economy—that is, as the total of the entities' sales adjusted for change in inventories minus their consumption of "intermediate goods and services" from other producers.[8] In each of these cases, production represents gross unduplicated output—that is, the output of goods and services for final use. In contrast, the concept of output that is the focus of the I-O tables is gross dupli-

[5] See *System of National Accounts*, 1993: 11.

[6] The "T" in "T-accounts" has no theoretical importance and does not represent an abbreviation. The name is derived from the "T" that is formed by the horizontal line above the columns meeting the vertical line that divides the debit and credit columns.

[7] A trick to remembering these terms is to use the mnemonic device of DC and US for debits (left)/credits (right) and uses (left)/sources (right).

[8] Because data are not perfect, the three methods will usually yield estimates that differ for statistical reasons. In the United States, the first two methods are used to derive both annual and quarterly estimates. The first method (often called the "sum of expenditures") yields GDP, and the second (often called the "sum of incomes"), GDI; the difference between GDP and GDI is the "statistical discrepancy."

cated output—that is, the output before intermediate goods are deducted from sales. (See Chapter 5, "Output.")

The first step in the consolidation of the business income statements into the national product accounts is to restructure the income statements of businesses (shown in table 2.2) into a T-account framework (see table 2.3). The sources of the company's funds are on the right side of the account, and the uses are on the left side of the account. Net income is the balancing item.

Table 2.3 Business Income Statement Restated as a T-Account

USES		SOURCES	
Cost of goods and services purchased	150	Sales, net of discounts	300
Finished-product and work-in-process inventory	20	Interest earned	8
Plus: Beginning-of-year	25		
Less: End-of-year			
Materials and supplies inventory		Gain or loss on sale of assets	-2
Plus: Beginning-of-year	30		
Less: End-of-year	20		
Wages and salaries	100		
Depreciation	10		
Business and property taxes	5		
Interest paid	4		
Net income	32		
TOTAL	**306**	**TOTAL**	**306**

Converting the income statement into a production account

Converting the business T-account shown above into one that features GDP is accomplished by limiting the sources (right side) to only those items that compose GDP and by limiting the uses (left side) to only those items that compose GDI (see table 2.4). This conversion involves a series of adjustments. Because the account must be kept in balance, these adjustments are carried out by performing the same mathematical operations on both sides of the account.

1. The "cost of goods and services purchased" consists of sales from one industry to another industry; thus, it represents duplicated output that must be removed in deriving GDP. This adjustment is carried out by subtracting the cost of goods and services purchased from both sides of the account. As a result of this adjustment, the cost of goods and services purchased has disappeared from the uses side of the account, and it reappears on the sources side as a negative entry that cancels out duplicated output in the calculation of GDP.
2. Inventories consist of output from current or prior periods that is being held or disposed of; thus, the change in inventories over the current period must be included in deriving GDP. This adjustment

is carried out by adding the change in inventories (ending less beginning inventories) to both sides of the account. As a result, the inventory entries have moved from the uses side of the account and to the sources side.[9]

3. All receipts not related to current production—that is, the "other income (expenses)" entries—must be removed in deriving GDP. This adjustment is carried out by first subtracting interest received from both sides of the account; by convention in the national accounts, interest paid by business is defined as interest payments by business less interest receipts by business and is shown as "net interest paid" (4 – 8 = -4). Second, the gain or loss on the sale of assets is subtracted from both sides of the account. In this example, the sale of assets resulted in a loss, so the subtraction of this loss from the left side of the account raises net income (32 – -2 = 34). As a result of these adjustments, the entries for receipts not related to current production have moved from the sources side of the account to the uses side.

After these adjustments are made, the sources (right) side of the restated business income statement sums to the GDP definition, and the uses (left) side sums to GDI.

Table 2.4 Business Income Statement Restated as a Production Account

USES		SOURCES	
Wages and salaries	100	Sales, net of discounts	300
Depreciation	10	Less: Cost of goods purchased	150
Business and property taxes	5	Plus: Total change in inventories	-5
Net interest paid	-4	Less: BOY FP&WIP	20
Net income	34	BOY M&S	30
		Plus: EOY FP&WIP	25
		EOY M&S	20
GROSS DOMESTIC INCOME	**145**	**GROSS DOMESTIC PRODUCT**	**145**

NOTE: Net interest and net income are implicitly included in net operating surplus.
BOY = beginning-of-year, EOY = end-of-year, FP = finished-product inventory, WIP = work-in-process inventory, M&S = materials and supplies inventory

[9] Note that before the adjustment, on the uses side of the account, end-of-year inventories are subtracted from beginning-of-year inventories, while after the adjustment, on the sources side of the account, beginning-of-year inventories are subtracted from end-of-year inventories.

Note also that the calculation of GDP includes the consolidated accumulation of materials and supply inventories even though, for the individual company, no production has taken place. This is explained by the fact that the materials and supplies that are added to the inventories of an individual company represent production during the accounting period by other domestic companies (or imports) that would not otherwise be counted.

Converting the income statement into an I-O account

Converting the business income statement into an account that focuses on I-O involves some of the same steps that were followed to convert it into a production account. However, there are several important differences. First, because the appropriate concept of output for the I-O accounts is gross duplicated output, it is not necessary to eliminate the cost of goods and services purchased from the uses side of the account (see table 2.5).

Second, the use of, or net reduction in, finished-product and work-in-process inventories must be recorded as output on the sources side of the account—the beginning-of-year levels must be subtracted from, and the end-of-year levels must be added to, both sides of the business account. However, note that the entries for materials and supplies inventories remain on the uses side of the account. Thus, the I-O presentation includes the inventories on both sides of the account (materials and supplies on the uses side and the finished product and work in process on the sources side), whereas the production account includes the *accumulation or decumulation* of all stages of fabrication on the sources side of the account.

For both the production and the I-O accounts, the same adjustments are made to remove the receipts that are not related to current production from the sources side of the T-account.

After the adjustments, the sources side of the rearranged business income statement reflects the I-O concept of gross duplicated output, and the uses side reflects the I-O concept of intermediate consumption plus value added.

Table 2.5 Business Income Statement Rearranged for the Input-Output Accounts

USES		SOURCES	
Consumption		Gross output	
Cost of goods and services purchased	150	Sales, net of discounts	300
Plus: BOY M&S inventory	30	Less: BOY FP&WIP inventory	20
Less: EOY M&S inventory	20	Plus: EOY FP&WIP inventory	25
Total consumption	160		
Value added			
Wages and salaries	100		
Business and property taxes	5		
Depreciation	10		
Net interest paid	-4		
Net income	34		
Total value added	145		
INTERMEDIATE AND VALUE ADDED	**305**	**GROSS DUPLICATED OUTPUT**	**305**

Consolidation of business accounts

The T-accounts of individual firms may then be consolidated to form the I-O accounts. To illustrate, assume a two-sector economy consisting of industry A and industry B with one company in each industry (see table 2.6).

Table 2.6 T-Accounts for Industries A and B

USES			SOURCES		
	INDUSTRY			INDUSTRY	
A		B		A	B
Consumption			Gross output		
Cost of goods and services purchased	150	40	Sales, net of discounts	300	150
Plus: BOY M&S inventories	30	5	Less: BOY FP&WIP inventories	20	10
Less: EOY M&S inventories	20	10	Plus: EOY FP&WIP inventories	25	12
Total consumption	160	35			
Value added					
Wages and salaries	100	20			
Business and property taxes	5	2			
Depreciation	10	0			
Net interest paid	- 4	0			
Net income	34	95			
Total value added	145	117			
TOTAL	**305**	**152**	**TOTAL**	**305**	**152**

The information provided for these two industries enables us to fill in portions of a simplified I-O use table (see table 2.7).[10] Note that this is a preliminary I-O table in that all of the elements are not yet present; no columns are shown for final uses because the information is not available for allocating spending among uses. In the value-added portion of the table, wages and salaries are included in the compensation row, followed by taxes on production and imports less subsidies, and the remaining components (depreciation, net interest paid, and income before taxes) are included in gross operating surplus. Outputs are shown in the commodity-output rows and in the industry-output columns.

[10] In this example, each industry produces only a primary product and no secondary products.

Table 2.7 Preliminary Input-Output Use Table

	INDUSTRY		TOTAL INTERMEDIATE	OUTPUT
	A	B		
Commodity A				**305**
Commodity B				**152**
Total intermediate	160	35	195	
Total value added	145	117	262	
Compensation	100	20		
Taxes on production and imports less subsidies	5	2		
Gross operating surplus	40	95		
OUTPUT	**305**	**152**	**457**	**457**

Consumption and inventory change

In order to complete the I-O table, information is required for the disposition of sales and for the specific inputs consumed by the two industries. By making the following simplifying assumptions, we can add some final-uses columns:

- Industry A produces only commodity A, and it purchases only commodity B as intermediate inputs. In this example, industry A purchased inputs of commodity B valued at $150 from industry B.
- Industry A reduced its inventories of materials and supplies (M&S) by $10 (from $30 to $20) during the year.
- Similarly, industry B produces only commodity B, and it purchases only commodity A as intermediate inputs. In this example, industry B purchased inputs of commodity A valued at $40 from industry A.
- Industry B increased its inventories of materials and supplies (M&S) by $5 (from $5 to $10) during the year.
- All of the output of these two industries that is not purchased by the other industry is either sold to consumers or reflected in inventory investment.

Thus, industry A's consumption for the period was $160 ($150 + $10). Because industry A only consumes commodity B from industry B, industry A's beginning M&S inventory must consist of commodity B that was produced in prior periods. Similarly, industry B's consumption for the period was $35 ($40 – $5).

Table 2.8 summarizes the calculation of inventory change by industry and commodity. Industry A both produces and holds commodity A, and industry B both produces and holds commodity B. In addition, each industry holds output from the other industry as M&S inventories. Thus, in calculating inventory change, values are placed in the table cells where the commodity and industry are the same for FP&WIP inventories, and values are placed in the table cells where

the commodity and industry are different for M&S inventories (these values come from table 2.6).

Table 2.8 Calculation of Inventory Change

	FINISHED-PRODUCT AND WORK-IN- PROCESS INVENTORY CHANGE		MATERIALS AND SUPPLIES INVENTORY CHANGE		TOTAL INVENTORY CHANGE
	INDUSTRY A	INDUSTRY B	INDUSTRY A	INDUSTRY B	
Commodity A	-20 + 25 = 5			-(5 - 10) = 5	10
Commodity B		-10 + 12 = 2	-(30 - 20) = -10		-8

Completion of the I-O use table

The I-O use table can then be completed by using the previously developed output and intermediate estimates and inventory-change estimates along with some assumptions about final uses (see table 2.9). (Note that for the purpose of this table, the inventory change could have been calculated directly from the information on total inventories, and the stage of fabrication detail is not needed; however, as discussed earlier, this detail is required for the calculation of I-O output.)

- Total output of commodity A is $305 (from table 2.6 and the assumption that the only producer of commodity A is industry A). Of the $305 of output, $35 is intermediate purchases (determined from the consumption of intermediate by industry B in table 2.7).
- Final uses of commodity A (total output less total intermediate purchases) is equal to $270 ($305 – $35).
- This $270 is then distributed to personal consumption expenditures (PCE) and to inventory change (the only final-use categories shown in this table). Inventory change for commodity A is $10 and the total final uses is $270, so PCE for commodity A is $260 ($270 – $10).

The same technique is used to derive the values for commodity B. For a detailed description of the data sources and methods for allocating commodities to intermediate purchases and to the various categories of final uses, see Chapter 6, “Transactions.”

Table 2.9 Input-Output Use Table

	INDUSTRY		TOTAL INTERME-DIATE	FINAL USES			OUTPUT
	A	B		PCE	INVEN-TORY CHANGE	TOTAL	
Commodity A		35	35	260	10	270	**305**
Commodity B	160		160	0	-8	-8	**152**
Total intermediate	160	35	195				
Total value added	145	117	262				
Compensation	100	20					
Taxes on production and imports less subsidies	5	2					
Gross operating surplus	40	95					
OUTPUT	**305**	**152**		**260**	**2**	**262**	**457**

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CHAPTER 3: DATA SOURCES

The benchmark input-output (I-O) accounts are prepared by incorporating a vast amount of information from a wide variety of sources. This chapter leads with a discussion of the primary I-O data source, the Economic Census, which is conducted once every 5 years by the U.S. Bureau of the Census. It then describes source data from other Census Bureau programs and concludes with descriptions of several other important data sources.

The preparation of the input-output (I-O) tables begins with identifying and obtaining the vast amount of source data that are required to effectively measure and relate the industry inputs and outputs. It is critical that I-O analysts know the sources of the data used to prepare the tables, the purposes for which they are used, and the limitations on their use.

The most important source for data is the U.S. Bureau of the Census, the largest statistical agency in the Federal Government. Although the Census Bureau is best known for collecting and publishing the demographic statistics for the United States, much of the agency's work involves collecting and publishing economic data. The primary data source for the benchmark I-O tables is the Economic Census, which the Census Bureau conducts about every 5 years.

The Economic Census is the preferred data source for the I-O tables because it provides the most comprehensive data available in terms of industry coverage and in the measurement of the economic units in those industries. The Economic Census collects most of the essential data required for the tables—such as receipts, inventories, and payrolls—and the data are collected at the level of the smallest operating unit, the "establishment." In addition, the Census Bureau's collection procedures are designed to ensure that no individual establishment is counted more than once. Thus, by relying on the Economic Census data wherever possible, BEA is able to limit duplications that could occur when the Economic Census is used in conjunction with other sources.

Despite its comprehensiveness, the Economic Census is not a complete canvas or count of all of the economic units in the economy. The activities of the small businesses covered in the Census are measured by sampling or by administrative records rather than by direct reports from each individual business. In addition, some economic units and some industries are not included in the Economic Census. Data from other sources are needed to fill these gaps. Further, additional data are needed to carry out the various adjustments that are made in transiting from the Census data to the I-O estimates.

Much of the additional data required to prepare the I-O tables comes from other Census Bureau programs—including annual surveys that cover selected industries, such as manufacturing and services.[1] The I-O tables also incorporate data collected and tabulated by other Federal agencies—including the U.S. Departments of Agriculture, Education, and Energy—and data from a number of private organizations.

For a list of the major source data that are incorporated into the I-O estimates, see appendix tables 3.A and 3.B at the end of this chapter.

Keeping the source data relevant

In order to improve the quality of the source data available for preparing the I-O tables, BEA regularly consults with the Census Bureau staff about issues relating to the Economic Census and other statistical programs. These issues could involve initiating the collection of data previously not included in the Census Bureau programs or refining the definitions of economic flows or of accounting specifications used in the surveys so that they more closely reflect I-O concepts.

A number of formal arrangements are in place to facilitate these consultations—including interagency committees, the Office of Management and Budget forms review process, and Census Bureau advisory committees. Additionally, day-to-day contacts between BEA and Census Bureau staff may cover such topics as what types of data are important, definitions of statistics collected, wording of report forms, and procedures for drawing statistical samples.

These frequent exchanges of information are essential to the challenge of keeping our statistics accurate and relevant in the environment of a vibrant, ever-changing U.S. economy. Products and even whole industries may come and go, and industrial structure and processes may alter dramatically. Examples of these types of changes include the following: Innovations in technology, such as computers and software, Internet transactions, cellular phones, and genetic drugs; introductions of new financial instruments, such as “derivatives”; regulation or deregulation in specific markets, such as the recent restructuring in the communication and broadcasting industries; and shifts in consumer tastes, such as demand for fingernail-care and pedicure services.

Specifically, I-O analysts must collaborate with Census Bureau data-collection staff to identify changes that affect the industry data. Together, we must be able to adapt data-collection procedures, to develop new adjustments to the data, and to make any other changes necessary to keep the I-O estimates in conformance with the concepts of I-O accounting. In particular, we must be alert to new industries entering the economy, which if missed, could result in less than optimal requirements coefficients, and to transformations in existing industries, which if missed, could dilute the homogeneity of the production functions of industries and commodities.

However, we must also be aware of the limitations on the ability of the Federal statistical agencies, such as the Census Bureau, to collect data from the variety of entities that make up our economy. The most important limitation is that not all of the measures desired by economic analysts are available from the various accounting records maintained by business (see Chapter 2, “Business Accounts,

[1] Information on industry expenses and sales taxes are generally collected using annual surveys. The Census Bureau also conducts quarterly and monthly surveys; data from some of these surveys are incorporated into other economic accounts, including the national income and product accounts.

National Accounts, and Input-Output Accounts"). In addition, the agencies are constrained both by the amount of the funding provided for their operations and by the provisions of the "Information Collection Budget," which, in accordance with the Paperwork Reduction Act of 1995, directs the Office of Management and Budget to monitor the reporting burden on businesses and others who fill out U.S. Government survey forms. As a result of these limitations, the desire for new areas of data gathering must be balanced against the needs for the data that are already being collected.

Why "establishment" data?

The meaning and interpretation of the data collected from businesses, particularly data on industrial activity, greatly depends upon the level of operation at which the data are reported. A business can be established in a number of legal ways—generally as a corporation, a sole proprietorship, a partnership, or a nonprofit institution. Data collection and classification for sole proprietorships and partnerships tends to be relatively straightforward, because these businesses usually operate at a single location and their activities usually fall within a single industry. However, some corporations, such as vertically and horizontally integrated companies, may encompass multiple operations.

"Vertically integrated" companies consist of operating units that are involved in many or all of the stages of production, delivery, and sales of a single product or of related products. For example, automotive companies may own operational units that carry out a broad range of activities: Manufacturing individual parts; assembling these parts into major components (for example, chassis or motors), assembling complete vehicles, transporting the vehicles to retail dealers, and financing new-car purchases. Similarly, oil companies may operate exploration units that search for oil, real estate units that purchase or lease drilling rights, development units that drill wells, production units that refine crude oil, and distributive units that transport and retail gasoline.

"Horizontally integrated" companies consist of operating units that cross industrial categories that may be only partly related or even unrelated. For example, a "publishing company" might own newspapers, magazines, radio and TV broadcasting stations, radio and TV networks, movie production companies, and major league sports teams. A company that crosses many unrelated lines of business is sometimes called a "conglomerate," and a company that operates in more than one country is sometimes called a "multinational corporation."

Because these multi-unit companies are engaged in a wide variety of industry activities, the data collected and tabulated from their company reports usually do not provide the homogeneous production data from which stable I-O relationships can be garnered. Thus, the establishment level is the preferred level of operating unit for reporting economic activity for I-O tables (and for many other statistical uses). As defined by the Census Bureau, an establishment is "a business or industrial unit at a single physical location that produces or distributes goods or that performs services."[2]

Some multi-establishment companies include units that do not produce products or provide services for sale either to other businesses or to final users; rather, these units provide administrative or support services to the "operating" establishments of the business. Such units—which include corporate offices, accounting and finance offices, and legal offices—are sometimes known as central administrative offices (CAOs) or "auxiliaries." In cases where the company operates across industry lines, it may be difficult to estimate and allocate the output of the auxiliaries to the appropriate industry.

The Economic Census

The Economic Census can be dated back to 1810, when a few questions on manufacturing were added to the Census of Population.[3] These questions were added shortly after James Madison became president; earlier, in meetings of the Constitutional Convention, he had urged that the Census be used for more than just a head count. Gradually, the scope of the Economic Census expanded, and data collection and processing were systematized. The 1905 Manufacturers Census marked the first time a census was taken separately from the decennial population census. Censuses for retail and wholesale trade and for construction were added for 1930, and some service trades were added for 1933.

The 1954 Economic Censuses were the first to be fully integrated: By using consistent time periods, concepts, definitions, classifications, and reporting units, they provided comparable census data across economic sectors.[4] These censuses were the first to be taken by mail, using lists of firms provided by the administrative records of other U.S. Government agencies. Since 1963, administrative records have also been used to provide basic statistics for very small firms, thereby reducing or eliminating the need to send them questionnaires. Beginning with 1967, the reference years for the Economic Census have been years ending in "2" and "7." Collecting and compiling the data for those years seems optimal for spacing out that work with the work required for the decennial Census of Population and Housing.

The Economic Census has grown from a few questions on manufacturing in the 1810 Census of Population to nearly 500 questionnaire variations that collected data from 3.7 million companies representing over 5 million business establishments in 1,056 industry classifications in the 1997 Economic Census. In addition, by using administrative records, the Census Bureau compiled data on 14

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[2] *History of the 1997 Economic Census*: 5. However, even individual establishments may produce commodities (goods and services) in more than one category, so additional adjustments to their data may still be required.

[3] For more information, see *Guide to the 1997 Economic Census and History of the 1997 Economic Census* on the Census Bureau's website.

[4] Prior to the 1997 Economic Census, these Censuses were referred to in the plural—that is, as "Economic Censuses"—because they were considered to be compilations of distinct censuses for each major industry.

million businesses without paid employees and on 1.5 million small-business employers.

The 1997 Economic Census used the North American Industry Classification System (NAICS) as the basis for industry classification; earlier censuses had used the U.S. Standard Industrial Classification (SIC) system. Compared with the SIC, NAICS greatly expanded the coverage of services and information-oriented industries. Under NAICS, economic activity is classified into 20 major sectors at the two-digit level; most of the detailed I-O industries correspond to the NAICS classifications at the six-digit level. (For more information, see Chapter 4, "Classification and Secondary Products.")

The Census universe

In order to understand the most important coverage adjustments that are made in transiting from the Census data to the I-O tables, it is helpful to understand the procedures used in the Economic Census to develop a comprehensive "universe" (mailing list or directory) of businesses to canvas. The Economic Census uses a centralized, multipurpose, computerized data file of U.S. business establishments and companies that includes both those with employees and payrolls and those without employees and payrolls (nonemployers). This list, now called the Business Register, first became operational as the Standard Statistical Establishment List (SSEL) for data year 1974. "Businesses" are legal or administrative entities that are assigned an employer identification number (EIN) by the Internal Revenue Service (IRS). For the 1997 Economic Census, the Business Register included over 19 million businesses—180,000 multi-establishment companies with about 1 1/2 million affiliate establishments, 5 million single-establishment companies, and nearly 14 million nonemployer businesses.

The Business Register database consists of two cross-classified databases, one for single-establishment companies and one for multi-establishment companies. In addition to the EIN and the Business Register identification number, the records contain the company name and address, the industry classification, the geographic code, the legal form of organization, and some operating data (receipts, payroll, etc.). By matching the EINs assigned to each establishment with employees to the Business Register identification numbers, the Census Bureau links and identifies affiliations for parent companies, subsidiary firms, and their establishments. The operating data are from the Census Bureau's Company Organization Survey (COS) and from IRS records for employment and payroll. The COS consists of a "Report of Organization" questionnaire that is sent annually to all multi-establishment companies with 50 or more employees and to a sample of smaller multi-establishment companies. The Business Register also uses information from the Social Security Administration (SSA) and the Bureau of Labor Statistics to develop the mailing list for the Economic Census.

Report forms and sampling

The 1997 Economic Census covered over 14 million establishments. In order to reduce respondent burden, whenever possible, Census forms were not sent

to the smallest establishments; rather, their classifications were determined and their data were compiled from administrative records provided by IRS and SSA. In cases where the Census Bureau lacked sufficient information to classify an establishment into a six-digit NAICS category, that establishment was sent a "Classification Form." This form asked for only a limited number of identification and data items for classification purposes, and the rest of the data for that establishment was compiled from administrative records. The remainder of the respondents to the Economic Census received either the short or the long survey form. (See table 3.1.)

Table 3.1 Contents of Economic Census Report Forms

This table summarizes the content of the report forms used in the Economic Census. The questionnaire items for manufacturing are used as examples. Note that the long questionnaires contained much more detail than listed below, but the questions were very industry specific and could not be easily summarized.

Basic data items requested of all respondents:

- Employer identification number (EIN)
- Physical location of economic activity
- Number of employees
- Payroll
- Value of sales, receipts, work done, or equivalent

The short questionnaire for manufacturing included the above items, plus the following:

- Value of products exported
- Total capital expenditures and gross value of depreciable assets (excluding land)
- Total rental payments (buildings, machinery, and equipment, including land)
- Cost of materials
- Value of inventories
- Legal form of organization

The long questionnaire for manufacturing included the short questionnaire items plus the following standardized items:

- Employer's cost for fringe benefits
- First-quarter payroll before deductions
- Plant hours worked by production workers
- Total shipments and other receipts, value of products exported, and shipments to other domestic plants
- Cost of materials and contract work
- Establishment inventories at end of year, depreciable assets, capital expenditures, and retirement of debts
- Rental payments
- Selected purchases of services
- Quantity of electricity used (kilowatt hours)
- Total depreciation charges
- Method of valuation of inventories not subject to last-in, first-out (LIFO) costing
- Ownership, control, and location

Source: History of the 1997 Economic Census (Census Bureau website).

The long form was sent to the establishments of all multi-establishment companies and to the largest single-establishment companies. These establishments were subject to an intense follow-up collection effort in order to ensure as complete coverage as possible.

In order to minimize respondent burden, only a portion of the smaller single-establishment firms were surveyed. The universe of these establishments was stratified and sampled using formulas designed to enable the Census Bureau to compile reliable estimates for industries at specified geographic levels. Cutoffs were established so that the sampled establishments would account for only about 3 percent of the total receipts for each industry.[5]

As an example, the 1997 Economic Census report on *Nonemployer Statistics* shows about 10.8 million service establishments (employer and nonemployer) in the services industries. The mailout for these industries broke down as follows: 662,000 companies received the classification form, 330,000 multi-establishment companies and 651,000 large single-establishment companies received long forms, and about 49,000 establishments (about 3.1 percent) were sampled to represent the remaining 1.55 million smaller single-establishment companies. The remaining 7 million nonemployer establishments were not surveyed, but estimates were developed from administrative records.

For the 1997 Economic Census, the Census Bureau published data reports for all the major two-digit NAICS categories except for agriculture, forestry, fishing, and hunting and for public administration. For mining, construction, and manufacturing, reports on industry statistics, product statistics, and materials consumed were issued at the six-digit NAICS industry level. For the other major sectors, reports by revenue lines or product lines were published.

Because payroll-tax records are at the heart of the Census Bureau's system for keeping track of businesses between censuses, nonemployers do not receive Economic Census forms, and their statistics are not reflected in any of the core business statistics reports. However, beginning with 1972 Economic Census, statistics for the number of nonemployer establishments and the value of their receipts have been tabulated and published separately. These statistics are derived primarily from IRS administrative records. Most of the nonemployer establishments are sole proprietorship businesses (that is, the "self-employed") that file Form 1040, Schedule C, "Profit or Loss from Business." The rest are partnerships and corporations that file tax returns but report no paid employees. These partnerships and corporations are covered in the Census Bureau's annual *County Business Patterns* report, which is discussed later in this chapter.

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[5] This part of the Economic Census, as well as many of the Census Bureau's annual programs, uses "probability sampling" (sometimes known as "scientific sampling"). This procedure involves "stratification," that is, placing the establishments in "strata" based on size. Within each stratum, samples are selected using random means, and the establishments within each stratum are assigned sampling weights that are inversely proportional to their probability of selection. Thus, the largest strata will usually have 100 percent probability of selection and a sampling weight of 1—that is, the establishment would represent only itself. The smallest stratum might have a probability of selection of 1 percent, and an establishment selected would have a sampling weight of 100—that is, the sampled establishment would represent 100 establishments.

Transportation surveys

The Census Bureau conducts two transportation surveys as adjuncts to the Economic Census: The Vehicle Inventory and Use Survey (VIUS) and the Commodity Flow Survey (CFS). Unlike the Economic Census itself, these surveys are based solely on samples, and the results of these surveys are not published as part of the industry-specific series of releases in the Economic Census. In addition, the sampling for the VIUS is not based on a list of establishments or firms, and the sampling for the CFS is only partly based on a list of establishments.

The VIUS began as the "Truck Inventory and Use Survey," which was part of the 1963 Census of Transportation. For 1997, the survey was renamed and the scope was expanded to include pickups, minivans, and sport-utility vehicles, which many states permit to be registered as either trucks or cars. Using an estimated 75 million motor vehicle registrations supplied by the states, R.L. Polk and Company selected and provided to the Census Bureau a stratified probability sample of 130,500 trucks and trailers in five body-type categories—pickup, van (including SUVs), single-unit light truck (26,000 pounds gross vehicle weight or less), single-unit heavy truck, and truck tractor. The Census Bureau then sent survey forms to the truck owners (including fleet owners); the survey questions covered physical characteristics (vehicle type, average weight, type and size of body, etc.) and operational characteristics (number of trucks operated, vehicle miles during 1997, use of vehicle, types of commodities carried, etc.).

In 1990, the Census Bureau began a joint effort with the Department of Transportation that resulted in the CFS, which was first conducted for 1993. This program improved upon an earlier Census Bureau program called the Commodity Transportation Survey, which produced measures of the flow of goods and materials by mode of transportation from 1963 to 1977.

The 1997 CFS sampled approximately 100,000 domestic manufacturing, mining, wholesale, and selected retail establishments. The sample was selected from a universe of about 800,000 establishments, including auxiliary units of multi-establishment companies, in these industries. Shipments were classified using the Standard Classification of Transported Goods system (SCTG). This system is partly based on the Harmonized Commodity Description and Code System, the system used in the United States for exports, imports, and customs (see Chapter 7, "Foreign Trade Transactions"). The survey respondents provided information on the value and classification of the shipment, the shipment weight, and the destination of the shipment (including whether for domestic use or for export).

Cautions about the Economic Census data

The Economic Census data are the best data available for the construction of I-O tables, but, as with all statistics, they are not perfect. Like all statistics, they are subject to measurement error, and additionally, they do not cover all the aspects of economic activity that we want to include in the I-O tables.

As indicated earlier, the Economic Census uses sampling for small businesses, and sampling itself involves errors. Moreover, as the Census Bureau state-

ment below spells out, there are some prevalent measurement problems other than sampling:

> "All surveys and censuses are subject to nonsampling errors. Nonsampling errors can be attributed to many sources: inability to obtain information about all of the companies in the sample; inability or unwillingness on the part of respondents to provide correct information; response errors; definition difficulties; differences in the interpretation of questions; mistakes in recording or coding the data; and other errors of collection, response, coverage, and estimation for nonresponse."[6]

A more colorful statement on accuracy is attributed to Sir Josiah Stamp, Head of the Inland Revenue Department of the United Kingdom:

> "The government is very keen on amassing statistics. They collect them, add them, raise them to the nth power, take the cube root and prepare wonderful diagrams. But you must never forget that every one of these figures comes in the first instance from the village watchman, who just puts down what he damn well pleases."[7]

In particular, there are three nonsampling problems that affect the Economic Census, all of which result in shortfalls of the statistics from true counts. Two of these are "adjusted for" by BEA in constructing the I-O tables (see Chapter 5, "Output"). First, as mentioned earlier, the Census Bureau does not include the values for nonemployers in the published tables. Second, the Business Register, which provides the universe of establishments used by the Economic Census, is based on administrative records from the IRS and SSA. The accuracy of these records depends upon the compliance of businesses with the tax and social insurance laws, and not all businesses comply. The shortfalls that result are termed "tax-misreporting" errors, which relate to economic flows that stem from legal activities but are missed because of noncompliance.

The third nonsampling problem, for which BEA does not make an adjustment, is illegal activities. Activities that are against the law, such as gambling in some states, are not covered in the Economic Census or in the I-O tables (or in most other economic data). By their nature, there are no source data for illegal activities, and they are excluded from the national accounts of the United States and of many other countries.

Most of the major sectors of the economy are covered by the 1997 Economic Census. However, for the farm sector, a separate Census of Agriculture is conducted by the U.S. Department of Agriculture; it covers farming but excludes most agricultural services, forestry, fishing, and hunting. The sector for public administration is largely covered by a separate Census of Governments, conducted by the Census Bureau.

In addition, the 1997 Economic Census does not cover a number of economic activities within the other major sectors. In transportation and warehousing, the U.S. Postal Service, large certificated passenger air transportation, and all rail

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[6] U.S. Bureau of the Census, *Annual Capital Expenditures, 1999*: C-4.

[7] Josiah Charles Stamp, First Baron of Shortlands, 1880-1941.

transportation are excluded. In finance and insurance, funds and trusts are excluded. In professional, scientific, and technical services, landscape architecture and veterinary services are excluded. In educational services, elementary and secondary schools, colleges, and professional schools are excluded. In other services (except public administration), pet care; labor, political, and religious organizations; and private households are excluded.[8]

As has been noted, the Economic Census does not cover all the economic activities and all the economic flows needed for the I-O tables. For this reason, BEA supplements the Economic Census with other data from the Census Bureau and from other sources.

Other Census Bureau programs

BEA draws upon various annual surveys of selected industries that are conducted by the Census Bureau—principally surveys covering manufacturing, wholesale trade, retail trade, and services.[9] In addition, BEA uses data from the Census Bureau's *County Business Patterns*, Business Expenses Survey, construction statistics program, and two programs covering government activities.

Annual industry surveys

In preparing the annual surveys, the Census Bureau selects samples of companies based on the Business Register. As was done in selecting the sample of the small single-establishment companies for the Economic Census, the Bureau uses stratified probability sampling to select the recipients for the annual surveys of manufacturing (Annual Survey of Manufactures or ASM), wholesale trade (Annual Wholesale Trade Survey or AWTS), retail trade (Annual Retail Trade Survey or ARTS), and selected services (Service Annual Survey or SAS). These surveys collect fewer data items than are collected in the corresponding Economic Census questionnaires, but they do provide some data that are not included in the Census (see table 3.2).[10]

In order to keep the annual surveys accurate and up to date, new samples are usually selected after each Economic Census. For example, a new sample for wholesale trade, based on the 1997 Economic Census, was introduced for the 1999 AWTS. In addition, the Census Bureau adds new companies on a regular basis. These "births," which are identified using new EIN numbers issued by IRS and kind-of-business classifications provided by the SSA, are added to the universe

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[8] The 2002 Economic Census added coverage for landscape architecture, landscaping services, veterinary services, and pet care; previously, under the SIC, these services were classified as agricultural services and, thus, were not included in the Economic Census. Conversely, logging, which had been classified in manufacturing, was included in the 1997 Economic Census but not in the 2002 Census.

[9] These surveys are also major sources for BEA's annual I-O update programs. The Annual Survey of Manufacturers is used only for the annual updates and not for the benchmark I-O tables.

[10] Beginning with 2007, the ASM and the SAS will begin collecting annual data on expenses.

from which the sample is drawn about 9 months after the new business begins operation. For the ASM, the Bureau also uses the annual COS to identify new establishments of multi-establishment companies covered by the Business Register.[11]

The manufacturing and retail surveys cover the same universe as the corresponding Census canvasses. In contrast, the wholesale trade and services surveys have covered only part of the corresponding Census universes. In the future, the Census Bureau is planning to expand these surveys by covering more industries and by collecting more detailed information.

County Business Patterns

County Business Patterns (CBP) is a publication or series rather than a Census Bureau survey. The basic data for the series are extracted from the Business Register, from the COS, from various other Census Bureau programs, including the four annual surveys described above, and from IRS and SSA administrative records. CBP contains data only for the number of establishments, for employment, and for payrolls, but during the Census years, it does include establishments with no payrolls. It covers partnerships and corporations that have no employees, but it does not cover the broad category of "Self employed" activity—filings of IRS Form 1040, Schedule C, "Income and Loss for Business." CBP also does not cover domestic service workers, railroad employees, agricultural production workers, most government employees, and employees on ocean-borne vessels or in foreign countries.

[11] The ASM is establishment based, and the COS picks up new establishments that become part of an existing company. The trade and services surveys are company based, so they do not use the COS to identify births.

Table 3.2 Characteristics and Data Items for Four Census Bureau Annual Industry Surveys

SURVEY TITLE[1]	SURVEY ENTITY	INITIAL YEAR	REPORTING LEVEL	TYPE OF SAMPLE	DATA ITEMS COLLECTED
MANUFACTURING	ASM	1949	Establishment	Stratified probability sample	Shipments Inventories by stage of fabrication Capital expenditures Electric energy consumed Cost of materials Cost of contract work Payroll
WHOLESALE TRADE	AWTS	1978	Company	Stratified probability sample	Sales Inventories Purchases Gross margins
RETAIL TRADE	ARTS	1951	Company	Stratified probability sample	Retail sales Sales taxes collected Inventories Method of inventory valuation Cost of purchases Account receivables balances
SELECTED SERVICES	SAS	1982	Company	Stratified probability sample	Tax and organizational status Operating revenue Sources of revenue (selected industries) Expenses by type (selected industries)[2] Exports (selected industries) Inventories (selected industries)

[1] Annual Survey of Manufacturers, Annual Wholesale Trade Survey, Annual Retail Trade Survey, and Service Annual Survey.

[2] The Census Bureau expanded coverage of expenses for the 2002 Economic Census. For most industries, expenses are collected using annual survey samples but are published as part of the Economic Census. (See Chapter 6, "Transactions," for more information on the expenses collected.)

Business Expenses Survey

The Business Expenses Survey (BES, formerly known as the Business Expenditures Survey) covers companies classified as merchant wholesalers and retailers and companies in selected service industries.[12] This survey is conducted every 5 years as part of AWTS, ARTS, and SAS, but it is on separate forms. The expense data include payroll, employer cost for fringe benefits, cost of contract

labor, taxes and license fees, depreciation and amortization charges, lease and rental payments, telephone and other purchased communications, purchased utilities, and various other expenses. For 2002, partly as a result of BEA recommendations, the industry coverage of the BES was expanded and more detailed expense questions were included. In 2007, the SAS will begin to cover expenses for services and will replace the BES as the source for these data. Additionally, the SAS will collect a limited set of expenses for services annually.

Value of construction put in place

The value of construction put-in-place program (VPIP) encompasses the monthly and annual surveys that measure construction activity. "Construction" as covered by this program differs from the construction industry of the Economic Census in a fundamental way—the Census of Construction measures the industry on the basis of reports by establishments primarily *engaged* in the construction business, whereas much of the VPIP program measures activity by collecting reports from the *owners* of the construction projects. Thus, the VPIP captures a number of important parts of construction activity that are not included in the Census—such as nonemployer construction, architectural and engineering costs, own-account construction, homeowner construction, and construction done as a secondary source of revenue by nonconstruction establishments. Additionally, the Census double-counts some construction activity—for example, in cases where businesses perform work as subcontractors for other construction companies rather than directly for the entities that are investing in new structures.

The Census Bureau's estimates of the value of construction put in place are prepared using several different methods. The estimates for private nonresidential buildings, for state and local government structures, and for multi-unit residential buildings are derived from data collected using stratified samples of construction projects, while the estimates for single-unit residential buildings are derived using an indirect method.

For private nonresidential buildings and for state and local government structures, the projects that are sampled are selected from a list of contract awards for construction projects valued at $75,000 or more that is compiled by the F.W. Dodge Division of the McGraw-Hill Information Systems Company; for geographic areas not covered by the Dodge list, the Census Bureau's sampling is partly based on building-permit notifications. Each month, about 8,500 projects are included in the private nonresidential buildings sample, and about the same number are included in the state and local government sample. The results of these samples are adjusted upward by 27 percent and 5 percent, respectively, to account for the undercoverage that results from the $75,000 cutoff for the samples. These adjustment percentages are based on periodic, in-depth surveys of construction activity by the Census Bureau. The results for the industrial buildings category are further adjusted by benchmarking the tabulated estimates to the Census Bureau's

[12] The BES evolved from an earlier survey known as the Assets and Expenditures Survey (AES). In addition to data on current-account business expenses, the AES also collected data on capital-account purchases.

Annual Capital Expenditures Survey levels for 1992, 1994, and 1998. The upward adjustment of 27 percent for the undercoverage of private nonresidential projects is considered a potential source of nonsampling error for this survey. Another potential source of error is the need to impute data for nonrespondents and for late and inconsistent reports.

For multi-unit residential buildings, the sample projects are selected from the Census Bureau's Housing Starts Survey (see below). Each month about 2,500 projects are sampled.

The estimates for single-family residential VPIP are derived by an indirect method using data from a comprehensive Census Bureau program that covers residential housing. This program collects data beginning with a sample survey of building permits issued by permit issuing places and continuing with sample surveys of housing starts, completions, and sales. The Census Bureau prepares the VPIP estimates by first multiplying the total number of housing units started in a month by the average value of these units (excluding the value of undeveloped land) to compute the total value of units started. Then, using "progress patterns" derived from periodic studies, this total value is distributed, month by month, across the period that an average house takes to build.

The construction-put-in-place estimates for "other construction" are from a variety of sources covering farms, utilities, communications, and Federal Government structures.

Government activities

The Census Bureau's Census of Governments is the primary source of the data on the financial activities of state and local governments. This Census is not considered part of the Economic Census, but it is conducted in the same years. The data collected in the Census of Governments represent direct summations of the individual units canvassed; no sampling and no estimation methodology is used other than imputations for nonresponse. The 1997 Census identified more than 87,000 local government units. In addition, the Census Bureau conducts the Annual Survey of Government Finances, which covers all state governments and a sample of local governments. For 2000, the annual survey sample was drawn from the 1997 Census of Governments and included all county governments with resident populations of 100,000 or more, all municipalities with populations of 75,000 or more, all independent school districts with enrollments of 10,000 or more, and certain other governments that met specific criteria. Other government entities not included in the survey, such as townships, are covered by sample.

As is the case with many of the Census Bureau data sources described in this chapter, the Census of Government and the Government Finances reports are generally filed by fiscal year. For all states, the fiscal year differs from the calendar year. For 46 states, their fiscal year ends on June 30; for Alabama, the District of Columbia, and Michigan, it ends on September 30; for New York, March 31; and for Texas, August 31. Similarly, the fiscal year for local governments seldom matches the calendar year; for many, it ends on September 30.

Federal Government data are derived by the Census Bureau from the Budget of the United States and related documents, which are on a fiscal year basis that ends on September 30.

Thus, almost all of the data for government must be adjusted to put them on a calendar year basis.

Other important sources of I-O data

The preparation of the I-O tables also relies on incorporating data from sources other than the Census Bureau. These sources include the statistical programs of the Department of Agriculture, the Department of Energy, Department of Education, and the Securities and Exchange Commission; insurance industry data from the A.M. Best Company; and estimates from BEA's national income and product accounts (NIPAs) and international transactions accounts (ITAs).

Department of Agriculture

The primary source for the I-O estimates of farm output is "cash receipts from farm marketings," which is compiled from various sources by the Economic Research Service (ERS) of the U.S. Department of Agriculture (USDA). This series is considered to be of higher quality and of more relevance for the I-O estimates than the data collected in the Census of Agriculture. The I-O estimates of farm expenses are based on the Farm Costs and Returns Survey, which is an annual survey that collects financial data on farm businesses. This survey is a cooperative project of ERS and the USDA's National Agricultural Statistics Service.

Department of Energy

The Energy Information Administration (EIA) of the U.S. Department of Energy compiles a variety of data on energy markets. An annual census of electric power industry participants collects data on power production and sales from approximately 4,900 respondents. About 3,300 of these respondents are electric utilities; the other respondents include independent power producers, power marketers, and the unregulated subsidiaries of electric utilities. The EIA's annual natural gas survey covers producers that deliver gas directly to customers, pipelines (interstate and intrastate), and investor- and municipally owned gas distributors. About 1,700 entities are included in the survey. Because responses to the electric and natural gas surveys are required by law, the results are considered to be universe counts. The EIA data provide the basis for the I-O allocations of energy consumption to final-use categories.

Securities and Exchange Commission

The Financial and Operating Combined Uniform Single (FOCUS) Report is an annual report required by the Securities and Exchange Commission (SEC) of all security and commodity agents and brokers that are subject to certain minimum

capital requirements established by the Securities and Exchange Acts of 1933 and 1934. The reports are filed by these companies through the exchanges responsible for regulating and overseeing their activity, such as the New York Stock Exchange. The information collected in the report includes balance sheet, revenue, expense, employment, transactions, and sales data. Aggregated data are not published by the SEC, but tabulations are made available to BEA. *The Annual Report of the Securities and Exchange Commission* also provides a variety of data on the activities of the securities industry in the United States. The SEC data are used in conjunction with the Economic Census data.

A.M. Best Company

The A.M. Best Company rates individual insurance companies, and as part of this work, compiles a variety of financial and operating data from about 6,000 insurance companies in the United States. These companies include property and casualty, life, and health insurance carriers, health maintenance organizations, and other insurance companies. "The primary source of information is each insurance company's annual and (if available) quarterly financial statements as filed with the regulator of the state in which the statements are prepared in accordance with statutory accounting requirements established by the National Association of Insurance Commissioners and administered by each state."[13]

Best's publications, *Averages and Aggregates,* focus separately on property/casualty, life/health, and health maintenance organizations. Statistics published include net premiums written, net premiums earned, losses incurred, and various expense items and operating rates.

Department of Education

The Department of Education's National Center for Education Statistics (NCES) continues the statistical studies and surveys conducted by the U.S. Office of Education since 1870. The annual *Digest of Education Statistics* provides summary data on pupils, staff, and finances—including government expenditures—at the elementary, secondary, and higher education levels. The NCES data are based on reports from administrators of educational institutions and of state and local agencies having jurisdiction over education. The NCES surveys include specialized vocational, trade, business, and correspondence schools, as well as nursery schools and kindergartens that are part of regular elementary schools. These statistics are used for the I-O accounts to supplement the data collected in the Census of Governments.

Other parts of the national economic accounts

Two other major sets of economic accounts—the NIPAs and the ITAs—that are prepared by BEA serve as important data sources for the I-O accounts. Many of the major aggregates that appear in the three sets of accounts are similar

[13] *Best's Insurance Reports, Property-Casualty, United States,* A.M. Best Company.

or identical, and the I-O accounts draw directly upon certain flows from the NIPAs and the ITAs. In addition, many of the detailed NIPA components are benchmarked periodically to the I-O accounts. These interdependencies help to keep the three sets of accounts consistent with one another.

The NIPAs are compiled from a wide variety of sources, including many of the sources described in this chapter. The I-O accounts themselves are used extensively as benchmarks for the corresponding NIPA flows, and some of the NIPA estimates are similarly adopted directly for use in the I-O tables (see table 3.3). As part of incorporating these estimates, I-O analysts are responsible for validating and ensuring that they represent the best-level estimates for the I-O accounts.

Table 3.3 NIPA Data Used in the I-O Accounts

NIPA DATA	USE IN I-O ACCOUNTS
OWNER-OCCUPIED HOUSING	Output, personal consumption expenditures (PCE)
MOTOR VEHICLES	PCE, producers' equipment and software, inventory, government, margins
FARMS	Output, value added
GOVERNMENT AS PRODUCER	Output (primary and secondary), government final uses
IMPUTED RENTS OF NONPROFIT INSTITUTIONS	Output
CAPITAL CONSUMPTION ADJUSTMENTS	Output for nonprofit institutions
HOUSEHOLD INDUSTRY	Output, PCE
IMPUTED BANK-SERVICE CHARGES	Output, PCE
INSURANCE	Output, PCE

The ITAs are a statistical summary of U.S. transactions with the rest of the world. The ITA estimates of exports and imports of goods and services, modified to appropriate concepts and coverage, are incorporated into both the NIPAs and the I-O accounts. (For more information, see chapter 7.)

APPENDIX TO CHAPTER 3

Table 3.A Principal Data Sources and Methods for Estimating Intermediate Inputs and Value-Added, 1997 Benchmark I-O Accounts (Page 1 of 3)

INPUT COMPONENT	SOURCE DATA AND METHODS USED
INTERMEDIATE INPUTS	**Natural Resources** Inputs to the agriculture, forestry, fishing and hunting industries were estimated from U.S. Department of Agriculture data or 1997 Economic Census data or by extrapolating the 1992 benchmark I-O estimates by the change in industry output from 1992 to 1997. These estimates were then adjusted during the process of balancing commodities to equal commodity output totals. **Mining** Inputs to the mining industries were estimated primarily from 1997 Economic Census data on selected materials and supplies, fuels consumed, electricity usage, and communication services purchased. The remaining inputs were estimated by extrapolating the 1992 benchmark I-O estimates by the change in industry output from 1992 to 1997. These estimates were then adjusted during the process of balancing commodities to equal commodity output totals. **Construction** Inputs to the construction industries were estimated primarily from 1997 Economic Census data. These estimates were then adjusted during the process of balancing commodities to equal commodity output totals. **Manufacturing** Inputs to the manufacturing industries were estimated primarily from 1997 Economic Census data on materials and supplies, fuels consumed, electricity usage, and communication services purchased. In addition, some of the purchased services were estimated from the census surveys conducted in conjunction with the 1997 Economic Census for manufacturing. The remaining inputs were estimated by extrapolating the 1992 benchmark I-O estimates by the change in industry output from 1992 to 1997. These estimates were then adjusted during the process of balancing commodities to equal commodity output totals.

Table 3.A Principal Data Sources and Methods for Estimating Intermediate Inputs and Value-Added, 1997 Benchmark I-O Accounts (Page 2 of 3)

INPUT COMPONENT	SOURCE DATA AND METHODS USED
INTERMEDIATE INPUTS	**Services, trade, transportation and warehousing, and utilities** For census-covered industries, information from the 1997 Business Expenditures Survey (BES) on operating expenses was used—including accounting services, advertising services, contract labor costs, data processing and other computer-related services, depreciation, lease and rental payments, legal services, office supplies, repair and maintenance expenses, tax and license fees, and cost of utilities. These estimates were then adjusted during the process of balancing commodities to equal commodity output totals. (The census-covered industries include the following: Information; professional, scientific, and technical services; administrative and support services; vocational educational services; health care and social assistance; arts, entertainment, and recreation; accommodation and food services; other services; retail trade; and wholesale trade.) For noncensus-covered industries, inputs were estimated either from trade-association data or by extrapolating the 1992 benchmark I-O estimates by the change in industry output from 1992 to 1997. These estimates were then adjusted during the process of balancing commodities to equal commodity output totals.
VALUE-ADDED:	
Compensation of employees	For census-covered industries, payroll data from the 1997 Economic Censuses were used; data were adjusted for misreporting and I-O industry definitions. Benefits data for manufacturing and mining were from the 1997 Economic Census. Benefits data for industries covered by the BES were based on the relationship between the BES benefits and payroll data applied to the 1997 Economic Census payroll data. For the remaining industries, benefits were estimated using indirect techniques. For noncensus-covered industries, tabulations of wages and salaries covered by state unemployment insurance and estimates of benefits from the national income and product accounts were used; data are adjusted for misreporting and I-O industry definitions. All estimates were adjusted to balance to total compensation in the national income and product accounts (NIPAs).

Table 3.A Principal Data Sources and Methods for Estimating Intermediate Inputs and Value-Added, 1997 Benchmark I-O Accounts (Page 3 of 3)

INPUT COMPONENT	SOURCE DATA AND METHODS USED
Indirect business tax and nontax liability	The estimates by industry were prepared in two parts: For excise and general sales taxes, the values were estimated as part of each industry's output; for other indirect business taxes, such as property taxes, and for nontax liabilities, such as fees, estimates were distributed on the basis of a variety of source data, including state government tax collections statistics and the BES. For all other tax and nontax liability, estimates were distributed to industries using indirect techniques. All estimates were adjusted to balance to total indirect business tax and nontax liability in the NIPAs.
Other value added	For most industries, the residual method (total industry output less total intermediate inputs, compensation of employees, and indirect business tax and nontax liability) was used.

Table 3.B Principal Data Sources for Industry or Commodity Outputs, 1997 Benchmark I-O Accounts (Page 1 of 3)

INDUSTRY OR COMMODITY	SOURCE
NATURAL RESOURCES AND MINING	U. S. Department of Agriculture, Forest Service, and Economic Research Service National Oceanic and Atmospheric Administration, National Marine Fisheries Service, *Fisheries of the United States* Census Bureau, Statistics of United States Businesses Census Bureau, 1997 Economic Census, NAICS Sector 21, Mining U.S. Geological Survey, *Minerals Yearbook* and *Mineral Commodity Summaries*
CONSTRUCTION	Census Bureau, 1997 Economic Census, NAICS Sector 23, Construction Census Bureau, Value of Construction Put In Place Statistics
MANUFACTURING	Census Bureau, 1997 Economic Census, NAICS Sector 31-33, Manufacturing Census Bureau, 1998 Current Industrial Reports
TRADE	Census Bureau, 1997 Economic Census, NAICS Sector 42, Wholesale Trade Census Bureau, 1997 Economic Census, NAICS Sector 44-45, Retail Trade Census Bureau, 1997 Annual Retail Trade Survey Census Bureau, 1997 Annual Trade Survey

Table 3.B Principal Data Sources for Industry or Commodity Outputs, 1997 Benchmark I-O Accounts (Page 2 of 3)

INDUSTRY OR COMMODITY	SOURCE
TRANSPORTATION AND UTILITIES	Census Bureau, 1997 Economic Census, NAICS Sector 48-49, Transportation and Warehousing U.S. Department of Transportation, *Air Carrier Financial Statistics Quarterly* U.S. Department of Transportation, Surface Transportation Board Association of American Railroads, *1998 Railroad Facts* Census Bureau, 1997 Economic Census, NAICS Sector 22, Utilities U.S. Department of Energy, Energy Information Administration
INFORMATION	Census Bureau, 1997 Economic Census, NAICS Sector 51, Information Census Bureau, 1997 Service Annual Survey
FINANCIAL ACTIVITIES	Census Bureau, 1997 Economic Census, NAICS Sector 52, Finance and Insurance Census Bureau, 1997 Economic Census, NAICS Sector 53, Real Estate and Rental and Leasing Federal Deposit Insurance Corporation, *1997 Statistics on Banking* Federal Reserve Board, *1997 Annual Report* National Credit Union Administration, *1997 Yearend Statistics for Federally Insured Credit Unions* Internal Revenue Service, *1997 Statistics of Income, Corporation Source Book, 1997* New York Stock Exchange, *1998 Annual Report* Securities and Exchange Commission, *1997 FOCUS Report* and *1997 Annual Report* Health Care Financing Administration, 1997 Private Health Insurance Data A. M. Best and Company, *Best's 1997 Aggregate and Averages Property/Casualty Insurance* Mortgage Insurance Companies of America, *2001 - 2002 Factbook* U.S. Department of Labor, Pension Welfare Benefits Administration, *1997 Income Statement of Pension Plans with 100 or More Participants* American Council of Life Insurers, *1997 Life Insurance Fact Book* Bureau of Economic Analysis, National Income and Product Accounts
PROFESSIONAL AND BUSINESS SERVICES	Census Bureau, 1997 Economic Census, NAICS Sector 54, Professional, Scientific, and Technical Services Census Bureau, 1997 Economic Census, NAICS Sector 55, Management of Companies and Enterprises Census Bureau, 1997 Economic Census, NAICS Sector 56, Administrative and Support Services and Waste Management and Remediation Services Census Bureau, 1997 Service Annual Survey

Table 3.B Principal Data Sources for Industry or Commodity Outputs, 1997 Benchmark I-O Accounts (Page 3 of 3)

INDUSTRY OR COMMODITY	SOURCE
EDUCATION AND HEALTH SERVICES	U.S. Department of Education, National Center for Education Statistics, *2000 Digest of Education Statistics* Census Bureau, 1997 Economic Census, NAICS Sector 61, Educational Services Census Bureau, 1997 Economic Census, NAICS Sector 62, Health Care and Social Assistance Census Bureau, 1997 Service Annual Survey
LEISURE AND HOSPITALITY	Census Bureau, 1997 Economic Census, NAICS Sector 71, Arts, Entertainment, and Recreation Census Bureau, 1997 Economic Census, NAICS Sector 72, Accommodation and Food Services Census Bureau, 1997 Service Annual Survey
OTHER SERVICES	Census Bureau, 1997 Economic Census, NAICS Sector 81, Other Services (except Public Administration) Bureau of Economic Analysis, National Income and Product Accounts Census Bureau, 1997 Service Annual Survey
GOVERNMENT INDUSTRIES	Census Bureau, 1997 Census of Governments Census Bureau, 1997-98 Government Finances Census Bureau, 1996-98 Public Employment Census Bureau, 1997 Monthly Construction Statistics Federal Budget Data and Federal Government Agency Reports Center for Medicare and Medicaid Services Bureau of Economic Analysis, National Income and Product Accounts
NONCOMPARABLE IMPORTS	Bureau of Economic Analysis, International Transactions Accounts
SCRAP	Census Bureau, 1997 Economic Census, NAICS Sector 31-33, Manufacturing
INVENTORY VALUATION ADJUSTMENT	Bureau of Economic Analysis, National Income and Product Accounts Census Bureau, 1997 Economic Census

CHAPTER 4: CLASSIFICATION AND SECONDARY PRODUCTS

The classification system for the input-output (I-O) accounts provides the structure necessary to prepare and present the estimates uniformly and consistently. The first part of this chapter describes the North American Industry Classification System, which has been established as the basis for all U.S. statistics, and its application to the I-O accounts. The handling of secondary products is a critical issue in preparing the I-O accounts. The second part of this chapter describes the three types of secondary products and their treatment in the accounts.

Classification

As discussed in Chapter 1, "Overview of the U.S. Input-Output Accounts," the principle of consistency in the input-output (I-O) tables requires uniformity in the organization and presentation of data. Without the structure provided by the use of a classification system, the data would be a field of numbers set adrift. BEA uses a classification system in order to facilitate the collection, tabulation, presentation, and analysis of the economic data in its I-O tables. This system ensures uniformity of data for accurate comparisons between industries and over periods of time.

For the I-O accounts, BEA uses a classification system that is based on the North American Industry Classification System (NAICS). The I-O classification system is consistent with that used by the principal agencies that provide the source data used in the I-O accounts and by the preparers of the national accounts and other economic series that are used for analysis in conjunction with the I-O accounts.

In I-O accounting, each industry is associated with a commodity that is considered the primary product of that industry. All other commodities produced by that industry are considered secondary products (see the section "Secondary Products" later in this chapter).

NAICS

NAICS is the official U.S. classification system. It was created after Canada, Mexico, and the United States signed the North American Free Trade Agreement (NAFTA) and was the result of a collaborative effort by the three countries. In the United States, the Economic Classification Policy Committee (ECPC) was instituted in 1992 and charged with the task of developing the new industry classification system. The Committee was chaired by BEA and had members from the Census Bureau and the Bureau of Labor Statistics (BLS) with oversight from the Office of Management and Budget (OMB). As part of the development process, the ECPC formed industry committees composed of experts from a large number of government agencies and private organizations, including businesses. Proposals were evaluated, and broad agreement on classification issues was reached among the three countries. Variations among the countries were accepted at detailed industry levels. For the most part, at the five-digit level, the new system harmo-

nized the classification systems of the United States, Canada, and Mexico, allowing for better comparisons of the economies of the three countries. In 1997, OMB issued a mandate directing the U.S. statistical agencies to use the newly developed NAICS for the classification of economic data. By 2004, most of the major economic series published by the U.S. Government were on the NAICS basis.[1]

Prior to the adoption of NAICS, the U.S. statistical agencies had used the Standard Industrial Classification (SIC) system for classification. The SIC was created in 1939, was tailored largely to manufacturing, and was last updated in 1987. The SIC's concentration on manufacturing mitigated its usefulness for the modern economy, as the service industries have surpassed the manufacturing sector in terms of their contribution to gross domestic product. Moreover, technological changes in manufacturing processes had created many new types of industries that were not readily accommodated by the SIC. In many cases, NAICS provided new industry classifications to replace residual "not elsewhere classified" categories in the SIC. The switch from the SIC to NAICS added 350 new industries and nine new services sectors. NAICS provided more detailed classifications for service industries, and it improved the classifications for high-tech industries.

In addition, NAICS provides a more conceptual basis for industrial classification. It takes a supply-based approach, organizing establishments based on their production methods, whereas the SIC used a market-based approach and classified economic activity based on the product produced. As a result, the NAICS groupings by production method provide more homogeneous data on the inputs required by each industry.

NAICS was updated for 2002, and further reviews are scheduled to be conducted every 5 years. This continuous review schedule provides for greater responsiveness to changes in the economy and is considered one of the many advantages of NAICS over the SIC. The 2002 NAICS has 20 major sectors with a total of 1,179 industries.

NAICS and I-O Classification Codes

The NAICS codes are composed of six digits, which reading from left to right, begin with general categories and move to the more detailed industries, or from sector to industry. The first two digits indicate the sector (for example, manufacturing). The third digit indicates the sub-sector (for example, food manufacturing), the fourth, the industry group (for example, dairy product manufacturing), and the fifth, the NAICS industry (for example, ice cream and frozen dessert manufacturing). The sixth-digit indicates a country-specific industry; most of the data at this level are not comparable among all three countries.

[1] For more information on the development and implementation of NAICS, see John Kort, "The North American Industry Classification System in BEA's Accounts," *Survey of Current Business* 81 (May 2001): 7-13.

The following is a list of the 20 major sectors and their two-digit NAICS codes.

11	Agriculture, forestry, fishing and hunting
21	Mining
22	Utilities
23	Construction
31-33	Manufacturing
42	Wholesale trade
44-45	Retail trade
48-49	Transportation and warehousing
51	Information
52	Finance and insurance
53	Real estate and rental and leasing
54	Professional, scientific, and technical services
55	Management of companies and enterprises
56	Administrative and support and waste management and remediation services
61	Educational services
62	Health care and social assistance
71	Arts, entertainment, and recreation
72	Accomodation and food services
81	Other services (except public administration)
92	Public administration

In general, the industry codes used in the I-O tables correspond closely with the NAICS codes.[2] However, the I-O classification system includes "special industries" (industries or commodities) and "government industries" that are not considered industries in NAICS.[3] Further, because of data limitations, the I-O industry system includes three industries—agriculture, construction, and real estate—that are defined on an activity basis rather than on an establishment basis.[4]

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[2] For a concordance between the I-O industry codes and the NAICS codes for the 1997 I-O benchmark, see appendix A in Ann M. Lawson, Kurt S. Bersani, Mahnaz Fahim-Nader, and Jiemin Guo, "Benchmark Input-Output Accounts of the United States, 1997," *Survey of Current Business* 82 (December 2002): 39-43.

[3] Government industries consists of both the general government industries and government enterprises— including the Postal Service, which is recognized as an industry by NAICS. Special industries includes industries and commodities for the inventory valuation adjustment and owner-occupied housing, as well as commodities for noncomparable imports, scrap, used and secondhand goods, and the rest-of-the-world adjustment to final uses.

[4] In both the standard and the supplementary I-O tables, all agricultural output is shown as output of the agricultural industry, and all real estate rental is shown as output of the real estate industry.

Classification of establishments

An "establishment" is a single physical location where business is conducted—that is, where industrial operations are performed or services provided. Depending on the industry, an establishment could be a storefront to a hotel, or it could be a large factory. It is important not to confuse an "establishment" with an "enterprise." An enterprise is a legal entity, such as a company, a corporation, or a nonprofit institution. In most cases, an enterprise consists of only one establishment, but some enterprises comprise many different establishments. For example, General Motors is defined as an enterprise, and the factory in Lordstown, Ohio, where it makes Chevrolets, is one of its establishments.

Establishments are classified into industries according to NAICS. As mentioned earlier, an establishment may have multiple activities. The classification of an establishment is determined by its primary activity. In theory, the primary product (good or service) would be determined based on its relative share of the establishment's current production costs and capital investment. However, in practice, other data—such as revenue, shipments, or employment—are used to make the determination.

An industry is a group of establishments with similar production processes. Statistics for an industry reflect all products made by that group of establishments. A commodity is a group of similar products. Each industry has some products that are primary and others that are secondary to the industry.

Commodity classification

The U.S. statistical system does not presently have a separate classification system for commodities, which are groups of similar products that are defined by the characteristics of the product (commodity) itself rather than by the production process. The NAFTA countries are currently developing the North American Product Classification System (NAPCS), which will be the commodity counterpart to NAICS. When NAPCS becomes available, it will be used as the basis for commodity classification in the I-O tables.[5]

At present, in the I-O commodity classification system, each commodity is assigned the code of the industry in which the commodity is the primary product. The foundation for the commodity classification system is the six-digit NAICS codes. All item (detailed product) codes begin with the NAICS-based commodity code and append more digits. The additional digits, which are generally based on the product lines from the Economic Census, extend but do not change the commodity definitions.

The commodity code is used to group all of the output of a commodity, whether it is a primary or secondary product of the producing industry. Thus, the output of the NAICS-based commodity group represents the total output of the commodity, regardless of the classification of the establishments that produce it. In a few cases, the I-O system reclassifies a commodity by making it a secondary

[5] NAPCS products for the services industries will be implemented on the 2007 Economic Census forms. NAPCS products for the goods-producing industries have not yet been developed.

product, rather than the primary product, of the industry that produced it. For example, newspaper advertisement sales, classified by Census as a primary product of the newspaper industry, are reclassified to "advertising" and shown as a secondary product of the newspaper industry.

Secondary Products

As indicated in the section "Classification," establishments are classified to industries according to the primary product that they produce (or primary activity that they perform). However, in most cases, an industry or establishment produces one or more products in addition to its primary product. These products are referred to as the secondary products. For example, a hotel, whose primary activity is lodging, may also house a restaurant, whose primary activity is serving meals and beverages.

Because the production and use of these secondary products may differ significantly from that of the primary product, their existence may result in significant classification challenges for I-O analysts. The desirability of adhering to the I-O principle of consistent classification under NAICS must be weighed against the I-O principle of having homogeneous inputs for one type of output and a direct relationship between industry output and commodity inputs (see chapter 1).

In light of these tradeoffs and in consideration of the broad range of uses for the I-O accounts, BEA prepares two sets of make and use tables. The *standard tables* closely follow NAICS and are consistent with other economic accounts and industry statistics. The *supplementary tables* are derived from the standard tables by reassigning some secondary products to the industry in which they are the primary products. In most cases, the reassignment decisions are based on comparisons of the production processes for the two industries.

Types of secondary products

BEA identifies three types of secondary products: Reclassified, redefined, and "other secondary products." *Reclassifications* affect commodity output but not industry output, and the changes that result affect both the standard and the supplementary I-O tables. *Redefinitions* affect industry output but not commodity output, and the changes that result affect only the supplementary tables. *Other secondary products* are secondary products for which BEA follows the Economic Census classification and does not make adjustments that affect industry or commodity output in either set of tables.

Reclassifications

Reclassifications are made when BEA decides that a product the Economic Census has identified as a primary product should, for I-O purposes, be regarded as a secondary product. For example, the Census identifies the newspaper industry's primary product as newspapers and newspaper advertising. However, for the I-O tables, this product is split into two products: Newspapers are treated as the primary product of the newspaper industry, while newspaper advertising is treated

as a secondary product of the newspaper industry and is reclassified to the advertising commodity. BEA makes this distinction because it views newspapers as a product for final use by consumers, while it views newspaper advertising as an intermediate product used by business.

Reclassifications are also made when a product is primary to more than one industry—that is, the final product is the same but it is made using different production processes. In these cases, BEA groups the output in the commodity where the largest amount of it is produced. For example, sheets can be made in knitting or weaving mills or from purchased fabric. For the purpose of the I-O accounts, all sheets are treated as a single commodity and are shown as the primary product of curtain and linen mills.

The following are examples of some of the major I-O reclassifications for manufacturing.

- Scrap receipts are reclassified to the commodity "scrap."
- Categories of miscellaneous receipts that are similar to service commodities are reclassified to services (for example, data-processing services).
- Advertising receipts in industries other than advertising are reclassified to the advertising commodity.
- Shipments of products that are comparable and that are the primary products of more than one industry are reclassified to one commodity (as described in the "sheets" example above).

Reclassifications do not affect the definition of the industry or the measurement of industry output, because both the primary and secondary products of an industry are included in the output of the industry. In our example, the output of the newspaper industry is unchanged. However, reclassifications do affect commodity output, which includes all of the output of that commodity regardless of where it is produced. Thus, the output of the commodity "newspapers" would be lower than the Census published receipts, and the output of the commodity "advertising" would be higher.

Reclassifications are made as part of the preparation of the standard I-O make and use tables. Because industry output is not affected, the reclassification does not affect the comparability of the industry statistics in the standard tables with other economic statistics.

Redefinitions

Redefinitions are made when the input structure for a secondary product of an industry differs significantly from the input structure for the primary product of that industry. In such cases, the output of the secondary product is "redefined" by moving it from the industry in which it originates to the industry in which it is primary. In the make table, the output is moved between rows, and in the use table, it is moved between columns. After a product is redefined, the associated inputs are then moved, or *reallocated*, from the industry where the output originates to the industry where the output is primary (see Chapter 9, "Reallocations"). Such redefinitions do not affect the measurement of commodity output in the tables. However, as a result of the redefinitions, the classification of industries in the

supplementary I-O tables, or the I-O tables after redefinitions, differs from a strict NAICS classification.[6]

Tables 4.1 and 4.2 below provide a simplified example of the effect of redefinitions on the I-O make table. Industry A produces both commodities A and B, and industry B produces only commodity B. An analysis showed that the inputs used to produce commodity B differ substantially from those used to produce commodity A, so the decision was made to redefine the output of commodity B by industry A from industry A to industry B.

Table 4.1 Make Table Before Redefinitions

	COMMODITY A	COMMODITY B	INDUSTRY OUTPUT
INDUSTRY A	90	10	100
INDUSTRY B		100	100
COMMODITY OUTPUT	90	110	

Table 4.2 Make Table After Redefinitions

	COMMODITY A	COMMODITY B	INDUSTRY OUTPUT
INDUSTRY A	90		90
INDUSTRY B		110	110
COMMODITY OUTPUT	90	110	

Note that the outputs of commodity A and commodity B are not affected by the redefinition, but the output of industry A is reduced from 100 to 90, and the output of industry B is raised from 100 to 110.

The following lists some of the principal output redefinitions and input reallocations that were made in preparing the supplementary tables.

- Construction activities performed by all industries are redefined to the construction industries. This redefinition includes “own-account” or “force-account” construction, which is construction work performed by the establishment’s work force on structures used by that establishment. Some installation receipts are also redefined from manufacturing to construction.
- Manufacturing activities in trade, services, and other industries are redefined to manufacturing industries. For example, meat slaughtering in wholesale establishments is redefined to manufacturing meatpacking.
- Trade activities in nontrade industries are redefined to trade industries. For example, margins on sales of shampoo and other products at beauty salons are redefined to retail trade. In manufacturing, trade output—sales less the cost of goods sold—is redefined to wholesale trade.[7]

[6] As a result, these tables are sometimes referred to as being on an I-O basis.

- Service activities in nonservice industries are redefined to service industries. In addition, some service activities are redefined between service industries. For example, repairs that are performed for others by leasing-equipment-industry establishments are redefined to the repair services industry.
- Rents received for equipment and vehicles are redefined to the rental industry. For example, rentals of autos by the auto repair industry are redefined to the rental industry.

Conceptually, the decision about redefining the output of a secondary product and reallocating its associated inputs revolves around the application of two opposing assumptions. According to the "commodity-technology assumption," each commodity has a unique production function no matter which industry produces it, whereas according to the "industry-technology assumption," all products made in the same industry have the same production function. In general, BEA considers the commodity-technology assumption to be more realistic, but each case should be examined individually, and sometimes practical considerations must be weighed as well.

By incorporating the redefinitions and reallocations of secondary products, the supplementary I-O tables represent a move toward the principle of homogeneity—that is, they provide a more homogeneous relationship between input structure and products. As a result, the I-O total requirements tables, which are derived from the supplementary tables, are a more useful and effective tool for analyzing the interrelationships among industries and the relationships between industries and the commodities they use and produce. (For more information, see "Deriving the requirements tables from the make and use tables" in Chapter 12, "Input-Output Modeling and Applications.") However, the supplementary tables also represent a move away from the principle of consistency—that is, the industry definitions no longer correspond as closely with those of NAICS.

Other secondary products

Other secondary products represent the application of the industry-technology assumption—that is, they are secondary products of an industry that are produced using inputs that are similar to those used to produce the industry's primary product. For example, milk and cheese have very similar inputs, so cheese, a secondary product produced in the fluid-milk industry, is included in the output of the fluid-milk industry in the make and use tables. In many cases, the decisions about whether products should be redefined are not so clear cut, or they may be influenced by other factors.[8]

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[7] In general, it is assumed that reselling by service establishments that cater to households should be redefined to retail trade, while reselling by establishments that cater to other businesses (for example, manufacturing) should be redefined to wholesale trade. In some instances, these assumptions may be incorrect and can be modified.

[8] Within manufacturing, none of the products identified as secondary by the Economic Census are redefined, although miscellaneous receipts and imputations may be. This approach is taken in order to simplify the preparation of the I-O tables, but it is not consistent with a strict implementation of the general rules for redefinitions.

For the products that are identified as other secondary products, no adjustments to the Census classifications are necessary. Their output is the same in the I-O tables both before and after redefinitions, and the industry definitions are not affected.

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CHAPTER 5: OUTPUT

The principal measure of output in the input-output (I-O) accounts is gross output, which includes the value of both intermediate product and final product. This chapter discusses the various definitions of output and some of the issues involved in attempting to measure it. It then describes the process for preparing the estimates of industry and commodity output in the I-O accounts.

The input-output (I-O) accounts show the value of what is produced by each industry (the make table) and the value of what is consumed by each industry and final user in the economy (the use table). Gross output, the principal I-O measure of output, consists of both the value of what is produced and then used by others in their production processes—that is, intermediate product—and the value of what is produced and sold to final users—that is, final product.

The measure of gross output used in the I-O accounts is sometimes referred to as "gross duplicated domestic output," because it counts both the industry output that is recorded as final product and the industry output that is purchased by other industries for use as inputs to their production. For the I-O accounts, the focus is on the output of each industry, so the I-O measure includes the value of shipments at all stages of production. In contrast, industry "value added" is defined as the value of the industry's sales to other industries and to final users minus the value of its purchases from other industries. Thus, value added is a nonduplicative measure of production that when aggregated across all industries equals gross domestic product (GDP) for the economy.[1]

For example, a new car shipped from an assembly plant reflects not only the costs and profit associated with final assembly but also the costs and profit associated with all of the stages of production that preceded final assembly. At an earlier stage, the tires that were put on that car were recorded as shipments from the tire plant and reflected the costs and profits associated with their manufacture. Thus, in gross output, the value of the tires is counted twice—once in the value of the car shipment and once in the value of the tire shipment. Further, including the value of the rubber and metal that were shipped to the tire plant would constitute triple counting, and so on. In contrast, in the measure of value added that constitutes GDP, the value of the tires shipped to the assembly plant is subtracted from the value of the shipments of cars from the assembly plant.

Because value added or GDP measures final product while gross output measures both final and intermediate product, total gross output is much larger than total value added. For the 1997 benchmark I-O, the sum of industry output was $14.9 trillion, while the sum of value added was $8.3 trillion.

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[1] Both unduplicated domestic output and GDP are "gross" in another respect. They both include gross fixed investment (gross capital formation), which consists of "new" capital built to expand production during the accounting period and of "replacement" for capital used in current production.

Defining output

In order to measure gross output and GDP, national economic accountants have to define "the production boundary"—that is, they have to determine the parts of the myriad of human activity that are to be included in and excluded from the measure of production in the economy. Most production takes place in the business sector and is distributed in the market economy: It includes production by all entities that produce goods and services for sale at a price intended to at least approximate the costs of production (including profit). The business sector includes corporate and noncorporate private entities organized for profit and certain other entities that are treated as business (mutual financial institutions, private noninsured pension funds, cooperatives, nonprofit institutions that primarily serve business, Federal Reserve Banks, federally sponsored credit agencies, and government enterprises). Business output and production also includes the services of owner-occupied housing and the services of buildings and equipment owned and used by nonprofit institutions that primarily serve individuals. Outside of the business sector, output includes households (measured as the compensation paid to domestic workers), nonprofit institutions that primarily serve individuals (measured as their operating expenses), and general government (measured as operating expenses—that is, compensation of employees, consumption of fixed capital, and current-account purchases of goods and services).[2]

Output can be "market" or "nonmarket." Market output is produced by establishments that sell all or most of their output. Nonmarket output is produced by establishments that typically provide their services free of charge or for prices that are not economically meaningful. Most of the output of nonprofit institutions and government agencies is nonmarket. Another form of nonmarket output is referred to as "own-account," meaning that it is produced by establishments providing capital goods for themselves. Own-account also includes the value of housing services produced by owner-occupiers and the value of food produced and consumed by subsistence farmers.

Two human activities are excluded from the gross output measure for practical reasons—they are difficult or impossible to measure. First, illegal activities, such as gambling and prostitution in some states, are excluded because they are by their very nature conducted out of sight of public scrutiny, and thus, data are not available to measure them. Second, most activities in the home—such as housework, hobbies, and do-it-yourself projects—are excluded because of the lack of data to measure them and because of the difficulty in assigning a value to the output. As mentioned earlier, home ownership is viewed as a business, so home activities that involve the maintenance or upkeep of an owner-occupied home are considered intermediate purchases that are embodied in the output of the services provided by the house.

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[2] Up through the 1997 I-O benchmark, general government output included only compensation and consumption of fixed capital. In the 2003 comprehensive NIPA revision, the definition of government output was changed to include the services produced by government. This change was incorporated into the I-O annual accounts beginning with 1998 and will be incorporated into the 2002 benchmark accounts.

Certain natural processes may be included in or excluded from production, depending upon whether they are under the ownership or control of an entity in the economy. For example, the fish that are living in the ocean are not counted as part of the economy until they are caught, but the growing of fish in fish farms is part of economic activity. Similarly, the growth of uncultivated forests is not part of production, but the harvesting of trees is included.

Measuring output

In general, output is measured using the market value (the actual revenues received) of the goods and services that are supplied or available to be supplied to other establishments.[3] The starting point for measuring output is usually receipts. In most cases, the receipts data are from the Economic Census, though other sources are also used (see Chapter 3, "Data Sources").

In the Economic Census, the basic measure used to estimate output differs among industries, although it is generally referred to as "receipts." For example, it is shipments for mining and manufacturing, revenue for utilities, sales for merchant wholesale trade and retail trade, receipts for most services, and commissions for commodity brokerage. Thus, the initial step in the measurement of industry output is determining what the industry produces and how that activity should best be measured for the purpose of the I-O tables. Is the industry extracting, fabricating, providing a service, selling goods, brokering goods or services, or building structures? Or, as is often the case, is the industry performing more than one of these activities?

In some cases, measures other than receipts provide a better basis for measuring the value of output. For example, for nonprofit institutions serving households, output is measured using current operating expenses rather than receipts. Because receipts by nonprofit institutions may vary considerably from year to year, expenses are thought to better track the value of the services these institutions provide.[4]

Additional adjustments and refinements are frequently required so that the output measures will conform to the basic I-O concepts. For the manufacturing and mining industries, which produce goods that can be placed in inventory, changes in work-in-process and finished-goods inventories must be taken into account in measuring output; for example, a steel manufacturer may produce steel that will be

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[3] Because the measure of output includes only what is available to be supplied to other establishments, the value of output may not include the value of the goods produced as intermediate steps in a vertically integrated establishment. For example, if an establishment produces fabric and then makes apparel from it, the value of the fabric is embodied in the value of the finished apparel, and the materials and supplies used to produce the fabric are expenses of the vertically integrated apparel manufacturer. In contrast, if an apparel manufacturer were to buy fabric from a weaving mill and then make the apparel, the fabric is an explicit expense of the apparel industry. Gross output in the economy would be higher in the second case than in the first, though GDP and the value of apparel in the economy would be the same in both cases.

[4] Additionally, nonprofit revenues may be distributed as grants to others, which would not be counted as output.

held in inventory for shipment at a later date. For wholesale and retail trade, output is measured as "margin"—that is, the difference between receipts and the cost of the goods sold. For some types of nonmarket transactions, "imputations" are made. Other types of adjustments include "redefinitions," which transfer industry output of some secondary products, and industry-coverage adjustments, which account for undercoverage in the source data.

The remainder of this chapter discusses some of the major adjustments and refinements that are made by I-O analysts in preparing the estimates of output for the I-O tables and presents examples that demonstrate the calculation of industry and commodity output.

Margin output

For the I-O accounts, the output for industries that buy and resell merchandise but do not provide any additional fabrication is measured as margin. By I-O convention, this margin is measured as sales receipts less the cost of goods sold.[5] This I-O treatment is characterized by *unbundling* (recording the value of the trade margin separately, rather than incorporating it in the value of the merchandise) and by *forward shifting* (showing the trade margin as being used directly by the purchaser of the merchandise, so a charge not incurred by the producer and thus not embodied in the "producers' price" of the commodity).

In the I-O accounts, the treatment of trade margins parallels the treatments of transportation costs and of some excise taxes, which are also unbundled and shifted forward regardless of who actually pays the costs (producer, wholesaler, retailer, or ultimate purchaser). The use of this margin treatment enables the I-O accounts to focus on the commodity-producing sectors of the economy and on the use of these commodities by other industries and by final users. Otherwise, all or most of the commodities in the economy would appear to emanate from the distributive industries (trade and transportation).

Margins must be distinguished from the identification and treatment of "commissions," a distinction that is particularly important for wholesale trade. Merchant wholesalers are wholesalers who take title to the goods in which they trade, so merchant wholesalers are treated as margin industries in the same manner as retailers. Conversely, "other wholesalers" include agents and brokers whose function is to bring buyers and sellers together in a market. Their output is defined as their commission, the compensation for this service. In contrast to the treatment of margins, commissions are treated as a cost to the producer, and this compensation is included in the producers' cost of the commodity.[6]

[5] The cost of goods sold is measured as purchases plus beginning inventory less ending inventory. Thus, in a period of inventory accumulation, the cost of goods sold is less than purchases, reflecting the fact that a portion of purchases went to inventory investment rather than sales; when inventories are drawn down, the cost of goods sold exceeds purchases.

Nonmarket transactions (NIPA imputations)

Commodities are valued wherever possible by the market place—that is, where the goods and services are valued at "transaction prices" that purchasers are willing to pay and that sellers are willing to take. However, not all productive economic activity fits into this box, and allowances must be made for certain nonmarket transactions.

In the national income and product accounts (NIPAs), a specific set of "imputations" are made to augment the estimates that are based on market activities. The largest NIPA imputation involves treating owner-occupied housing so it is comparable with tenant-occupied housing. In this treatment, the purchase of a new house (excluding the value of the unimproved land) is treated as an investment, the ownership of the home is treated as a business, and a service is assumed to flow, over its economic life, from the house to the occupant. A similar set of imputations is made for the rental value of nonresidential assets owned and used by nonprofit institutions serving individuals. These imputations provide a more stable and meaningful measure of output that is invariant to whether households or nonprofit institutions choose to own or rent their dwellings.

Another large imputation is that made for services furnished without payment by financial intermediaries (often referred to as "imputed interest"). In this treatment, an explicit value is created for services (such as checking-account maintenance and services to borrowers) that are usually provided to account holders and borrowers either without charge or for a small fee that does not reflect the entire value of the service. For the depositor, the value of this service is measured as the difference between the interest paid by the bank and what they could have received if they had invested in "safe" government securities. For the borrower, it is measured as the difference between the interest charged by the bank and what the bank could have earned had it invested in the same government securities. A corresponding payment of interest to the account holders and from the borrowers is "imputed" as part of the output of the financial institution.[7] The imputation raises gross output and value added for financial institutions.

Other NIPA imputations include an imputation for farm products consumed on farms, an imputation for premium supplements for property and casualty insurance, employment-related imputations (such as employee lodging), private-investment-related imputations (such as profit margins on owner-built housing), and government-related imputations (government gross investment and consumption of fixed capital).[8]

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[6] For another type of wholesaler, manufacturers' sales branches and sales offices, output is defined as their expenses (other than profit). In the past, output for manufacturers' sales branches was treated as margin output, while output for manufacturers' sales offices was treated as nonmargin output. Beginning with NAICS 2002, manufacturers' sales branches and offices are combined with merchant wholesalers while agents and brokers and electronic markets are shown separately. However, Census will continue to collect the information on sales and expenses of manufacturers' sales branches and offices separately from that for the more traditional merchant wholesalers.

[7] For more information, see Dennis J. Fixer, Marshall B. Reinsdorf, and George M. Smith, "Measuring the Services of Commercial Banks in the NIPAs, Changes in Concepts and Methods," *Survey of Current Business* 83 (September 2003): 33-44.

The I-O tables also include a set of imputations for "own-account investment" (sometimes referred to as "force-account investment"), which involves additions to the capital stock that are created directly by the business that owns the new asset rather than being purchased from another business. Two categories are included in own-account investment—construction and software. An example of own-account investment in construction would be the building of a railroad storage building by the railroad's maintenance-of-way crew when they are not busy repairing or inspecting tracks and roadways. Own-account investment in software occurs when companies develop or improve their own software rather than purchasing custom-made and prepackaged software from companies primarily engaged in software development.

Industry-coverage adjustments

Three adjustments are made to bring the coverage of industries to levels that reflect all of their economic activities. The nonemployer adjustment and the tax-misreporting adjustment are economy-wide adjustments, while the tips or gratuities adjustment affects only a small number of industries.

The nonemployer adjustment is necessary because the Economic Census covers only establishments with employees and with payrolls (see chapter 3). Although the industry specific data reported in the various Census publications does not cover nonemployers, nonemployer receipts data are separately published as a special Census report. Receipts from this report, which are based on administrative data—such as tax-return data from the Internal Revenue Service (IRS)—rather than on actual reports to the Census Bureau, are added to the Economic Census receipts data.

The tax-misreporting adjustment has two elements: An adjustment for underreporting of income and an adjustment for illegal nonfiling or late filing of tax returns. (1) The adjustment for underreporting of income is based on two IRS studies. The Taxpayer Compliance Measurement Program (TCMP) is a periodic audit conducted by the IRS on the basis of samples of taxpayers who file returns. The Information Returns Program (IRP) is an IRS study that goes a step further than the audit by matching information returns with the returns of individual taxpayers. These information returns are third-party reports to the IRS, such as IRS Form 1099—MISC, Miscellaneous Income, that track certain payments such as consulting fees paid by one business to another. The 1997 I-O table was based on the TCMP for 1988. (2) The adjustment for illegal nonfiling or late filing is based on "exact match studies" conducted using information from the Current Population Survey (CPS), Social Security Administration, and the IRS. These studies are used to identify proprietors that reported self-employment income to the CPS but cannot be matched to the appropriate IRS records for that income.

The IRS uses information from these types of studies to calculate the "tax gap." The tax gap reflects underreported income; overstated deductions, exemp-

[8] See NIPA table 7.12, "Imputations in the National Income and Product Accounts," on page 169 of the August 2005 *Survey of Current Business*. The government-related imputation of government gross investment is not an imputation in the I-O accounts.

tions, and credits; calculating errors; and late payments for persons (individuals including sole proprietors) who file returns as well as nonfiling of returns. Because one purpose of the I-O tax-misreporting adjustment is to correct the reporting of receipts, it covers only the underreporting of income, and it applies only to small employers and to nonemployers because the data for them are based on tax returns. An additional adjustment, based on the exact match studies, is made for small businesses that should have filed a tax return but did not, and thus were not included in the Census estimates. A sample from the 1988 TCMP identified "potential nonfilers," and a subsample of this group provided the information necessary to distinguish the delinquent taxpayers from the legal nonfilers who fell below certain income levels and were thus exempt from both liability and the responsibility to file. A new IRS study for 2001, called the National Research Program (NRP), will provide information on misreporting for the 2002 I-O tables. The NRP adjustment will combine the TCMP and IRP adjustments.

Both the nonemployer and the tax-misreporting adjustments were applied only to the industries for which the Economic Census data were used as the basic source for receipts. Thus, for example, the adjustments were not applicable to the farm or construction industries.

The tips or gratuities adjustment was required for only those industries—such as the accommodations, food service, taxi, barber shop, and beauty salon industries—where tips are significant. This adjustment is based on our assumption that tips are not included in the receipts that are reported by these establishments to Census.

The adjustment is based on information on "tip rates" from IRS studies. The studies, which are used generally by the IRS in auditing tax returns, are done infrequently and only for selected industries. For some industries, such as gambling, we obtained an estimate of tips from the IRS and generated a tip rate. Tip rates are generally held constant between I-O tables unless new information becomes available.

Inventory change

In order to correctly measure output during an accounting period, an adjustment is needed for the change in work-in-process and finished-goods inventories in the goods-producing industries. If an establishment accumulates inventories during the year, the shipments data will understate output for that year. For example, if beginning inventories are 10 units, shipments are 100 units, and ending inventories are 20 units, the correct measure of output for the year is 110 units (the 100 units shipped plus the 10 units added to inventories). Similarly, if inventories are drawn down during the year, shipments will be an overstatement of output, and a negative adjustment must be made. Only work-in-process and finished-goods inventories are used for these I-O adjustments; inventories of materials and supplies need not be taken into account because they do not represent current production of the establishment.[9]

An adjustment is also needed in wholesale trade and retail trade for the change in inventories of goods for resale. As noted earlier, output for the trade industries is measured as margin, or sales less the cost of goods sold. Some of the

goods purchased for resale may still be held in inventory at the end of the year, and thus should be excluded when calculating the cost of goods sold. Margin can be calculated as sales less purchases plus net additions to inventory. For example, suppose a retailer had sales of $100 and purchases of merchandise for resale of $50 in a year, and it had $20 of merchandise in inventory at the beginning of the year and $25 of merchandise in inventory at the end of the year. In this case, some of the purchases for resale remain to be sold and should not be included in the cost of goods sold. Thus, output would be $100 - $50 + ($25 - $20), or $55.

The inventory adjustment would be rather straightforward if inventories were recorded in terms of physical units. However, inventories are typically recorded in dollar terms using a variety of accounting methods, and so their valuation is subject to variations that result from price fluctuations. For example, if a business accumulated inventories during a period of rising prices, part of the increase in the value of the inventories would reflect the rising price levels. This "holding gain" is eliminated using the *inventory valuation adjustment* (for more information, see the appendix to this chapter).

Capital consumption adjustment

As stated earlier, the output of nonprofit institutions is measured using expenses rather than receipts. Among these expenses is depreciation, which must be adjusted in order to conform with the NIPA treatment of consumption of fixed capital (CFC). CFC is a slightly broader measure than depreciation (for example, it includes accidental damage), and it contains adjustments that reflect the current-replacement cost of the capital used up in the accounting period and that reflect consistent service lives and depreciation schedules. For nonprofit institutions, adjustments to capital consumption are added to expenses reported to the Census Bureau and other sources.[10] The impact of this adjustment is the same as removing reported depreciation from expenses and then including CFC.

Cost of resales

Resales are sales of goods that have had no further processing by the establishment. For all industries that resell goods—whether in wholesale trade, retail trade, manufacturing, or services—output excludes the "cost of resales" or the "cost of goods sold." For manufacturing industries, the cost of resales is found in "Table 3, Detailed Statistics by Industry" in the Economic Census publications. For other nontrade industries, the cost of resales may have to be estimated based

[9] In addition, inventory adjustments are not needed for the industries whose output is measured on a value-put-in-place basis. This applies to construction and to two industries in manufacturing—tobacco and shipbuilding and repairing—where the value of output instead of shipments is reported to the Census Bureau.

[10] No adjustment is needed for for-profit industries because output is measured as receipts, not expenses.

on relationships for the most appropriate kind of business in wholesale or retail trade.

Sales and excise taxes

Data on sales taxes and excise taxes are collected by a variety of sources. For wholesale trade, retail trade, and services, sales taxes are collected as part of the corresponding annual Census surveys. Sales taxes are generally taxes that are calculated as a percentage of the bill and added to it. Wholesale and retail sales taxes are included as a part of margin output. Services sales taxes are included as part of output for the services industry/commodity.[11]

Excise taxes, on the other hand, are generally calculated per unit—that is, by gallon or by barrel. These taxes are allocated based on the industry that pays the taxes to the taxing authority. Only a few excise taxes—the "sin" taxes on tobacco and liquor—are allocated to manufacturing. Excise taxes that are allocated to wholesalers or retailers are referred to as "other wholesale taxes" or "other retail taxes."

Industry and commodity output

As indicated in chapter 3, the preferred basic building block for the collection of economic data for the I-O tables is the establishment. The establishment is generally the lowest level of the company for which books are maintained, and thus it provides the most homogenous picture of the production process. However, even individual establishments may produce two or more commodities (goods or services) that have significantly different cost structures. For example, in the accommodations industry, hotel/motel establishments often have restaurants in the same location, and in the automotive industry, dealers usually maintain both sales and service facilities in the same location.

Commodity output combines all like commodities together no matter where the commodities are made. Thus, the output of the commodity, "car repair service," includes all of the receipts for car repairs, regardless of whether those receipts are generated by the auto repair industry, new car dealers, gasoline service stations, or wholesalers.

Industry output is defined by the establishment and classified according to NAICS. It is the output of all establishments classified in the industry, and it includes all of their productive activities. In I-O accounting, each industry is associated with a commodity (commonly, a broad grouping of like commodities) that is *primary* to that industry, and all the other commodities that the industry produces

[11] A comparison of the sales-tax estimates based on Census data with a set of sales-tax estimates developed by the Regional Economic Analysis Division after the 1997 benchmark I-O tables were published showed significant differences, particularly for the wholesale and retail trade industries. As a result, a decision was made to modify both sets of estimates for the revised 1997 I-O tables that became the basis for the integrated annual I-O and GDP-by-industry accounts. This review and reconciliation of the sales-tax estimates is expected to continue in the future.

are considered *secondary.* These secondary products may or may not have input structures that are similar to those of the primary commodity. If they do not, the secondary output is "redefined" (see below).

An exception to the NAICS industry classification is the treatment of rental receipts for structures and land (but not for equipment) by businesses that are not primarily engaged in the real estate industry. These receipts, which are not collected for most industries, are all assigned to the real estate industry. Their transfer is sometimes referred to as an "implicit redefinition"; they are included in real estate output both before and after redefinitions.

Redefinitions

A redefinition is a transfer of a secondary product from the industry that produced it to the industry in which it is primary. Redefinitions enable the I-O accounts to adjust for secondary products that have inputs that differ significantly from those of the primary product of the industry.[12] (For more information, see Chapter 4, "Classification and Secondary Products.")

Redefinitions improve the homogeneity of the I-O matrix and therefore provide for more stable I-O coefficients in the total requirements tables. For example, shifting restaurants in hotels/motels to the restaurant industry makes the production functions (or cost structures) more homogeneous for both industries. After the redefinition, the cost structure of the hotel/motel industry more closely reflects its purchases for lodging (such as linens, television and telephone services, and travel agency commissions) by removing its purchases for restaurant services (largely food and beverages).

These regroupings do not change the total value of what is produced. Thus, for the economy as a whole, total industry output before redefinitions is equal to total industry output after redefinitions. Likewise, total commodity output for the economy is equal to total industry output for the economy.

As discussed in chapter 1, two versions of the I-O tables are prepared—one before redefinitions and one after the redefinitions. In the I-O accounts, the "featured" measure of output is NAICS industry output before redefinitions.[13] This version of output, which is based on the source data and includes the value of all activities of the establishments, is more useful for comparisons with the economic statistics from other sources. Industry output after redefinitions is generally referred to as "I-O industry output." This version of output is used in the calculation of the total requirements tables, but it is generally not as comparable with other economic statistics.

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[12] An exception to the general rule for redefinitions exists for "captive" activities of some establishments—generally, where an "admission" is charged and where the consumer is not free to go elsewhere to make a purchase. A primary example is food and beverage receipts of airlines and railroads, movie theaters, sporting events, and theatrical events. In such cases, the secondary products are not redefined; rather, they are treated as a primary product of the industry.

[13] Prior to the 1997 benchmark, the featured measure of industry output was after the redefinitions.

Calculating output

The method of calculating industry and commodity output differs, depending on the industry or commodity. For mining and manufacturing industries, the Census Bureau collects and tabulates shipments data by industry, where the shipments include both the primary and secondary products of the industry, and by product, where the shipments cover the total for the product no matter where it is made. For other industries, the Census Bureau tabulates receipts data by industry, including information by source of receipt.[14] Based on that information, BEA estimates receipts by type of product. For nonprofit institutions, the Census Bureau collects data on total operating expenses as well as on receipts, or revenue. BEA uses the data on operating expenses to estimate the output of nonprofits, and it uses the receipts data to identify and adjust for secondary products.

In industries where product shipments or product receipts are collected and tabulated, the calculation of commodity output starts with that data rather than the industry data. The adjustments for tax-misreporting and nonemployers, inventory change, taxes, imputations, etc., are the same as those for industry output. Adjustments are also made for reclassifications (instances where BEA opts to treat a product differently than the Census Bureau). In addition, the imputations and other industry-based adjustments are evaluated to identify products that are secondary to the industry and must be removed in the calculation of commodity output.

In industries where only data on industry receipts are collected and tabulated, more adjustments are necessary when calculating commodity output. We begin with all of the production of the industry, and then we identify the portion of that production that is attributable to secondary products (reclassifications, redefinitions, and other secondary products) of the industry and thus is not part of the production of that industry's primary commodity. The production of these secondary commodities is removed, and then the production of the primary commodity by other industries is identified and included. The adjustments for tax-misreporting and nonemployers, inventory change, taxes, imputations, etc., are also evaluated to identify those that pertain to secondary products and so must be removed.

The following examples illustrate the two situations—one in which we have both industry and commodity shipments data and the other in which we have only industry shipments data. When following the examples, it is critical to bear in mind that in the first example, the calculations of industry output and of commodity output start from different data sources, whereas in the second example, the calculations start from the same data source.

[14] The data published may change as a result of the implementation of the North American Product Classification System in the 2007 Economic Census.

Example 1. In the cheese industry, we have both industry and commodity shipments data (table 5.1). To calculate the *output of the cheese industry,* we begin with industry shipments and adjust those shipments for changes in inventories of finished goods and work-in-process inventories to get to a measure of production. We add the imputations for own-account software and construction and the estimates for miscellaneous receipts of the industry. We also make coverage adjustments for tax-misreporting and nonemployers, and then we remove the cost of the goods that are resold. To calculate the *output of the cheese commodity,* we begin with product shipments and adjust for changes in inventories of finished goods and work-in-process (assumed to all be for the primary product and not for secondary products). We remove reclassified products (products the source data treat as primary and we treat as secondary). The imputations of own-account software and construction for the cheese industry are added in; however, they are then removed because, while they pertain to the cheese industry, they do not pertain to the cheese commodity (part of redefinitions out). The estimates of miscellaneous receipts are added in; most of these services are assumed to be primary to the industry, but the reselling activity is removed and treated as wholesale activity (the rest of redefinitions out). We also add in the tax-misreporting and nonemployer adjustments, all of which are assumed to relate to the primary product of the industry. We then remove the cost of goods that are resold. There is a final adjustment (the make-table adjustment) that corrects for inconsistencies between the product and industry shipments data.[15]

[15] The make-table adjustment is created during the balancing of the secondary-products matrix for mining and manufacturing, a table that shows the products produced by each industry. The secondary-products matrix is used in estimating the make table. The adjustment is necessary because of small inconsistencies between the product and industry data. Without it, it would not be possible to create a balanced make table, and total commodity output and total industry output would not be equal.

Table 5.1 Cheese Manufacturing (NAICS 311513)

INDUSTRY	BASICVAL	COMTAX	COMMODITY	BASICVAL	COMTAX
Industry shipments	19515.0		Product shipments	18285.0	
Beginning inventory	-925.2		Beginning inventory	-925.2	
Ending inventory	927.4		Ending inventory	927.4	
Imputations[1]	9.3		Imputations[1]	9.3	
Misc. receipts[2]	815.0		Misc receipts[2]	815.0	
Tax misreporting	85.6		Tax-misreporting	85.6	
Nonemployers	10.0		Nonemployers	10.0	
Cost of resales	-696.0		Cost of resales	-696.0	
NAICS OUTPUT	**19741.1**	**0.0**	Redefinitions out[3]	-80.3	
Redefinitions out[3]	-80.3		Reclassifications[4]	-113.0	
I-O OUTPUT	**19660.8**	**0.0**	Make-table adjustment	-6.0	
			COMMODITY OUTPUT	**18314.8**	**0.0**

[1]For most industries, the imputations are the own-account software and construction estimates.

[2]Miscellaneous receipts includes contract-work receipts, receipts from reselling, and other miscellaneous receipts.

[3]Own-account software and construction and margin from reselling are removed because they represent products other than cheese.

[4]Reclassifications are products that Census views as primary and thus part of product shipments, but we treat them as secondary products.

Example 2. In the telecommunications industry, we have only industry receipts data (table 5.2). Because data are not available on a product basis, both the industry and commodity output calculations begin with industry receipts. (The two calculations are similar but are performed separately in the I-O processing system.) To industry receipts, we add the nonemployer and tax-misreporting adjustments. We include sales and excise taxes, the imputations for own-account software and construction, and an imputation for capitalized installations performed by the industry's own employees. We then remove the cost of goods being resold, and the result is the *output of the telecommunications industry.* To calculate the *output of the telecommunications commodity,* we continue by evaluating the content and identifying secondary products. The imputations for own-account software and construction and margin on reselling (part of redefinitions out) are removed. We also remove other products (rental of equipment, directory advertising, and internet access) that are primary to other industries (part of redefinitions out and secondary out). We add telecommunications receipts of other industries (secondary in). The result is commodity output.

Table 5.2 Telecommunications (NAICS 5133)

INDUSTRY	BASICVAL	COMTAX	COMMODITY	BASICVAL	COMTAX
Industry receipts[1]	261337.0	10216.0	Industry receipts[1]	261337.0	10216.0
Commodity taxes		8887.0	Commodity taxes		8887.0
Imputations[2]	12499.5		Imputations[2]	12499.5	
Tax misreporting	377.4		Tax misreporting	377.4	
Cost of resales	-4512.0		Cost of resales	-4512.0	
NAICS OUTPUT	269701.9	19110.1	Redefinitions out[3]	-11095.5	-112.0
Redefinitions out[3]	-11095.5	-112.0	Secondary out[4]	-6901.0	-63.0
I-O OUTPUT	258606.4	18998.1	Secondary in[5]	1101.0	14.0
			COMMODITY OUTPUT	252806.4	18949.1

[1]Industry receipts include both employer and nonemployer receipts.

[2]In addition to own-account software and construction, imputations include the value of capitalized installations performed by their own employees.

[3]Redefinitions out includes own-account software and construction, margin on sales of merchandise, and rental and leasing of equipment. Own-account telephone installation is not redefined.

[4]Secondary out includes internet access and directory advertising receipts, which are not primary to the telecommunications industry.

[5]Secondary in includes telecommunications services produced in other industries.

For a summary of sources and calculations of the output for selected industries and commodities, see table 5.A at the end of this chapter.

Recent changes that affect I-O output

As noted in chapter 4, the incorporation of NAICS had a substantial impact on the 1997 benchmark I-O tables. Of particular note was the recognition of the services provided by auxiliaries as output. The 2003 comprehensive revision of the NIPAs, which was released after the publication of the 1997 benchmark I-O, introduced a number of changes that will affect I-O tables in the future.

Administrative offices and auxiliaries

The new NAICS Industry 55, "Management of companies and enterprises," includes establishments that provide multiple types of services. Establishments that had previously been treated as auxiliaries that provided only one type of service (for example, legal services, accounting services, or trucking services) to other establishments of the same firm are now included as part of the industry providing those services. For all of these establishments, output is measured as expenses (including expenses paid on behalf of other establishments of the company). The creation of the new NAICS industry increases gross output in the economy. It also rearranges value added: Employee compensation for the central administrative office that had appeared in a manufacturing industry is now in the

auxiliary industry (for example, legal services or management of companies and enterprises).[16]

NIPA benchmark changes

A number of changes in concepts and classifications are usually introduced in comprehensive NIPA revisions that occur about every 5 years. The 2003 revision included a number of changes that affect the calculation of industry output in the I-O accounts.[17] The most important of these are the following: The recognition of implicit services provided by property and casualty insurance companies and a change in the treatment of insured losses (which affects output of the insurance industry); a change relating to implicit services of commercial banks that recognizes that both borrowers and depositors receive these services (affects output of the banking industry); and the recognition of the explicit services produced by the general government and the treatment of its purchases of goods and services as intermediate inputs (affects output of the general government industry). Some of the other changes that were introduced were designed to bring the NIPAs into closer conformance with the I-O tables, and some others affected only the NIPA measures of income and not of gross output.

[16] For more information, see Ann M. Lawson, Kurt S. Bersani, Mahnaz Fahim-Nader, and Jiemin Guo, "Benchmark Input-Output Accounts of the United States, 1997," *Survey of Current Business* 82 (December 2002): 20-23.

[17] See Brent R. Moulton and Eugene P. Seskin, "Preview of the 2003 Comprehensive Revision of the National Income and Product Accounts: Changes in Definitions and Classifications," *Survey of Current Business* 83 (June 2003): 17-34.

APPENDIX TO CHAPTER 5

The Inventory Valuation Adjustment

For most industries, data on inventories held are collected as part of the Economic Census. Data by type of inventory (materials and supplies, finished goods, work in process, and merchandise for resale) are reported as of the end of the year.[18] The values reported are "book values," or the value the establishment has on their books. The establishments may use different inventory valuation methods, but they generally report the book value of their inventories at the prices prevailing at the end of the year.

The inventory valuation adjustment (IVA) is an adjustment that removes the effects of changes in prices in the calculation of the change in private inventories. It is the difference between the change in book values and the change in private inventories in the national income and product accounts (NIPAs). The NIPAs show two IVAs—one on the product side of the accounts and the other on the income side. On the product side, the IVA removes the effects of changing prices on the value of commodities held in inventory; on the income side, it removes the effects of the changes in prices on the profits of the industry. The two values are necessary because the inventory-reporting methods in the Economic Census data, which are used for the product-side estimates, differ from those in the IRS data, which are used for the income-side estimates.

For the input-output (I-O) accounts, inventories should be valued at their average cost for the period. Remember that inventories show up in the I-O accounts in two ways—as part of industry and commodity output and as business investment (a final use of gross output). For a manufacturing industry, gross output is based on shipments, adjusted for changes in inventories of finished goods and work in process.[19] However, output should be valued at the prices when it was produced, rather than at the prices when it was sold. So, if a product is produced in the first quarter, placed in inventory, and then sold in the second quarter at a higher price, we need to exclude the "inventory profits" from our measure of output.

Why use the average price instead of the end-of-year price to revalue the change in inventories? Over the course of the year, products continuously move in and out of the stock of inventories. As illustrated in the accompanying example, suppose a manufacturer starts the year with one unit of output in inventory that has a value of $9 on January 1st. During the first quarter of the year, 10 units are produced with a value of $10 per unit, or $100. Nine units are shipped ($90), and one unit is placed in inventory. During the second quarter, another 10 units are produced with a value of $11 per unit, or $110. Eleven units are shipped ($121), including one unit withdrawn from inventory. In the third quarter, an additional 10 units are produced with a value of $12 per unit, or $120. Nine units are shipped

[18] Beginning-of-year inventories are the same as the end-of-year inventories for the previous year.

[19] For manufacturing industries, shipments are reported rather than production. The adjustment for changes in finished-goods and work-in-process inventories is necessary to calculate output.

($108), and one unit is added to inventory. In the fourth quarter, an additional ten units are produced with a value of $13 per unit, or $130. Production during the year totaled 40 units, and the value of output should be $460 ($100 + $110 + $120 + $130). Shipments totaled $449 ($90 + $121 + $108 + $130). At the end of the year, two units were held in inventory at a value of $26, and the change in inventories at book value is $17 ($26 - $9).

- If output were calculated as shipments plus change in inventory at book value ($449 + $17 = $466), the result would be an overstatement of output by $6.
- If, instead of using book values, we revalued the beginning and ending inventories to the average price for the period ($11.50/unit or the average of $10, $11, $12, and $13), then the change in inventories would be $11.50 ($23 - $11.50). Output would be shipments ($449) plus change in inventories ($11.50), or $460.50, which is much closer to the value we would have calculated directly if we had been able to collect data on the value of production rather than the value of shipments.
- If we were able to correctly calculate the IVA of -$6, output would be measured as shipments ($449) plus change in book value of inventories ($17) plus IVA (-$6), or $460.

The IVA removes the effects of price change on the book value of inventories. In our example, the unit in inventory on January 1st increases in value by $1 during the first quarter. In the 2nd quarter, the two units of inventory increase an additional $2 in value (one remains in inventory, the other was shipped at the higher value). In the 3rd quarter, the remaining unit of inventory increases in value by $1. In the 4th quarter, the two units of inventory increase an additional $2 in value. For the year, the value of inventories have increased by $6 ($1 + $2 + $1 + $2), yielding an IVA of -$6.

	BOY	QUARTER				EOY
		FIRST	SECOND	THIRD	FOURTH	
Price	$9	$10	$11	$12	$13	
Quantity produced		10	10	10	10	40
Quantity sold		9	11	9	10	39
Inventory quantity	1	2	1	2	2	2
Inventory quantity change		1	-1	1	0	1
Output (quantity produced * price)		$100	$110	$120	$130	$460
Shipments (quantity sold * price)		$90	$121	$108	$130	$449
Inventory value (quantity * price)	$9	$20	$11	$24	$26	$26

BOY=beginning of year inventory
EOY=end of year inventory

The Census Bureau surveys that collect inventory data periodically include questions on the types of inventory valuation used by the businesses. NIWD uses

this information—along with IRS data on inventory valuations, price data that comes primarily from the Producer Price Program of the Bureau of Labor Statistics, and IAD estimates of the products held in inventory by detailed industries—to estimate the IVA. Inventory valuation methods include first-in first-out (FIFO), last-in first-out (LIFO), average cost, and specific cost. Although there are some differences in the various methods, they generally require an IVA. In the 1980s, after extensive studies and consultation with businesses on their inventory accounting records, the Census Bureau substantially changed their surveys so that businesses report only "non-LIFO" inventories. For businesses that use LIFO for all or part of their inventories, the surveys request that they report their "LIFO reserves"—the amount that would need to be added to their LIFO inventory in order to convert it to a non-LIFO basis. This information is provided to BEA to assist in the calculation of the IVA.

In the past, IAD has used an IVA that differed from the product-side IVA in the NIPAs. This difference was equal to the amount of the LIFO reserves. However, because IAD also adjusted book values by the amount of LIFO reserves, the total change in private inventories in the I-O accounts was the same as the NIPA change in private inventories. For the 2002 benchmark I-O table, the method for estimating change in private inventories is expected to change to remove the LIFO-reserve adjustment and to allocate the IVA to the commodities held in inventory. This change should improve the calculation of gross output and supply in the I-O accounts.

Table 5.A Output Summary Reports for Selected Industries and Commodities, 1997 (Page 1 of 5)
[Millions of dollars]

	COTTON FARMING		
	BASIC VALUE	COMMODITY TAX	
OUTPUT CONTROL COMPONENT TYPE			
Principal source receipts	6164.0	0.0	Cash marketings
Additional industry receipts	523.0	0.0	Secondary products, including rents
Inventory change	677.6	0.0	Finished goods and work in process
Imputations	136.0	0.0	Nonpurchased feed and seed
Redefinitions out	-320.0	0.0	Rents are redefined to the real estate industry
INDUSTRY OUTPUT	**7180.6**	**0.0**	
I-O INDUSTRY OUTPUT	**7180.6**	**0.0**	
Secondary products out	-203.0	0.0	Other secondary products
COMMODITY OUTPUT	**6977.6**	**0.0**	

Table 5.A Output Summary Reports for Selected Industries and Commodities, 1997 (Page 2 of 5)
[Millions of dollars]

	CHEESE MANUFACTURING		
	BASIC VALUE	COMMODITY TAX	
OUTPUT CONTROL COMPONENT TYPE			
Principal source receipts	19515.0	0.0	Industry shipments
Beginning inventory	-925.2	0.0	Finished goods and work in process
Ending inventory	927.4	0.0	Finished goods and work in process
Imputations	9.3	0.0	Own-account software and construction
Miscellaneous receipts	815.0	0.0	Includes receipts from resales
Tax-misreporting adjustments	85.6	0.0	Misreporting adjustment for small employers and nonemployers
Nonemployers	10.0	0.0	From Economic Census
Cost of resales from redefinitions and secondary products	-696.0	0.0	From Economic Census
INDUSTRY OUTPUT	**19741.1**	**0.0**	
Redefinitions out	-80.3	0.0	Margin on resales; own-account software and construction
I-O INDUSTRY OUTPUT	**19660.8**	**0.0**	
Primary products made elsewhere	682.0	0.0	From Economic Census
Make matrix adjustment for mfg.	-6.0	0.0	Adjustment to commodity output for make table
Secondary products out	-113.0	0.0	Reclassifications
Secondary products of the industry	-1909.0	0.0	From Economic Census
COMMODITY OUTPUT	**18314.8**	**0.0**	

Table 5.A Output Summary Reports for Selected Industries and Commodities, 1997 (Page 3 of 5)

[Millions of dollars]

	FURNITURE AND HOME FURNISHING WHOLESALERS		FURNITURE STORES (RETAIL)		
	BASIC VALUE	COMMODITY TAX	BASIC VALUE	COMMODITY TAX	
OUTPUT CONTROL COMPONENT TYPE					
Principal source receipts	39346.0	0.0	41945.0	0.0	Sales (merchant wholesalers and retailers) and commissions
Additional industry receipts	-17.0	0.0	-180.9	0.0	Service contracts removed
Commodity taxes	0.0	1262.0	0.0	2152.1	Sales taxes
Expenses	1836.0	0.0	0.0	0.0	For manufacturers' sales offices and branches
Beginning inventory	-4516.0	0.0	-6900.0	0.0	Merchandise
Ending inventory	4722.0	0.0	6977.0	0.0	Merchandise
Imputations	9.3	0.0	337.0	0.0	Own-account software and construction
Tax-misreporting adjustments	824.0	0.0	379.2	28.0	For small employers and nonemployers
Resales	-26852.0	0.0	-25444.0	0.0	Purchases for resale
Cost of resales from redefinitions and secondary products	184.0	0.0	15.0	0.0	Adjustment to resales for services provided
INDUSTRY OUTPUT	**15536.3**	**1262.0**	**17128.3**	**2180.1**	
Redefinitions out	-747.3	-11.0	-895.0	-9.0	Repair services, own-account software and construction
I-O INDUSTRY OUTPUT	**14789.0**	**1251.0**	**16233.3**	**2171.1**	
COMMODITY OUTPUT	**14789.0**	**1251.0**	**16233.3**	**2171.1**	

Table 5.A Output Summary Reports for Selected Industries and Commodities, 1997 (Page 4 of 5)
[Millions of dollars]

	TELECOMMUNICATIONS		
	BASIC VALUE	COMMODITY TAX	
OUTPUT CONTROL COMPONENT TYPE			
Principal source receipts	261337.0	10216.0	Receipts and sales taxes
Commodity taxes	0.0	8887.0	Excise taxes
Imputations	12499.5	0.0	Own-account software and construction, capitalized own-account installation
Tax-misreporting adjustments	377.4	7.1	For small employers and nonemployers
Cost of resales from redefinitions and secondary products	-4512.0	0.0	IAD estimate
INDUSTRY OUTPUT	**269701.9**	**19110.1**	
Redefinitions out	-11095.5	-112.0	Own-account software and construction; margin on sales of merchandise; repair and rentals
I-O INDUSTRY OUTPUT	**258606.4**	**18998.1**	
Adjustment in for item output	1138.0	0.0	Adjustment to items within commodity
Adjustment out for item output	-1138.0	0.0	Adjustment to items within commodity
Secondary products in	1101.0	14.0	Telecommunications services of other industries
Secondary products out	-6901.0	-63.0	Internet access and directory advertising services
COMMODITY OUTPUT	**252806.4**	**18949.1**	

Table 5.A Output Summary Reports for Selected Industries and Commodities, 1997 (Page 5 of 5)

[Millions of dollars]

	HOSPITALS (TAXABLE)		HOSPITALS (TAX EXEMPT)		
	BASIC VALUE	COMMODITY TAX	BASIC VALUE	COMMODITY TAX	
OUTPUT CONTROL COMPONENT TYPE					
Principal source receipts	41373.0	221.0	0.0	0.0	Receipts and sales taxes of for-profits
Additional industry receipts	0.0	0.0	-3307.0	0.0	Adjustments to expenses of nonprofits
Capital consumption adjustment	0.0	0.0	2265.0	0.0	Capital consumption adjustment
Expenses	0.0	0.0	233552.4	369.5	Expenses and sales taxes of nonprofits
Imputations	688.3	0.0	429.3	0.0	Own-account software and construction
Cost of resales from redefinitions and secondary products	-1.0	0.0	-202.5	0.0	IAD estimates
INDUSTRY OUTPUT	**42060.3**	**221.0**	**232737.2**	**369.5**	
Redefinitions out	-735.3	-2.0	-7243.1	-72.4	Cafeteria sales; merchandise sales; home health care services; nursing home services; own-account software and construction
I-O INDUSTRY OUTPUT	**41325.0**	**219.0**	**225494.1**	**297.1**	
Secondary products out	-256.0	-1.1	0.0	0.0	Home health care services
Secondary products in	0.0	0.0	73863.0	0.0	Government hospitals
COMMODITY OUTPUT	**41069.0**	**217.9**	**299357.1**	**297.1**	

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CHAPTER 6: TRANSACTIONS: INDUSTRY INPUTS AND FINAL USES

Transactions track the economic flows between the producers of the commodity and the users of the commodity, both intermediate and final. This chapter describes the function of transactions as the building blocks of the input-output use table and the major categories of transactions found in the table. It then describes the source data used and the steps followed to estimate transactions. Definitions of some key terms are provided at the end of the chapter.

In Chapter 5, "Output," of this handbook, we discussed industry and commodity output, the elements that compose the input-output (I-O) make table. The make table shows the commodities that industries produce. In this chapter, we discuss transactions, which form the principal building blocks for the construction of the I-O use table. The use table shows the disposition of the commodities that the industries produce.

In the I-O accounts, a *transaction* is an economic flow between establishments or from an establishment to a final user. Thus, transactions form the bridge that connects the output of commodities by industries with the use of these commodities either as inputs to production by industries or as consumption by final users. By answering the question "Who buys what?", transactions show the value of what is consumed by each industry and final user in the economy.

The estimation of transactions is often referred to as "the art of input-output." "Art" is needed because of the paucity of data for measuring transactions in many areas. Many of the basic data sources that are used for estimating output—for example, the Economic Census—are also used for estimating transactions. However, because the primary goal of many economic statistics programs has been measuring output, substantially less information is available for estimating transactions.

Defining transactions

In the economy, the total supply of commodities that are available for use are primarily those that are produced by domestic industry. However, additional commodities enter the supply as imports or as net withdrawals from inventory. The commodities that make up supply are disbursed either for intermediate use by industries to produce other commodities or for final use. Transactions span the broad range of these activities and involve both the derivation and the use of the supply of commodities. Examples of transactions include the following: Shipments of processed steel from the steel industry to automotive plants, exports of grain to foreign countries, withdrawals of petroleum from inventory, sales of appliances to consumers, payments of wages and salaries to employees, and payments of property taxes by businesses.

In the real world, commodities are generally carried by some mode of transportation from the producer or importer to a wholesaler (and in the case of consumer goods, through a retailer) and then to the purchaser. In the use table of

the I-O accounts, transactions show the direct flow of goods or services to users, but they do not explicitly show the flows through transportation and trade channels. For example, the sale of a washing machine to a consumer is shown as a transaction between the producer and the consumer.

Transactions in the use table

The I-O use table is composed of transactions that show the inputs of commodities by industries and final users. These use-table transactions are an aggregation and reformatting of the transactions that are recorded in the I-O database.[1]

Looking across a row in the use table, a transaction is a flow of a commodity to an industry or final use. Looking down a column of the use table, a transaction is an input into an industry or final use. The sum of the transactions for any commodity in the use table is equal to the commodity output of that commodity in the make table. Additionally, the sum of commodity inputs to any industry is equal to the industry output of that industry in the make table.

The use table is constructed from the point of view of the producer. It displays transactions in producers' prices, a price that is relevant for analyzing the flow of goods and services to users.

Producers' prices are not as relevant for analysis from the viewpoint of consumption. For example, inputs to an industry at producers' prices are not the usual valuation experienced by the purchasing industry. Rather, industries typically view inputs in terms of the price paid, or purchasers' prices. Purchasers' prices include the costs of transporting goods to the industry and any trade margins required to acquire the inputs, which are included in separate rows of the use table (in the transportation and trade commodities). The sum of all inputs to an industry includes all of the costs that make up the purchasers' value of inputs, even though these costs are shown in different rows of the use table.

As mentioned earlier, the use table shows the distribution of goods and services to their ultimate users—that is, it does not identify the flows of specific commodities through transportation carriers and trade channels. Instead, the costs of these flows are accounted for in the rows of the distributive industries in the use table: Transportation rows for the costs associated with moving the goods from producer to user, and wholesale and retail trade rows for the markup on goods moving through trade channels. In the use table, these transportation and trade rows include the total cost of transportation or trade markups for all goods purchased by the industry. The transportation and trade rows also include direct purchases of the commodity. For example, the row for air transportation includes both the costs of moving freight to industries and the cost of purchased air fares.

The transactions in the use table are developed from the data on transactions that are contained in the I-O database. Transactions in the use table show the flow of goods and services from the producer to the user of the commodity in pro-

[1] The use table shows the producer-value portion of the purchase. The transportation costs and trade margins of the transaction are reformatted to show the producer-value purchases of transportation and trade services for all goods purchased by an industry or final user.

ducers' prices, a presentation that is designed for our I-O modeling of relationships between industries. Unfortunately, most industries and final users cannot supply information on the purchases of goods in producers' prices or on the associated costs of transportation and of trade markups. Industries, however, can report the purchasers' value of those goods, leaving us with the job of estimating the producers' value, transport costs, and margins.

We use the information in the database to estimate purchases in purchasers' prices. With the help of other data, we estimate the cost of transporting the goods and the costs associated with wholesaling or retailing these goods, and then we calculate the producers' value of the good. Additionally, where we estimate the flow of goods in producers' prices, we estimate the transport costs and selling costs implicitly paid for by the industry or final user.

Major categories of transactions

There are three distinct areas of the use table: Intermediate, final use, and value added. Each area serves a different purpose for I-O accounting for transactions.

Intermediate transactions

Intermediate transactions (shaded area in figure 6.1) are transactions associated with the consumption of goods and services used up in the production process. These transactions, sometimes referred to as current-account expenditures, consist only of purchases that are used up in the current period. They do not include any capital purchases (that is, structures, equipment, and software) or purchases of goods that are held in inventory. Intermediate transactions include the consumption of imputed output, such as bank service charges. Intermediate purchases are almost always positive values.[2]

[2] Prior to the 2003 comprehensive revision of the national income and product accounts, the output of the property/casualty insurance industry sometimes appeared as a negative value. This anomaly occurred because the output was measured as premiums less benefit payments, and benefit payments were sometimes large in a period that was affected by a major disaster. Under the new treatment, insurance output is now measured as premiums earned less expected claims. As a result, intermediate purchases of insurance should not be negative.

The only other negative value that has appeared in intermediate purchases is for the sale of used video tapes. These tapes were originally purchased for rental but are later sold to customers as "remainders." Because the tapes were not capitalized, these sales are treated as current-account purchases. The transaction appears as a negative because the sale of the used tapes reduces total current-account purchases.

Figure 6.1 Intermediate Inputs in the Use Table

	INDUSTRIES	FINAL USES	COMMODITY OUTPUT
COMMODITIES			
VALUE ADDED			
INDUSTRY OUTPUT			

Final-use transactions

Final-use transactions (figure 6.2) consist of the transactions that make up the final-expenditure components of gross domestic product (GDP): Personal consumption expenditures, private fixed investment, change in private inventories, exports, imports, and government. Most final-use transactions are positive, but some—such as imports and sales of used goods and scrap—are negative.

Figure 6.2 Final Uses in the Use Table

	INDUSTRIES	FINAL USES						COMMODITY OUTPUT
		PCE	PFI	INVENTORY	EXPORTS	IMPORTS	GOVERNMENT	
COMMODITIES								
VALUE ADDED								
INDUSTRY OUTPUT								

Personal consumption expenditures (PCE) consists largely of purchases by households; by convention, PCE also includes the sum of the expenses of nonprofit institutions primarily serving households. The estimates of PCE for goods are largely based on the commodity-flow procedure (discussed later), whereby the flows to users are based on information about the product that helps identify the user of the item. For example, consumer-packaged food products would be assigned to consumer spending. Shipments in bulk would usually be considered intermediate product, part of which flows to other manufacturers for further pro-

cessing and part of which flows to restaurants and to other establishments with food-service activities, such as schools and hospitals.

Private fixed investment (PFI) consists of residential and nonresidential investment by private business, nonprofit institutions, and households (recall that home ownership is treated as a business). PFI includes purchases of new and used equipment and structures. It does not include depreciation. The estimates of investment in equipment are largely based on the commodity-flow procedure, and those of investment in structures are based on the Census Bureau's value-put-in-place estimates (see Chapter 3, "Data Sources").

Change in private inventories, or inventory investment, represents the flow of goods into and out of inventory. The inventory column shows the commodities held in inventory by all businesses. Inventories may be categorized into several types:[3]

- Materials and supplies, which are held by most industries, are made up of the materials and supplies used by the reporting industry.
- Work-in-process and finished-goods inventories, which are largely held by agriculture, mining, and manufacturing industries, are assumed to consist of the primary products of the reporting industry.
- Merchandise inventories, which are mostly held by wholesale and retail trade, are made up of the goods purchased by trade industries for sale.

Government consumption expenditures and gross investment consists of current-account expenditures by general government and of gross investment by general government and government enterprises. In the 2003 comprehensive revision of the national income and product accounts (NIPAs), a new treatment of government was introduced. Government is now recognized as a producer of services, and government consumption expenditures consist of the purchase of services of the new commodity "Government." Inputs to the new industry "Government" consist of compensation of general government employees, consumption of general government fixed capital, and current-account purchases from business and from the foreign sector.[4] Government gross investment, like PFI, is gross of depreciation.

Exports consist of goods and services that are produced in the United States but are sold to the foreign sector. *Imports* consist of goods and services that are produced by the foreign sector and are purchased as intermediate inputs or for final use in the United States. Because imports are subtracted in the calculation of GDP,

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[3] Although the I-O accounts only need to show inventory transactions from the commodity to the inventory final-use category, the national income and product accounts require estimates of the commodity makeup of inventories held by each industry in order to calculate the inventory valuation adjustment (see chapter 5). To meet these needs, the I-O accounts maintain data showing the commodity held in inventory and the industry holding the inventory.

[4] See Brent R. Moulton and Eugene P. Seskin, "Preview of the 2003 Comprehensive Revision of the National Income and Product Accounts: Changes in Definitions and Classifications," *Survey of Current Business* 83 (June 2003): 30-31.

they are shown as negatives in the use table. The primary source for the estimates of exports and imports is BEA's international transactions accounts. (For more information, see Chapter 7, "Foreign Transactions.")

Special treatments. Two types of final-use transactions—used goods and scrap—require special treatment. Used goods are goods that are traded but were not produced during the current year, so their value (except for the margin, if any, associated with the sale of used items) is not part of the current-period gross output in the economy. There is no industry that produces used goods; they are commodities only. Nevertheless, used goods are part of supply available for consumption, and they are sold by businesses, government, or households to other sectors. For example, used motor vehicles are not produced by an industry, but they are sold by the business sector to the consumer sector. These transactions result in an increase in PCE and a decrease in PFI (that is, the used vehicles sold by business are netted against new business investment). The negative transaction for business is also viewed as a reduction in the stock of capital available for production. Another example is the sale of an existing structure by the government sector to the business sector or vice versa. Each of these transfers results in a positive transaction for one sector and a negative transaction for another sector (and in most cases, a positive margin transaction, such as a real estate commission).

Scrap that is from final uses is treated similarly. Scrap sold by final users is not part of the gross output of the economy, but it is part of the supply of goods available. All scrap originating in final uses is sold to intermediate. Examples include sales of used aluminum cans by persons to recyclers and sales of scrapped vehicles to junk dealers.

Supply of commodities. Within final uses, transactions represent either a use of commodities or a part of the supply of commodities, depending on the type of final use. PCE, PFI, and government represent the use of commodities for either consumption or investment.

Imports, exports, inventory change, and sales of scrap and used goods are part of the calculation of the supply of commodities available for domestic use. Imports are additions to the available supply, while exports are subtractions. Inventories are commodities that are either produced in the current period and not used (a positive inventory change) or produced in a prior period and withdrawn for use (a negative inventory change). Scrap and used goods sold by final uses increase the supply of goods. The domestic supply is calculated as commodity output minus imports, exports, change in private inventories, and sales of scrap and used goods. In this calculation, note that because imports and sales of scrap and used goods are negative, their subtraction results in additions to supply. Also note that a positive inventory change results in a reduction to supply, while a negative inventory change results in an addition to supply.

Value-added transactions

Value-added transactions (figure 6.3) consist of the transactions that relate to gross domestic income (GDI) in the NIPAs. For the published 1997 benchmark I-O tables, value added was composed of compensation of employees, indirect business taxes, and "other valued added." Compensation and indirect business

taxes were estimated explicitly, and "other value added" was derived as a residual using industry output. As a result of the changes introduced in the 2003 comprehensive NIPA revision, value added is now composed of compensation of employees, taxes on production and imports less subsidies, and gross operating surplus. These changes are consistent with the terminology in the United Nation's System of National Accounts.

Figure 6.3 Value Added in the Use Table

	INDUSTRIES	FINAL USES	COMMODITY OUTPUT
COMMODITIES			
TOTAL VALUE ADDED			
Compensation of employees			
Taxes on production and imports less subsidies			
Gross operating surplus			
INDUSTRY OUTPUT			

Compensation of employees is the income accruing to employees as remuneration for their work. It is the sum of wage and salary accruals and of supplements to wages and salaries (employer contributions for employee pension and insurance funds and employer contributions for government social insurance).

Taxes on production and imports less subsidies consists of a variety of taxes—sales and excise taxes, customs duties, property taxes, motor vehicle licenses, severance taxes, other taxes, and special assessments—and of subsidies—monetary grants paid by government agencies to private business and to government enterprises at another level of government. Commodity taxes—that is, sales taxes and excise taxes—are among the taxes that make up this component. In the I-O accounts, commodity taxes are included in industry and commodity output.

Gross operating surplus is a profits-like measure that shows business income after the deduction of the first two components. It includes proprietors' income, rental income, corporate profits, net interest, business transfer payments, consumption of fixed capital, etc. It is calculated as industry output less the sum of intermediate inputs, compensation of employees, and taxes on production and imports less subsidies.

In the future, as part of the ongoing integration of the I-O benchmark and GDP-by-industry accounts, value added in the two accounts will be reconciled to develop best-level estimates.

Estimating transactions

The goal in estimating transactions is to trace the flow of commodities through the economic process. We must determine how much of each commodity is available for intermediate and final use, and we must determine what intermediate and value-added inputs are required by each industry to produce its output. We must also determine the costs associated with each transaction so that it may be properly valued. Finally, we must verify that the picture of economic interactions that emerges is reasonable and complete.

Detailed source data are available for a limited number of I-O industries. Where these data—manufacturing and mining materials consumed, input category controls directly related to a specific commodity, and commodity flow—are available, the estimates of inputs can be processed quickly and mechanically. The results of these processes must be evaluated, but they are generally based on reliable methods and have provided reasonable results. The larger and more difficult process is the estimation of inputs where the source data do not provide direct estimates—including the majority of inputs to industries and to government. This effort involves considerable research, analysis, and judgment by the I-O analyst.

The economic data that are available to prepare the I-O accounts transactions are provided in different valuations. Sometimes the data are provided in terms of what was purchased and are valued in purchasers' prices, and sometimes in terms of what was supplied valued in basic prices. Because we must eventually put all transactions into one common valuation, producers' prices, it is necessary to maintain information that enables us to convert transactions from one valuation to another.

Transactions are estimated following 10 broad steps: Estimate domestic supply; estimate input category controls; incorporate source data on inputs to industries; disaggregate input category controls into transactions; incorporate other source data; estimate taxes, transportation costs, and wholesale margins; compute commodity-flow estimates; estimate retail margins; review "item" flows; and review industry inputs.[5] These steps are not necessarily carried out in the order shown, and they may often be performed simultaneously.

1. Estimate domestic supply. The domestic supply is the supply of commodities available to be consumed within the United States.[6] It is equal to domestic output (in basic value) plus imports and sales from final uses minus exports and change in private inventories.[7] In order to estimate the domestic supply of a commodity, it is

[5] "Items" are the most detailed level of output controls and inputs at which the I-O database is maintained.

[6] In the 1997 I-O benchmark and in earlier benchmarks, sales by government were included as a separate item in the calculation of domestic supply. However, government is now treated as an industry that provides services, and its sales are treated as secondary products of the government industry.

[7] Sales from final uses are sales of used goods from one final-use sector to another or sales of scrap from final uses to intermediate.

necessary to estimate the detailed transactions for inventories, exports, imports, and sales of scrap and used goods.

Inventories: Data on inventories are collected in the Economic Census for mining, manufacturing, retail and wholesale trade, and some service establishments and in the *Statistics of Income* tabulations by the Internal Revenue Service. The total value of inventory by type is collected by industry, but the I-O accounts need to account for inventory by commodity. For finished-product and work-in-process inventory, we assume that the establishment that reports the inventory is the one that produced it, and the inventory is assumed to consist of the primary product of that establishment. Materials and supplies inventories are assumed to be made up of the goods purchased by the industry.[8] Trade inventories are made up of the goods sold through each type of trade establishment. We have used the product-line sales data for wholesale and retail trade to define the commodities making up trade inventories. Transactions are created from these data to show the movement of the products in and out of inventory.

Exports and imports: Data on exports and imports of goods are collected and tabulated by the Census Bureau according to the international harmonized classification schedule (HS). This classification schedule is very detailed, consisting of over 15,000 different codes. In most cases, each HS code can be assigned to an I-O item using a concordance.[9] Data on exports and imports of services are from BEA's international transactions accounts. (For more information, see chapter 7.)

Scrap and used goods: Data on sales of used goods come from the wholesale and retail trade product-line sales data. Data on sales of scrap come from various sources.

2. Estimate input category controls. An input category control is an estimate of the total expenses for one input category, such as purchases of electricity or of specific materials and supplies, for an industry or a final-use category. Input category controls are prepared for every industry and for most final-use categories. For industries, the input controls show the expenses incurred by an industry, including the value-added components, at the most detailed level shown in the source data.[10] All industries have at least 1 input category, and many have more than 20; the sum of the input controls for an industry is equal to the industry's output. Input category controls are prepared only for the use table before redefinitions. The input categories for an industry may be derived either from detail from the output calculations or from independent information on expenses. The input category control estimates are based on source data for groups of inputs—such as materials consumed,

[8] Ideally, we should use the current inputs to industries to make the estimates of materials and supplies inventories held by industries. However, in the 1997 I-O benchmark and in earlier benchmarks, the estimates were made using input structures from prior tables.

[9] The concordance is used in the database to map detailed foreign-trade data to transactions in the I-O table.

[10] Exceptions are materials consumed for mining and for manufacturing, where there is more detail in the Economic Census.

utilities, rents, legal services, etc. (See table 6.1 on the following page for a list of input categories from the 1997 benchmark.)

Data sources: The Output Control Summary Report is the starting point for developing input controls (a sample of these reports is shown for a few industries in chapter 5, appendix table 5.A). This report provides information on the major sources of receipts and the adjustments for each industry. Each input category control is built up to capture all establishments and their expenses; the sum of the input controls for an industry equals the industry output. We must ensure that each industry covers both employer and nonemployer establishments and that, where appropriate, the inputs have been adjusted for tax misreporting.

The sources for the expense data are often the same as for the output controls, although generally from a different set of tables in that source. For agriculture, the input category controls are provided by the Department of Agriculture from the Farm Costs and Returns Survey. For mining and manufacturing, the reports in the Economic Census provide most of the necessary data (beginning with 2002, additional expenses will be covered for these sectors, and an "all other expenses" category will be added; this information is already provided for construction). For wholesale and retail trade and for most services, the input controls are based on the Business Expenses Survey (BES) (see chapter 3); the BES has generally provided information on "all other expenses." For some industries, data are available from the Census Bureau's annual surveys, and for others, industry and trade association data are used. For most industries, the published data must be supplemented by studies and research by I-O staff. The expanded BES for 2002 will provide additional data on expenses and will cover additional industries. Beginning with 2007, the Service Annual Survey (SAS) will cover expenses for services and will replace the BES as the source for these data. Additionally, the SAS will collect a limited set of expenses for services annually.

Table 6.1 Expenses by Source Data from the 1997 Economic Census

	QUESTIONNAIRE						
EXPENSE	MINING	CONSTRUC-TION	MANUFAC-TURING	WHOLE-SALE	RETAIL	SER-VICES	AUXIL-IARY
Payroll	Y	Y	Y	Y	Y	Y	Y
Fringe benefits	Y	Y	Y	Y	Y	Y	Y
Building rental	Y	Y	Y	Y	Y	Y	Y
Equipment rental	Y	Y	Y	Y	Y	Y	Y
Depreciation	Y	Y	Y	Y	Y	Y	Y
Building repair		Y	Y	Y	Y	Y	Y
Equipment repair		Y	Y	Y	Y	Y	Y
Software and data processing			Y	Y	Y	Y	
Software							Y
Data-processing services							Y
Accounting, auditing, and bookkeeping			Y	Y	Y	Y	Y
Legal			Y	Y	Y	Y	Y
Advertising			Y	Y	Y	Y	Y
Communication services	Y	Y	Y	Y	Y	Y	Y
Fuel for heat or power	Y		Y	Y	Y	Y	Y
Electricity	Y	Y	Y	Y	Y	Y	Y
Other utilities				Y	Y	Y	Y
Materials and supplies, refuse removal, and cost of sales				Y	Y	Y	
Materials and supplies	Y	Y	Y				Y
Refuse removal			Y				
Cost of resales	Y		Y				
Contract work	Y		Y	Y			
Contract labor				Y	Y	Y	
Taxes and license fees				Y	Y	Y	
Office supplies				Y	Y	Y	
Packaging, containers, and materials				Y	Y		
Commission expense				Y			
Other operating expenses				Y	Y	Y	
Interest expense					Y		
Construction work subcontracted out		Y					
Natural gas and propane		Y					
Gasoline and diesel							
On highway		Y					
Off highway		Y					
All other fuels and lubricants		Y					
Lease rents for mineral properties	Y						

Y—The category of expense in the first column is included in the 1997 Economic Census on the questionnaire at the head of the column.

Estimation and adjustments: In estimating the input category controls, it is important to examine the list of operating expenses. Some expense categories must be excluded in order to be consistent with I-O and NIPA definitions and conventions. For example, capital expenditures are excluded because they do not represent current-period expenses; depreciation is the appropriate measure of the cost of capital consumed in the current period. Interest payments are excluded because they are netted against interest receipts in the calculation of "net interest," a component of gross operating surplus. In addition, it is particularly important to ensure that the expenses for an industry include the inputs to own-account construction.

Some input controls must be adjusted so they will be consistent with the content and definition of industry output. In many cases, these adjustments parallel those for estimating output (see chapter 5). However, before making an adjustment, the I-O analyst must ascertain whether the inputs based on published data are already consistent with output; otherwise, an unnecessary adjustment may be made and an error introduced.

- For some of the NIPA imputations (such as owner-occupied housing and imputed interest paid by financial intermediaries) and for the I-O imputations for own-account investment, adjustments may be needed to the input data that are based on published sources, such as the Economic Census.
- For resales, the cost of the items sold must be removed from expenses.
- For nonemployers receipts, the associated expenses must be added in order to maintain consistency with output.
- For tax-misreporting adjustments to receipts, the associated expenses must also be added. The procedure used to allocate these expenses depends on the type of adjustment. Misreported inputs for businesses that filed tax returns are usually included in "other value added."[11] However, for the businesses in this category that had employees and who operated in industries whose employers are likely to underreport wages (especially industries where wages are often paid in cash, such as construction and eating and drinking places), allocating part of the adjustment to employee compensation should be considered. For nonfilers, an adjustment is applied to each employer-expense category except the cost of resales.
- An adjustment to inputs may also be appropriate if an inventory-change adjustment has been made for output in a goods-producing industry.
- Commodity taxes must be added for industries where these taxes have been added to industry output.

[11] This treatment is based on an assumption that receipts were underreported while expenses were reported properly.

- Tips must be added where they were added to the receipts in the accommodations and food services industry and in a few other service industries. For transactions, tips are included in value added (compensation of employees).

3. Incorporate source-data inputs. Step 3 is used for the cases in which the source data for industries include estimates of inputs of specific products. One major source is the data on manufacturing and mining materials consumed from the Economic Census. These data provide specific information on industry purchases during the accounting period. Additionally, some of the input category controls, by description, apply to a single detailed commodity. For example, the input category "legal services" applies directly to the item "legal services."

Manufacturing and mining materials consumed:[12] The Economic Census covers materials consumed for manufacturing and mining, including specific purchases of selected materials.[13] A complete set of inputs is rarely available. For large establishments, a few materials are typically shown separately, and the rest are grouped as "all other" materials consumed. The composition of this "all other" category is estimated by I-O analysts by evaluating the listed purchases and determining what other goods might need to be purchased in order to produce the primary and secondary products of the industry.[14] For small establishments, the census does not enumerate the materials consumed, but it does include the total materials consumed in a line item called "not specified by kind" (n.s.k.). For most I-O tables, we have assumed that the purchased inputs for small establishments are similar to those for large establishments, so the n.s.k. values are allocated to the materials consumed categories in accordance with the proportions that were determined for the large establishments.

The assignment of materials consumed codes to items is dependent on the industry reporting the inputs.[15] The Economic Census assigns a consistent set of materials consumed codes across manufacturing industries. However the assignment of a materials-consumed code to an I-O item must be evaluated in terms of what each specific industry produces. For example, materials-consumed "paint," would be coded as "auto paint" in the motor vehicle industry, "marine paint" in the boat building industry, and "furniture paint" in the furniture industry. In benchmark I-O tables, a concordance is developed for manufacturing and mining industries between each industry's materials-consumed codes and its items. This

[12] Materials consumed, the correct concept for measuring inputs in the I-O accounts, represent the goods used up in the manufacturing process and are not necessarily equal to purchases.

[13] The Economic Census for the minerals industry includes equipment purchases in the tabulations of purchases. The equipment purchases must be excluded from total purchases in order to obtain current-account purchases of materials consumed.

[14] The 1972 *Census of Manufacturers* included a special survey of "all other materials" consumed, but this survey was not repeated in later censuses.

[15] In the I-O database, we develop concordances that assign data coded under different classification systems into the coding used in the I-O accounts.

concordance is used in conjunction with materials-consumed data to create transactions.

One-to-one input category controls: Some of the input categories have a one-to-one relationship to an I-O item. In these cases, transactions can be developed directly from the input-category value. Examples include building rents, purchases of electricity, accounting services, legal services, and advertising.

4. Disaggregate the input categories. Step 4 is used for the cases in which the source data for input categories cover a broad range of items that could be included as inputs. For example, utilities may include water and sewer services, natural gas, or trash collection. These broad categories must be disaggregated into purchases of individual items. This process involves a procedure that creates "dummy industries and commodities" to aid in the distribution.[16] Frequently, the weights used to disaggregate input categories are based on the domestic supply of the items assigned to the input category. Once the distribution of commodities to dummy industries is made, the industry analyst must review the inputs for reasonableness of content and size.

Estimates of spending by function of government and by type of expenditure also serve as input category controls. The data for the Federal Government are based on the Budget of the United States, and the data for state and local governments are from the Census of Governments. The item makeup of Federal Government purchases is based on a disaggregation of detailed Federal expenditure components by BEA's Government Division.[17] State and local government estimates are generally based on the input structure of previous I-O tables.[18]

5. Incorporate other source data. Up to this point, estimating transactions has primarily involved the tabulation and manipulation of source data. However, many of the input categories have not yet been completely filled, and many items may not yet have transaction estimates. So, the "art" of I-O begins. This step requires the development and application of methods for estimating inputs to industries using data from whatever sources are available—for example, trade associations, industry experts, or special studies of industries.

Many commodities flow to more than one user, and for these, it is often necessary to make allocations based on related data. For example, data on mileage are used to allocate gasoline among consumers, business, government, and intermediate, and also to allocate intermediate by industry. Other important items that

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[16] Dummy industries and commodities are used to simplify the process by grouping related items that are generally assumed to be purchased in the same proportion by many different industries. For example, office supplies (pens, paper, etc.) are used by all industries, so a dummy industry "office supplies" is set up to purchase these supplies, and the other industries are shown purchasing the commodity "office supplies" rather than the individual items.

[17] This disaggregation is found in the Government Division's "Investment and Consumption Expenditures" (ICE) file.

[18] While less than ideal, the old input structures were used because of the paucity of data. Improved data are being developed for the 2002 I-O benchmark.

are allocated among consumers, business, and government are software, computers, and pharmaceuticals (pharmaceuticals are purchased by consumers directly as well as through hospitals and doctors offices).

There are two general approaches to estimating transactions where source data are not available—one based on item flows and the other based on identifying industry inputs. Under the item-flow approach, the description of the item is analyzed for clues suggesting its destination in the economy. Under the industry-inputs approach, the analysis focuses on what an industry buys and what costs it incurs to make its primary and secondary products. In other words, the item-flow approach looks downstream from the domestic supply of items to determine where these outputs are likely to flow to in the economy, while the industry-input approach looks upstream at what inputs are used or needed by the industry. In some cases, a combination of the two approaches may be needed.

Experienced I-O analysts have usually found it best to begin by evaluating the undistributed items and making reasonable distributions of items to industries. Then, the industry is analyzed, and the most important inputs determined and estimated. Finally, the commodities that have not been fully allocated are reviewed to determine the industries that should be using them. The following are several techniques that may be used in the allocation of inputs:

- *Prorates* are used to allocate item supply over a number of industries or final uses. For example, in earlier benchmark I-O tables, prorates were used to allocate gasoline and tire purchases to particular industries on the basis of their use of motor vehicles as reported in the Vehicle Inventory and Use Survey (see chapter 3). As a result of improvements in various Census Bureau programs (for example, the BES), we expect to use prorates less often in the future.
- In some cases, an input structure from another related industry might be used as a proxy. For example, in estimating the inputs used for hotel restaurants, the input structure from the restaurant industry is applied to the hotel food sales.
- The nature of the product may provide clues for the distribution to other industries. For example, automobile paint will flow to automotive manufacturing and to automotive repair.
- Structure types in the value-put-in-place data may provide clues for the allocation of construction related items to construction industries. For example, bricks, roofing shingles, and plumbing supplies are allocated to buildings rather than to highways.

This step also includes the estimation of “reallocations.” Industry-input transactions in the I-O accounts consist of inputs for both the primary and secondary products of the industry. In preparing estimates according to I-O definitions of industry output, the output of some of the secondary products are “redefined” to another industry (see Chapter 4, “Classifications and Secondary Products”). As part of these redefinitions, the associated inputs are *reallocated* to that industry. The reallocations represent another set of transactions that sum to the value of the

redefinition and that account for all of the inputs required to produce the redefined secondary output. (For more information, see Chapter 9, "Reallocations.")

6. Estimate taxes, transportation costs, and wholesale margins on transactions. Reported transactions are estimated in the value that is appropriate from the perspective of the source of the estimate. If an industry is reporting inputs, the value of the input is most likely in purchasers' prices (the costs the industry has paid). If the value is based on the sale of an item to industries, the estimate is probably in basic prices. Further processing of transactions—that is, to sum them up by item or to sum by industry—requires that they be valued both in basic prices and in purchasers' prices. In order to compute these values for each transaction, it is necessary to estimate taxes, transportation costs, and wholesale margins.

Commodity taxes (excise and sales taxes) are distributed using the output of items bearing the tax. Sales-tax data on various services, such as dry cleaning, are used to calculate tax rates that are applied to output. Account is taken of the fact that some purchasers, such as business and government, are not required to pay some sales and excise taxes.

Total transport costs are estimated as part of the output control process. First, these costs are distributed to commodities based on factors developed from various sources. For example, the Commodity Flow Survey (CFS) is used for truck transportation costs. The CFS shows commodities that are typically delivered by truck, broken down by detailed commodity (see chapter 3).[19] Other transport costs—rail, water, air, and pipeline— are distributed using various other sources. Because data sources in this area are sparse, the allocations have often been based on distributions carried over from prior benchmarks. Second, the transportation costs by commodity are distributed proportionally to the commodity items that are likely to use transport costs. Third, rates are calculated by item and are applied to transactions.

Margins and sales taxes for wholesale trade are included in the output controls. Margins by kind of business are distributed to commodity groups using the Economic Census product-line sales data. The margin by product line is distributed to commodities and items using information on supply. Margin rates are then calculated for each item and applied to transactions.

For more information, see Chapter 8, "Commodity Taxes, Transportation Costs, and Wholesale and Retail Margins."

7. Compute commodity-flow estimates. Commodity-flow transactions are transactions in which a predominant user of the commodity can be identified. These transactions are estimated using the domestic supply of the commodity, either before or after purchases by intermediate or other final uses. Commodity-flow transactions are always calculated in basic prices. Most of the transactions for

[19] The Service Annual Survey, beginning with data for 2003, includes estimates of truck-transportation revenues by commodity group.

PCE and PFI final uses are estimated using the commodity-flow technique, and the technique can be used for any transaction if appropriate.

In computing commodity-flow estimates, two variants are available for evaluating the transaction: Share of domestic supply and share of residual supply (domestic supply less intermediate purchases and final uses). The shares are based either on prior benchmark estimates or, where possible, on new information (for example, class-of-customer data). The data in table 6.2 are used below to illustrate the two different types of commodity-flow variants.

Table 6.2 Example of Commodity-Flow Calculation

FACTORS FOR COMMODITY FLOW	VALUES
Output	100
Plus: Imports	40
Less: Exports	10
Inventory change	5
Equals domestic supply	125
Less: Intermediate (excluding commodity-flow residual transactions)	30
PCE, PFI, or government (excluding commodity-flow residual transactions)	20
EQUALS: RESIDUAL SUPPLY	**75**
COMMODITY-FLOW PERCENT	**10**

Share of domestic supply: Domestic supply (output plus imports less exports and inventory change), $125, times the commodity-flow percent, 10 percent, yields $12.50 as the basic value of the transaction. This variant is used when we have information that a share of the supply flows to a particular user, but we are not sure of the identity of the other users of the item.

Share of residual supply: Residual supply (domestic supply less all intermediate, PCE, PFI, and government transactions that are not commodity-flow residual transactions), $75, times the commodity-flow percent, 10 percent, yields $7.50 as the basic value of the transaction. This variant is used when we can identify other users of the item, but we believe some portion of the remainder should go to a particular user.

In order to maintain consistency, the commodity-flow estimates are initially carried forward from the prior I-O benchmark. The commodity-flow estimates may be improved by the incorporation of additional information, such as class-of-customer data. These data consist of information provided by sellers on the category of customer—usually households, business, and government—for their products or services. Class-of-customer data are collected in the Economic Census for several sectors but not for all industries, and the coverage varies from one census to another. Where class-of-customer data have been available, they have been used either to refine the commodity-flow estimates or to improve the estimate of the amount of a commodity sold to a particular group of consumers, such as the share of output sold to the various levels and functions of government.

8. Estimate retail margins. Most of the goods flowing to PCE and some of the goods flowing to PFI and intermediate are sold through retail stores, and thus have retail margin included in the final purchasers' value. After the PCE transactions are estimated, retail margins are estimated for these transactions and for any other transactions that are identified as moving through retail establishments.[20]

Retail margins by kind of business are contained in the output controls and are distributed to groups of retail product lines—referred to as Retail Category Controls—using Economic Census product-line sales data. Margins by retail category are then distributed to groups of transactions that have been assigned to the retail category. The assignment of transactions to categories is based on the item and the industry or final use. For example, all food items sold to PCE are included in the retail category for food.

For more information, see chapter 8.

9. Review item flows. The distribution of each item to intermediate and final uses must be reviewed. This review involves looking for missing users, evaluating the reasonableness (size, proportion of supply) of the uses, evaluating the transportation cost and trade margin rates, and eliminating overallocations (that is, where output less the sum of transactions is negative) of commodities. In particular, where an item has a large amount of unallocated output, we should determine if there are industries or final users that should be purchasing the item.

The transactions allocated to PCE and PFI must be evaluated for reasonableness. Some general tests include (1) comparison of an item's share of the total PCE/PFI category with its share in the preceding I-O use table, (2) comparison of the items included in the category with the items included in previous tables, (3) comparison of the I-O estimate for the category with the corresponding NIPA estimate for the category, (4) comparison of the retail margin rates (retail margin as a percent of the total category) with those of previous tables, and (5) comparison of the I-O estimates of sales in the retail categories with the Census Bureau's product-line sales estimates in retail trade. (See Chapter 10, "Reconciliation of Final Uses.")

Exports should not be greater than output. Exports, by definition, consist only of domestically produced products. If exports are greater than output, the assignment of the foreign-trade data to the particular item must be evaluated.

The current I-O estimates should be compared with the previous I-O estimates to see if there are changes in the pattern of use and to determine if those changes are reasonable. The proportion of domestic supply flowing to all intermediate or to each of the final-use sectors and the flow of the item to each industry should both be evaluated.

[20] It is usually best to wait until most transactions that receive retail margin have been estimated before running programs that estimate retail margins. Otherwise, most of the retail margin will be applied to only a few transactions, and the results will be meaningless.

10. Review industry inputs. Each industry and final-use category must be reviewed.[21] The review includes looking for missing inputs and evaluating the reasonableness of inputs in terms of size and proportion. It is helpful to compare the current I-O table with the prior benchmark table. These comparisons should be made after accounting for price changes and will show where inputs have changed.

A review of input categories is made. Are the transactions assigned to an input category control greater than the input control itself? If so, the analyst evaluates those inputs as well as the input control. Additionally, if an input category is underfilled, are there additional inputs that need to be purchased?

A review of the impact of the inputs to industries on gross operating surplus (GOS) is undertaken. Will the sum of inputs change the original estimate of GOS, and if so, is the change reasonable?

After all possible transactions are estimated, the table is ready to be prepared for balancing (see Chapter 11, “Final Review and Balancing”).

[21] The estimates for PCE and PFI are prepared by NIPA PCE and PFI categories.

KEY TERMS FOR CHAPTER 6

Commodity flow. A method used for estimating transactions when a predominant user of the commodity can be identified. For example, for purchases of dental services, the predominant user is households. The transactions are estimated by beginning with the total domestic supply of the commodity and then either by allocating a fixed percentage to an intermediate or final user or by adjusting for specific purchases and allocating the remainder to intermediate or final users. Commodity-flow estimates are always calculated in basic prices.

Domestic supply. The value of a commodity that is available for use within the United States. It is equal to domestic output (in basic value) plus imports and sales from final uses minus exports and change in private inventories. It does not include commodity taxes, transportation costs, and wholesale margins.

Input category code (ICC). A 1-5 digit code used to identify input or expense categories in the database. If the code begins with a number it relates to an industry. If the code begins with a letter it relates to a final-use category.

Input category control. An estimate of the total expenses for one input category, such as purchases of electricity, for an industry or for a final-use category. For industries, the input category controls show the expenses incurred by an industry, including the value-added components, at a highly detailed level.

Item. A subcategory of an I-O commodity that represents the most detailed level of output controls and inputs at which the I-O database is maintained. An item's title may provide information regarding the possible users. For example, the item "milk in consumer type containers" is used predominately by consumers, and the item "automotive paint" is used primarily by automotive manufacturers and by automotive repair services. In the I-O database, the item report provides a description of each item, its output in producers' prices, the derivation of domestic supply available for consumption as well as a summary of the purchases by industries (intermediate) and final uses. It also shows the distribution of the item in the preceding I-O use table.

Materials consumed. A Census Bureau term for an industry's consumption of major materials used in the manufacturing or mining industries. It represents the goods used up in the manufacturing process, the correct concept for measuring inputs in the I-O accounts, and is not necessarily equal to purchases.

Elements of a transaction in the I-O database

- The *basic value,* which is the receipts value, such as shipments, used in the output estimation process for the industry.
- The *commodity tax,* which consists of the excise and sales taxes collected by the seller of a good or service for the transaction.
- The *transportation costs,* which are the costs of moving a good by for-hire transport services. These costs are for rail, truck, water, air, and oil and gas pipeline.
- *Trade margins,* which are the wholesale and retail costs of marketing goods or services to users.
- The *purchasers' value through wholesale,* which is the sum of the above four categories excluding the retail margins and retail taxes.
- The *total purchaser's value,* which is the sum of the same four categories including the retail margins and retail taxes.
- The *firm value,* which is the valuation in the transaction that is considered the most reliable. It is the valuation that is the most closely based on hard data, such as the Economic Census, and that is least dependent on adjustments and judgmental estimation. The firm value may be the basic value, purchasers' value through wholesale, or the total purchasers' value.
- Finally in the I-O database, the transaction also has a number of elements of identification. The most important of these are the commodity code, the item code, and the industry code.

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CHAPTER 7: FOREIGN TRADE TRANSACTIONS

Foreign trade transactions track the flows of commodities between the United States and other countries. This chapter describes the U.S. international transactions accounts, the primary data source for the estimates of foreign transactions in the input-output (I-O) accounts. It also describes the function of export and import transactions in the I-O use table and provides several general rules for evaluating the estimates. Definitions of some key terms are provided at the end of the chapter.

As noted in Chapter 6, "Transactions," transactions track the economic flows between the producers of a commodity and the users of that commodity. In the input-output (I-O) accounts, foreign trade transactions account for the goods and services that are produced in the United States but are excluded from domestic supply (exports) and for the goods and services that are produced outside the United States but become part of domestic supply (imports). The primary source for the I-O estimates and for the national income and product account (NIPA) estimates of trade in goods and services is BEA's international transactions accounts (ITAs).[1]

Structure and concepts of the ITAs

ITAs summarize the transactions of an individual country with the rest of the world. Foreign transactions are defined as the transfer of ownership of something that has economic value measurable in monetary terms from the residents of one country to the residents of another. The major purpose of the ITAs is to facilitate the tracking and understanding of the international economic relationships of a nation. For example, these accounts can be used to assess how effectively the nation competes in international markets. The U.S. ITAs consist of a current account and of a capital and financial account, and the foreign transactions are classified as either debits or credits to these accounts.

The current account constitutes transactions in goods, services, income, and current transfers. (The I-O accounts include only the transactions in goods and services.) The current account records exports of goods and services and receipts of income (largely receipts of income on U.S. assets owned abroad) as credits (that is with a plus sign), and it records imports of goods and services and payments of income on foreign-owned assets in the United States as debits (with a minus sign). Unilateral transfers, which comprises gifts to other countries, are recorded on a net basis. The sum of the credits and debits in the current account is the *current-account balance*. In recent years, the current-account balance for the United States has typically been negative.

[1] The ITAs were previously referred to as the balance of payments accounts.

In the capital and financial account, the capital account constitutes capital transfers, such as debt forgiveness, and the financial account constitutes transactions involving exchanges of financial assets for other financial assets or for real resources or gifts or grants of financial assets. The financial account records as debits the net outflow of U.S.-owned assets abroad—that is, the net increases in U.S. official reserve assets (for example, gold and foreign currencies) and in private assets (for example, direct investment and foreign securities). Inflows of foreign official assets in the United States and of private assets owned by foreigners are recorded as credits. The "statistical discrepancy" is calculated as the sum of all current-account and capital-and-financial account entries with the sign reversed.

The geographic boundaries for the ITAs are based on a broad definition of an *economy,* which "consists of economic entities that have a closer degree of association with a given territory than with any other."[2] Thus, in addition to the 50 states and the District of Columbia, the U.S. ITAs cover the Commonwealth of Puerto Rico, American Samoa, Guam, Midway Island, Wake Island, and all other U.S. territories and possessions.

A second important concept in the ITAs is "*residency*." The distinction between residents and nonresidents is based on two criteria: A resident is a "person" who has an "economic interest" in an area (consumes, produces, or otherwise participates in economic activities) and who resides, or expects to reside, in that area for 1 year or more. Such persons can be individuals, businesses, nonprofit institutions, or governments. Exceptions are made for individuals and members of their families who reside outside the United States for more than 1 year if they are diplomats, consular officials, or members of the armed forces and for students enrolled in foreign educational institutions. U.S. Government military, diplomatic, consular, and other nonmilitary installations abroad are considered to be within the U.S. economy; international organizations are not considered to be in any country.

Foreign subsidiaries (incorporated) and branches (unincorporated) of U.S. businesses are considered residents of the foreign countries in which they are located. A *foreign affiliate* is a foreign business enterprise in which there is U.S. direct investment—that is, a U.S. person owns or controls, directly or indirectly, 10 percent or more of the voting securities of an incorporated foreign business enterprise or an equivalent interest in an unincorporated foreign business enterprise.[3]

Subsidiaries and branches of foreign parent companies are considered U.S. residents. A *U.S. affiliate* is a U.S. business enterprise in which there is foreign direct investment—that is, a foreign person owns or controls, either directly or indirectly, 10 percent or more of the voting securities or the equivalent.[4]

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[2] Material for this section has been adapted from U.S. Bureau of Economic Analysis, *The Balance of Payments of the United States: Concepts, Data Sources, and Estimating Procedures* (1990), available on BEA's website.

[3] See Raymond J. Mataloni, Jr., "U.S. Multinational Companies: Operations in 2003," *Survey of Current Business* 86 (July 2005): 9-29.

Relationship among the ITAs, NIPAs, and I-O accounts

Both the NIPA and I-O estimates of foreign trade are derived from the ITAs, which are prepared by BEA's Balance of Payments Division in accordance with the guidelines set forth in the *Balance of Payments Manual*.[5] The NIPAs and the I-O accounts generally follow the principal international guidelines for national accounts, *System of National Accounts*.[6] As discussed next, there are a number of conceptual, statistical, and other differences between the three sets of accounts.

As indicated earlier, exports are recorded in the ITAs as positive values, imports are shown as negative values, and they sum to the trade balance. The I-O accounts also follow this convention, but in the NIPAs, imports are recorded as positive values that are subtracted in the calculation of gross domestic product (GDP).[7]

The ITAs have a slightly different definition of exports and imports than that in the NIPAs and I-O accounts. The major differences include the treatments of trade in nonmonetary gold and of trade by and with U.S. territories. In addition, there are various statistical differences that result from different revision schedules. Table 7.1 provides a sample of NIPA table 4.3B, which shows the relationship between the ITAs and the NIPAs (in particular, note lines 1-11 for trade in goods and lines 18-27 for trade in services).

- The adjustment for nonmonetary gold excludes gold purchased for investment, which is not included as part of GDP. ITA exports and imports of gold are excluded, and an estimate for the net exports of gold used for domestic production is added. (For more information, see the appendix to this chapter.)
- The geographic coverage of the ITAs is broader than that of the NIPAs and I-O accounts, which is limited to the 50 states and the District of Columbia.[8]

The ITAs are revised annually (usually in June), and the revisions may cover much or all of the time series. The NIPAs are typically revised annually

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[4] See William J. Zeile, "U.S. Affiliates of Foreign Companies: Operations in 2003," *Survey of Current Business* 86 (August 2005): 198-214.

[5] The *Balance of Payments Manual* is published by the International Monetary Fund (Fifth Edition, 1993).

[6] The *System of National Accounts,* 1993, is published by the Inter-Secretariat Working Group for the National Accounts (Commission for the European Communities, International Monetary Fund, Organisation for Economic Co-operation and Development, United Nations, and World Bank).

[7] It is not technically correct to state that "imports reduce GDP" because, though they are subtracted in calculating GDP, they are offset by positive entries in other final uses, such as PCE and inventory investment. For example, the value of a car that is imported appears as a subtraction from GDP, but the value of that car as it goes into inventory or is sold to a consumer appears as an offsetting addition to GDP.

[8] Additional information is provided in the unpublished paper "NIPA Territorial Adjustment: A Discussion," by Nadia F.P. Sadee, March 6, 2003.

(usually in July), but the revisions cover only the 3 most recent years. Comprehensive revisions of the NIPAs usually take place about every 5 years and cover a much longer period. As a result of these timing differences, statistical changes may be incorporated into the ITAs earlier than into the NIPAs. There are no timing differences between the annual I-O accounts and the annual NIPAs. However, the benchmark I-O accounts will incorporate the ITA revisions for that year, while the NIPAs will not incorporate them until the next comprehensive revision.

Table 7.1 Reconciliation of ITAs and NIPAs (Page 1 of 2)

[Billions of dollars]

From NIPA table 4.3B, "Relation of Foreign Transactions in the National Income and Product Accounts to the Corresponding Items in the International Transactions Accounts" (as published on April 30, 2004)		
Line		**2002**
1	**Exports of goods, ITAs**	**681.9**
2	Less: Gold, ITAs[1]	3.4
3	Statistical differences[2]	0
4	Plus: Adjustment for U.S. territories and Puerto Rico[3]	19.3
5	**Equals: Exports of goods, NIPAs**	**697.8**
6	**Exports of services, ITAs**	**292.2**
7	Less: Statistical differences[2]	-2.7
8	Other items[4]	0.7
9	Plus: Adjustment for U.S. territories and Puerto Rico[3]	4.2
10	Services furnished without payment by financial intermediaries except life insurance carriers	10.6
11	**Equals: Exports of services, NIPAs**	**309.1**
12	**Income receipts, ITAs**	**255.5**
13	Less: Statistical differences[2]	-10.3
14	Plus: Adjustment for U.S. territories and Puerto Rico[3]	29.6
15	Imputed interest received from the rest of the world	-1.2
16	Adjustment for grossing of parent/affiliate transactions[5]	5.0
17	**Equals: Income receipts, NIPAs**	**299.1**
18	**Imports of goods, ITAs**	**1164.7**
19	Less: Gold, ITAs[1]	2.9
20	Statistical differences[2]	0
21	Plus: Gold, NIPAs[1]	-3.3
22	Adjustment for U.S. territories and Puerto Rico[3]	31.8
23	**Equals: Imports of goods, NIPAs**	**1190.3**
24	**Imports of services, ITAs**	**227.4**
25	Less: Statistical differences[2]	-10.3
26	Plus: Adjustment for U.S. territories and Puerto Rico[3]	5.1
27	**Equals: Imports of services, NIPAs**	**242.7**
28	**Income payments, ITAs**	**259.5**
29	Less: Statistical differences[2]	-2.7

Table 7.1 Reconciliation of ITAs and NIPAs (Page 2 of 2)

[Billions of dollars]

From NIPA table 4.3B, "Relation of Foreign Transactions in the National Income and Product Accounts to the Corresponding Items in the International Transactions Accounts" (as published on April 30, 2004)		
Line		**2002**
30	Plus: Adjustment for U.S. territories and Puerto Rico[3]	1.1
31	Imputed interest paid to the rest of the world	9.4
32	Adjustment for grossing of parent/affiliate transactions[5]	5.0
33	**Equals: Income payments, NIPAs**	**277.6**
34	**Balance on goods and services and income, ITAs (1+6+12-18-24-28)**	**-422.0**
35	Less: Gold (2-19+21)	-2.8
36	Statistical differences (3+7+13-20-25-29)	0
37	Other items (8)	0.7
38	Plus: Adjustment for U.S. territories and Puerto Rico (4+9+14-22-26-30)	15.1
39	**Equals: Net exports of goods and services and net receipts of income, NIPAs (5+11+17-23-27-33)**	**-404.8**
40	**Unilateral current transfers, net, ITAs**	**58.9**
41	Less: Statistical differences[2]	0
42	Plus: Adjustment for U.S. territories and Puerto Rico[3]	0.5
43	**Equals: Current taxes and transfer payments to the rest of the world, net, NIPAs**	**59.3**
44	**Balance on current account, ITAs (34-40)**	**-480.9**
45	Less: Gold (35)	-2.8
46	Statistical differences (36-41)	0
47	Other items (37)	0.7
48	Plus: Adjustment for U.S. territories and Puerto Rico (38-42)	14.6
49	**Equals: Balance on current account, NIPAs (39-43)**	**-464.1**

[1] Exports and imports of gold in the NIPAs differ from those in the ITAs. ITA gold exports (line 2) and imports (line 19) are excluded from the NIPAs; imports of gold in the NIPAs (line 21) is the excess of the value of gold in gross domestic purchases over the value of U.S. production of gold.

[2] Consists of statistical revisions to the ITAs that have not yet been incorporated into the NIPAs and statistical revisions to the NIPAs that have not yet been incorporated into the ITAs.

[3] Consists of transactions between the United States and its territories, Puerto Rico, and the Northern Mariana Islands. The treatment of U.S. territories, Puerto Rico, and the Northern Mariana Islands in the NIPAs differs from that in the ITAs. In the NIPAs, they are included in the rest of the world; in the ITAs, they are treated as part of the United States. The adjustment to unilateral current transfers, net (line 42) consists only of transfer payments from persons, because transfer payments, subsidies, and grants-in-aid from the Federal Government to residents of U.S. territories, Puerto Rico, and the Northern Mariana Islands are excluded from NIPA transfer payments to the rest of the world.

[4] Beginning with 1988, the ITAs classify certain military grants as services that the NIPAs do not. In the NIPAs, these transactions are excluded from exports and included in transfer payments from government.

[5] In the ITAs, income transactions between parents and affiliates are recorded on a net basis. In ITA exports, U.S. parents' receipts from foreign affiliates for interest are net of such payments by U.S. parents to foreign affiliates. In ITA imports, U.S. affiliates' payments to foreign parents for interest are net of such receipts by U.S. affiliates from foreign parents. In the NIPAs, these transactions are recorded on a gross basis. The amount of the adjustment is identical in income payments and in income receipts, and thus does not affect NIPA net income receipts or balance on current account.

Although the estimates of exports of goods and services on a net basis are the same in the NIPAs and the I-O accounts, they differ on a gross basis (table 7.2). These differences reflect two adjustments that are made to the I-O estimates of gross exports and gross imports. The first adjustment removes reimports (U.S. merchandise returned) and reexports from both exports and imports, and the second removes certain overseas activities by U.S. Government agencies from both exports and imports. These adjustments are made so that gross imports and exports reflect the goods actually moving into and out of domestic supply for U.S. production. The NIPAs, which focus on the calculation of final consumption, do not need to make this adjustment. As a result of these adjustments, total exports and total imports are lower in the I-O accounts than in the NIPAs but net exports is the same.

Table 7.2 Reconciliation of Exports and Imports Between the NIPAs and the I-O Accounts
[Millions of dollars]

	2002
Exports, NIPAs	1,006,827
Less: U.S. merchandise returned (reimports)	32,602
Reexports	62,037
Activities of U.S. Government agencies on the behalf of foreign governments	309
Equals: Exports, I-O accounts	911,879
Imports, NIPAs	1,433,079
Less: U.S. merchandise returned (reimports)	32,602
Reexports	62,037
Activities of U.S. Government agencies on the behalf of foreign governments	309
Equals: Imports, I-O accounts	1,338,131
Net exports, NIPAs	-426,252
Net exports, I-O accounts	-426,252

Reimports are domestically produced goods that were previously exported to other countries for processing and/or assembly, and then returned to the United States for further processing or for sale (for example, articles of metal that are manufactured in the United States, exported to Canada for further processing, and then returned to the United States). In the I-O accounts, reimports are not included in exports and imports so as to not overstate the domestic supply of goods.[9] Reexports are goods produced outside the United States that were previously imported into the United States and subsequently exported in substantially the same condition (for example, a monitor made in China, purchased by a U.S. personal computer manufacturer, joined with a U.S.-made console, and then exported to

[9] For a complete set definitions used in the merchandise trade data, see "Guide to the Foreign Trade Statistics: Description of the Foreign Trade Statistical Program" prepared by the Census Bureau (go to www.census.gov/foreign-trade/guide/sec2.html#for_coverage).

Mexico). Among the largest categories of reexports are semiconductors, printed circuits, jewelers' materials, and telephone apparatus. Reexports are subtracted from both exports and imports in order to exclude goods that were not produced within the United States.[10]

Certain activities of U.S. Government agencies overseas on the behalf of foreign governments are removed from exports and imports. For example, the Army Corps of Engineers manages the construction of a structure (or provides a good or a service) to a foreign government (which constitutes a U.S. export), and then purchases services and goods from residents in that foreign country as inputs to the project (which constitute U.S. imports). The industry accounts exclude from U.S. production activities that do not take place within the United States. In this example, construction and its inputs take place overseas.

Exports and imports in the use table

Exports and imports are components of final uses in the I-O use table. Total exports represent the value of all domestically produced goods and services shipped to foreign residents. Exports by commodity are shown in producers' prices, the same valuation basis that is used for other domestically produced commodities.[11] The transportation costs and trade margins that are required to move exports from the producer to the port of exit are included in the transportation and trade rows of the use table; these charges are treated in the same way as those for domestically produced commodities (see Chapter 8, "Commodity Taxes, Transportation, and Wholesale and Retail Trade Margins").

Table 7.3 provides an example of the use table with several additional rows and columns that help illustrate the entries for foreign trade. In this example, the import column is separated into the three components that make up imports in the use table: Foreign port value, duty, and freight. Additionally, the use table row for freight and wholesale is shown in five rows: The first shows the total freight included in imports, the second shows the ITA value for imported freight, the third

[10] Reexports are available by harmonized tariff system (HTS) code and can be matched against imports by HTS code. Reimports are available only by the total value of reimports. In order to adjust exports, the value for reimports is prorated across all exports except those that are from items with flows to private equipment and software.

[11] Census data on exports of goods is in purchasers' prices, but the use table shows exports at producers' prices, and the transportation costs and margins required to move the export to the port are included in the respective commodities for transportation and trade. Both the NIPAs and the ITAs value exports by commodity at the value leaving the country, which is equivalent to purchasers' prices.

shows the cost of freight to move exports to the port of exit, the fourth shows duty on imports, and the fifth shows the wholesale margin on exports.

Table 7.3 Sample Use Table with Exports and Imports
[Millions of dollars]

COMMODITY	INTERME-DIATE	EXPORTS	IMPORTS			
			TOTAL (A) (B + C + D)	FOREIGN PORT VALUE (B)	DUTY (C)	FREIGHT (D)
A		48	-33	-30	-1	-2
B		94	-169	-150	-3	-16
C		76	-103	-100	-1	-2
FREIGHT: INCLUDED IN IMPORTS			20			20
FREIGHT: ITA IMPORT OF FREIGHT			-13	-13		
FREIGHT: COST ON EXPORTS		4				
WHOLESALE: DUTY			5		5	
WHOLESALE: MARGIN ON EXPORTS		8				
TOTAL		**220**	**-293**	**-293**	**0**	**0**

The use-table total for imports represents the value of all foreign goods and services sold to U.S. residents at *foreign port value* (value at the foreign port excluding freight, insurance, and customs duties). The value of imports is recorded as a negative value in the I-O accounts because it represents production outside the United States. In the example, total imports at foreign port value are -$293 million. In contrast, imports of goods by commodity are shown at *domestic port value*, which is equal to the foreign port value plus customs duties, freight charges, and insurance.[12] In table 7.3, the domestic port value for commodity A is -$33 million (-$30 million foreign port value plus duty of -$1 million and freight charges of -$2 million). The domestic port value is approximately equivalent to the basic value, the value used for domestically produced commodities (see chapter 6).[13] In the I-O accounts, the imports of an individual commodity and the domestic production of

[12] Aside from customs duties, imports do not include commodity taxes imposed on the sale of goods or services. These taxes, if applicable, are added to the domestic supply. For example, the excise taxes on liquor are included in the output of the liquor industry and are added to the entire supply of liquor sold to U.S. purchasers, whether domestically produced or imported.

[13] Because imports at domestic port value include customs duties but not other domestic taxes, they are valued at somewhere between basic prices and producers' prices.

the commodity must be valued on the same basis so they can be summed to yield the domestic supply of that commodity.

Because the definition of total imports does not include customs duties (duty is a domestic product) while imports of goods by commodity do include them, the sum of all imports by commodity will not equal total imports. Therefore, an offset must be made in the use table in order to reconcile this difference. To make this adjustment, a positive import transaction value for duty is added to the commodity "wholesale" that thereby balances out the sum of all customs duties included in the domestic port value of imported goods by commodity.[14] In the example, the sum of the duties by commodity is -$5 million, and the offsetting entry of +$5 million is entered in the row for wholesale duty.

Because the domestic port value of imports by commodity includes the freight charges and insurance, an offsetting adjustment is necessary to ITA imports of freight and insurance to avoid double counting. To make this adjustment, the transportation costs and insurance included in the domestic port value of goods are summed by type (water, air, and insurance) and added to respective commodity ITA imports. The result removes double counting of freight charges that are included in both the domestic port value of goods and in the freight charges by U.S. carriers.[15] In the example, the sum of the freight charges included in the domestic port value of imported goods is -$20 million, and the offsetting value of +$20 million is entered in the row for freight included in imports. In the published use table, the two rows for freight—ITA freight imports of -$13 million and the offsetting sum of freight included in the domestic port value of imports, $20 million—are summed together, and the net value of $7 million is shown. This positive value indicates the value of freight services on imports provided by domestic carriers.

The use table also includes two commodities (rows) that are part of foreign trade: Noncomparable imports and the rest-of-the-world adjustment to final uses. In sample table 7.4, noncomparable imports are $33 million and are distributed to intermediate industries and to final uses. The rest-of-the-world adjustment to final uses of $49 million consists of values for exports and imports that have offsetting adjustments to personal consumption expenditures (PCE) and government.

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[14] The wholesale industry/commodity output includes the value for duty; importers are classified as wholesalers by NAICS.

[15] If the net result of the offset for a particular mode of transportation is positive, then the value represents the transportation services for imports of goods provided by domestic, rather than foreign, carriers.

Table 7.4 Sample Use Table with Noncomparable Imports and Rest of the World Adjustment to Final Uses

COMMODITY/INDUSTRY	A	B	PCE	EXPORTS	IMPORTS	GOVERNMENT	TOTAL
A							
B							
NONCOMPARABLE IMPORTS	5	2	23		-33	3	0
REST-OF-THE-WORLD ADJUSTMENT			-46	50	-1	-3	0
VALUE ADDED							
TOTAL							

Noncomparable imports consist of three types of services: (1) Services that are produced and consumed abroad, such as airport expenditures by U.S. airlines in foreign countries; (2) services imports that are *unique*, such as payments for the rights to patents, copyrights, or industrial processes; and (3) services imports that cannot be identified by type, such as payments by U.S. companies to their foreign affiliates for an undefined "basket" of services. These imports are distributed directly to industries and to final users (see table 7.5).[16] This distribution, by industry group, is based on Department of Defense direct defense expenditures data, on BEA surveys covering direct investment (affiliated foreigners), and on other BEA surveys (unaffiliated foreigners) for royalties, license fees, and other private services.

Table 7.5 Noncomparable Imports (Page 1 of 2)

[Millions of dollars]

TYPE OF PURCHASE	2002
Total: Direct defense expenditures	**11,167**
Military post exchanges' purchases (Government enterprises)	436
Military personnel expenditures abroad (PCE)	3,486
National defense purchases of services abroad (Federal Government)	7,245
Total: Travel by U.S. residents abroad	**53,550**
Foreign travel by business (intermediate)	13,898
Foreign travel by U.S. residents (PCE)	39,651
Total: Port expenditures abroad	**11,965**
Water transportation expenditures at foreign ocean ports (intermediate)	2,721
Air transportation expenditures at foreign airports (intermediate)	9,162

[16] Before the 1992 benchmark I-O accounts, noncomparable imports also included certain imported goods, such as bananas and coffee, that were domestically consumed but were deemed to have no significant domestic counterparts. For the 1992 benchmark, this treatment was dropped. For coffee, significant domestic production of coffee takes place in Hawaii, and for bananas, the commodity "fruit" is not broken down into further detail. All the other noncomparable imports of goods either were determined to be insignificant or were matched with similar U.S.-produced commodities.

Table 7.5 Noncomparable Imports (Page 2 of 2)
[Millions of dollars]

TYPE OF PURCHASE	2002
Rail transportation expenditures at foreign terminals	82
Total: Royalty and license fee payments	**9,173**
Royalty and license fee payments to foreigners (intermediate)	8,575
Royalty and license fee payments for the use of software (PES)	598
Total: Other private services	**31,293**
Education expenditures of U.S. students abroad (PCE)	1,396
Commissions paid to foreign securities and commodities brokers (intermediate)	3,347
Expenditures abroad by nongovernment workers (PCE)	162
Expenditures in Canada by U.S. workers' from labor union strike benefits (PCE)	126
Payments by telecommunication companies for long distance access and other services (intermediate)	8,346
Rental payments to affiliated foreigners for the use of tangible property, excl. film rental (intermediate)	847
Other private services payments to affiliated foreigners (intermediate)	16,762
Payments to foreigners for installation, maintenance, and repair of equipment (intermediate)	307
Total: U.S. Government payments for miscellaneous services	**3,366**
Payments for foreign post office services (Government enterprises)	602
Nonmilitary personnel expenditures abroad (PCE)	439
Nondefense purchases of services abroad (Federal Government)	2,325
Total noncomparable imports	**120,514**

PCE Personal consumption expenditures
PES Private equipment and software

Foreign trade also includes a special category referred to as the “rest-of-the-world adjustment to final uses.” This adjustment is required in order to conform the commodity treatment of the I-O use table to the expenditure concepts used for final uses in the NIPAs. This is accomplished by making offsetting adjustments between PCE and gross exports and between Federal Government nondefense purchases and exports and imports. Table 7.6 shows each of the categories from the ITAs and the offsetting adjustment in final uses. For example, the ITAs record the value of travel in the United States by foreigners as an export. Foreigners traveling in the United States consume goods and services, such as accommodations, that are included in the source data for PCE. In order to put the PCE

estimate on a NIPA basis, an adjustment of -$73,645 is made to account for these purchases.

Table 7.6 Rest-of-the-World Adjustment to Final Uses, 1997
[Millions of dollars]

REST-OF-THE-WORLD EXPORTS	91,249	
ITA CATEGORY	ADJUSTMENT TO FINAL USES	FINAL-USE CATEGORY AFFECTED
Donations included in merchandise exports[1]	-484	Personal consumption expenditures (PCE)—Personal remittances in kind to foreigners[2]
Private gift parcel remittances (parcel post)	-685	PCE—Personal remittances in kind to foreigners[2]
Transfers under military agency sales contracts	-475	Federal Government nondefense purchases—Receipts for overseeing foreign-to-foreign transactions[3]
Travel in the United States by foreigners	-73,645	PCE—Travel in the United States by foreigners[4]
Port expenditures in the United States	-964	PCE—Expenditures of foreign ocean and air crews in the United States[4]
Other private services receipts:		
	-8,346	PCE—Education (foreign students' expenditures in the United States)[4]
	-1,113	PCE—Expenditures for medical services in the United States by foreigners[4]
	-1,533	PCE—Expenditures in the United States by foreign governments and international organizations[4]
	-3,283	PCE—Expenditures in the United States by foreign seasonal, migrant, and professional workers[4]
U.S. Government receipts for miscellaneous services	-722	Federal Government nondefense purchases—Receipts from foreigners for other private services[5]
Total adjustment to final uses	**0**	

[1] Donated Census merchandise exports and imports are identified by foreign trade code (harmonized code) description as "donated for relief or charity." Donated exports include food, medicine, apparel, and other articles. It is assumed that these items are also included in estimates of PCE and are offset to avoid double counting.

[2] Values are included in NIPA table 2.5.5 line 113.

[3] Values are included in NIPA table 3.9.5 line 12.

[4] Values are included in NIPA table 2.5.5 line 112.

[5] Values are included in NIPA table 3.9.5 line 17.

Data sources and estimation

BEA's ITAs are the overall source for the foreign trade estimates in the I-O accounts. The sources for individual estimates for the foreign trade transactions are from the Census Bureau's publication FT-900 *U.S. International Trade in Goods*

and Services and from the detailed estimates prepared for the ITAs. Sources for the ITAs include BEA's international surveys of trade in services and of direct investment, Department of Defense reports, the International Trade Administration's *Survey of International Air Travelers*, Immigration reports, and various private sources. Tables 7.A and 7.B at the end of this chapter list the major sources by type of export and import.

Goods

Trade in goods, often referred to as merchandise trade, is tabulated monthly by the Census Bureau. Both exports and imports are tabulated from documents filed with Customs (Department of Homeland Security, U.S. Customs and Border Protection). Exports are primarily from Shippers Export Declarations, which are required for shipments leaving the United States. They exclude shipments to the armed forces for their own use. Exports are generally valued at the free alongside ship (f.a.s.) value at the port of export—which is based on the transaction price and includes inland freight, insurance, and other charges incurred in placing the merchandise alongside the carrier at the U.S. port of exportation. Thus, for a machine produced in the United States and exported to Great Britain, the f.a.s. value includes the costs incurred in trucking it to New York for shipment, but not the costs associated with loading it onto the ship and transporting it to London.

Imports are tabulated from various customs forms. The data are provided on two valuation bases: Customs import value and cost, insurance, and freight (c.i.f.). The customs import value reflects the foreign port value and is used in the ITAs. In the I-O accounts, imports are valued at the c.i.f. value, which represents the value paid by the importer, plus duty.

There are two classifications of imports: "General imports" and "imports for consumption." General imports, which is used by BEA, consist of imports for immediate consumption and of entries into customs-bonded warehouses and into foreign trade zones. Imports for consumption consists of imports for immediate consumption plus withdrawals from customs-bonded warehouses and from foreign trade zones.

The Census Bureau covers all shipments above a certain size, and it samples the remaining "low-value" shipments. The cutoff for low-value has varied over time; it is currently $2,500 or less for exports and $2,000 or less for imports (except $250 or less for certain quota items). Low-value exports and imports are estimated on the basis of ratios of low-value shipments to individual totals by country of destination (for exports) or by country of origin (for imports) for past years.

For trade between the United States and Canada, U.S. exports to Canada are derived from the measures of Canadian imports from the United States as tabulated by the Canadian Government (similarly, Canada uses U.S. import statistics to derive Canadian exports to the United States). Import statistics are generally regarded as the more accurate, partly because they are often associated with the collection of tax revenues. The estimates of U.S. exports are improved by this bilateral data exchange.[17]

All export and import codes used by the United States are based on the international Harmonized Tariff System (HTS). The HTS assigns six-digit codes to general categories. Countries that use the HTS may define commodities at a more detailed level—the United States defines products using 10-digit HTS codes. Export codes (which the United States calls Schedule B Codes) are administered by the U.S. Census Bureau. Import codes are administered by the U.S. International Trade Commission (USITC).

The HTS codes are updated monthly, and for any calendar year, approximately 15,000 different codes are used. The Census Bureau's Foreign Trade Division maintains a concordance between these 15,000 HTS codes and the approximate North American Industry Classification System (NAICS) codes (see Chapter 4, "Classification and Secondary Products"). This concordance provides the basis for the industry-accounts concordance between HTS codes and I-O item codes.[18]

The concordance between HTS and I-O is used to assign each export and import to an item and to create a foreign trade transaction. In most cases, the concordance assigns one HTS export or import to a single item. In cases where the HTS description appears to belong to more than one item, the HTS export or import is split among those items. In order to ensure consistency with the detailed source data, I-O analysts can only edit the concordance through the benchmark user interface and cannot edit any of the values of the merchandise export or import transactions.

Services

In contrast to the transactions for trade in goods, where the transactions are created within the database system using a concordance and data files prepared by the foreign-trade analyst, the transactions for trade in services are developed outside the database system by the I-O foreign-trade analyst and then added to the database.

Exports and imports of services are estimated based on data from the ITAs. Beginning with the ITA published values for trade in services (table 7.7), the industry accounts apply the geographic adjustments and other adjustments required for consistency with the NIPA definitions. Using underlying data (published and unpublished) from the ITAs, the estimates for services are subdivided into the input category controls used in the industry accounts. Tables 7.A (exports)

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[17] Each year since 1970, the bilateral current-account estimates of the United States have been reconciled with those of Canada, reflecting the extensive economic links between the two countries. For example, see Renee Sauers, Patricia Abaroa, Edward Dozier, and Denis Caron, "Reconciliation of the U.S.-Canadian Current Account, 2003 and 2004," *Survey of Current Business* 85 (November 2005): 36-49.

[18] BEA's Balance of Payments Division (BPD) maintains a concordance of each HTS code to BEA end-use codes. End-use codes group merchandise trade into categories related to how the good will be used, either in the United States or in a foreign country. These codes are used in the NIPAs to categorize exports and imports of goods by type. BPD maintains separate concordances for exports and imports, so exports and imports with the same HTS code may be assigned to different end-use categories. BPD and IAD have not yet reconciled the export and import concordances.

and 7.B (imports) at the end of this chapter summarize the categories of services and the sources used in the industry accounts.

The input category controls are used to develop the foreign trade transactions for services in the I-O database. For some categories, the assignment of the export or import to an I-O commodity is straightforward; for example, exports and imports of passenger fares are assigned directly to air and water commodities. For some other categories, where the service is applicable to many industries, the industry data collected by BEA's International Investment Division is used to make the distribution—for example, for other private services. For the remaining categories, such as port expenditures, no current data are available, and historical distributions are used.

Table 7.7 Trade in Services (Page 1 of 2)
[Millions of dollars]

From ITA table 3, "Private Services Transactions" (as released on December 16, 2005)		
Line		**2002**
1	**Exports of private services**	**282,116**
2	Travel (table 1, line 6)	66,605
3	Passenger fares (table 1, line 7)	17,046
4	Other transportation (table 1, line 8)	29,195
5	Freight	12,289
6	Port services	16,906
7	Royalties and license fees (table 1, line 9)	44,489
8	Affiliated	32,751
9	U.S. parents' receipts	29,656
10	U.S. affiliates' receipts	3,095
11	Unaffiliated	11,738
12	Industrial processes	4,039
13	Other	7,699
14	Other private services (table 1, line 10)	124,781
15	Affiliated services	42,869
16	U.S. parents' receipts	24,624
17	U.S. affiliates' receipts	18,245
18	Unaffiliated services	81,912
19	Education	12,626
20	Financial services	17,746
21	Insurance services	4,467
22	Telecommunications	3,890
23	Business, professional, and technical services	29,230
24	Other unaffiliated services	13,954
25	**Imports of private services**	**211,716**
26	Travel (table 1, line 23)	58,715
27	Passenger fares (table 1, line 24)	19,969

Table 7.7 Trade in Services (Page 2 of 2)
[Millions of dollars]

From ITA table 3, "Private Services Transactions" (as released on December 16, 2005)		
Line		**2002**
28	Other transportation (table 1, line 25)	38,407
29	Freight	25,973
30	Port services	12,434
31	Royalties and license fees (table 1, line 26)	19,335
32	Affiliated	15,116
33	U.S. parents' payments	2,925
34	U.S. affiliates' payments	12,191
35	Unaffiliated	4,219
36	Industrial processes	2,049
37	Other	2,169
38	Other private services (table 1, line 27)	75,290
39	Affiliated services	31,688
40	U.S. parents' payments	17,001
41	U.S. affiliates' payments	14,687
42	Unaffiliated services	43,602
43	Education	2,701
44	Financial services	4,160
45	Insurance services	22,150
46	Telecommunications	4,233
47	Business, professional, and technical services	9,688
48	Other unaffiliated services	671

General rules for foreign trade transactions in the I-O database

1. By definition, exports include only domestically produced goods and services. Excluding transactions in used goods, the sum of exports for each commodity (or item) should be less than domestic output. However, exports may occasionally be higher than domestic output if the export value includes output from a prior year—either because of the timing of the export or because of inaccuracies in the inventory estimates. In these cases, the difference between domestic output and the value of the export should be small. Thus, if the value of the export exceeds the value of domestic production by a significant amount, the analyst should check for incorrect assignment of the harmonized code to an item and for incorrect margins and transportation-cost rates on the commodity as possible causes.

2. The firm value for exports is either purchasers' value or purchasers' value through wholesale. Goods exports are reported at the value leaving the U.S. port, which is equivalent to purchasers' value.
3. Imports are valued at basic prices. Merchandise imports are reported at the value arriving at a U.S. port (foreign port value plus freight, insurance, and duty).
4. Transactions for trade in goods cannot be edited. Only the assignment of a harmonized foreign trade code to an item can be edited.
5. Goods exports and imports with the same harmonized code are always assigned to the same item. Similar harmonized codes (those with the same first seven, eight, or nine digits) are assigned to similar items.
6. Trade in tobacco is always assigned to manufacturing. In contrast, the Census Bureau's Foreign Trade Division assigns tobacco to agriculture.
7. Trade in fish is always assigned to fishing (NAICS 1141) rather than to manufacturing. In contrast, the Census Bureau's Foreign Trade Division NAICS assignment divides fish between manufacturing and agriculture services.

KEY TERMS FOR CHAPTER 7

Geographic adjustment. An adjustment that is made to the trade estimates from the ITAs in order to remove the transactions involving the Commonwealth of Puerto Rico and the U.S. territories. In the NIPAs and the I-O accounts, the geographic boundary for the United States is limited to the 50 states and the District of Columbia.

Reexports. Commodities of foreign origin that were previously imported into the United States and then exported from the United States in substantially the same condition as when imported. An example would be imported foreign-made monitors that are purchased by U.S. personal computer manufacturers, joined with U.S.-made consoles, and then exported to a third foreign country. Among the principal reexports are semiconductors, printed circuits, jewelers' materials, and telephone apparatus. Reexports are subtracted from both exports and imports in order to exclude goods that were not produced within the United States.

Reimports. Domestically produced goods that were previously exported to other countries for processing or assembly, or both, and then returned to the United States. Examples include articles of metal that are manufactured in the United States, then exported for further processing abroad, and then returned to the United States for more processing or textiles that are exported, assembled into clothing abroad, and then returned for sale in the United States.

F.A.S. (free alongside ship) export value. The value of U.S. exports at the seaport, airport, or border port of export. This value is based on the transaction price, and it includes inland freight, insurance, and other charges incurred in placing the merchandise alongside the carrier at the U.S. port of exportation. This value excludes the cost of loading the merchandise aboard the exporting carrier, and it also excludes freight, insurance, and any other charges or transportation costs beyond the port of exportation. In the I-O accounts, f.a.s. value is the valuation used for U.S. exports of commodities.

Foreign port value or Customs import value. The value of U.S. imports at the point of exportation to the United States. This value is based on the price actually paid or payable for merchandise when sold for exportation. It excludes U.S. import duties, freight, insurance, and other charges incurred in bringing the merchandise to the United States. In the I-O accounts, foreign port value is the valuation used for total U.S. imports of commodities.

C.I.F. (cost, insurance, and freight) import value. The value of imports at the first port of arrival in the United States. This value is equal to the Customs import value plus "import charges"—that is, the freight, insurance, and other charges incurred in bringing the merchandise to the United States. It excludes U.S. import duties.

KEY TERMS FOR CHAPTER 7 *(CONTINUED)*

Domestic port value. The value of an import as it enters the United States. This value is equal to the c.i.f. value plus customs duty. (It is also equal to the foreign port value plus freight, insurance, and other charges, plus customs duties.) In the I-O accounts, this is the valuation used for U.S. imports of individual commodities.

Customs bonded warehouses. Bonded warehouses are authorized by U.S. Customs for storage or manufacturing of goods on which payment of duties is deferred. When these goods are removed from the warehouses and sent into a Customs territory, they become subject to U.S. customs duties. However, if they are instead reshipped to foreign points, no duties are collected.

Foreign trade zones. Foreign trade zones are enclosed areas, operated as public utilities, under the control of U.S. Customs that have facilities for handling, storing, manipulating, manufacturing, and exhibiting goods. The goods may be exported, destroyed, or sent into Customs territory from the zone, in the original package or otherwise. The goods that are sent into Customs territory become subject to customs duties, but those that are reshipped to foreign points do not.

Schedule B codes. U.S. export statistics are initially collected and compiled in terms of approximately 8,000 commodity classifications in "Schedule B, Statistical Classification of Domestic and Foreign Commodities Exported from the United States," a U.S. Bureau of the Census publication. Schedule B is based on the international Harmonized Commodity Description and Coding System (Harmonized System).

Harmonized Tariff Schedule. U.S. import statistics are initially collected and compiled in terms of approximately 14,000 commodity classifications in "Harmonized Tariff Schedule of the United States Annotated for Statistical Reporting Purposes (HTSUSA)," a publication of the U.S. International Trade Commission. The HTSUSA is the U.S. import version of the Harmonized System.

End-Use Commodity Category. BEA's Balance of Payments Division maintains a concordance that aggregates the HTSUSA and Schedule B classifications into about 140 broad commodity groupings that are in turn summarized into six principal end-use categories. These categories are used in developing seasonally adjusted and constant-dollar estimates for the ITAs.

Table 7.A Services Exports: Categories and Sources (Page 1 of 10)

INPUT CATEGORY	DESCRIPTION	2002 (MILLIONS OF DOLLARS)	SOURCE
XB01	U.S. international transactions accounts (ITAs), transfers under military agency sales contracts (TUMASC): The contracts include delivered goods and services by U.S. military agencies to foreign governments. I-O excludes three items from the ITA estimate: (1) Military goods identified in Census documents (I-O includes these goods in I-O merchandise (input category XA01)), (2) ITA military grants for U.S. Department of Defense assistance (NIPAs and I-O exclude this part of the ITA military grants from ITA exports), and (3) Reimbursable funds spent on the behalf of foreign governments.	3002.2	U.S. ITA estimates based on U.S. military agency reports, prepared by the Balance of Payments Division (BPD) National income and products accounts (NIPA) estimates of part of ITA military grants, prepared by the National Income and Wealth Division (NIWD)
XC01	Travel in the United States by foreigners: Receipts of U.S. residents from foreigners traveling in the United States.	66728.0	U.S. and foreign immigration authorities (numbers of travelers) U.S. Consumer Price Index, U. S. Bureau of Labor Statistics (BLS) U.S. Travel and Tourism Administration (USTTA) Statistics Canada U.S. Citizenship and Immigration Service (CIS) and Bank of Mexico
XD01	Passenger fares: Passenger fares paid to U.S. carriers by foreign residents traveling between the United States and foreign countries and between two foreign points, less passenger fares paid to foreign ocean and air carriers by U.S. residents traveling between the United States and foreign countries and between two foreign points.	17046.0	U.S. Citizenship and Immigration Service (CIS) and U.S. Department of Transportation (DOT), U.S International Air Travel Statistics U.S. Travel and Tourism Administration Statistics Canada (Canadian passengers) CIS and DOT (Mexican passengers) BE-37 Survey: U.S. Airline Operators' Foreign Revenues and Expenses
XE10	Space transport, ITA other transportation: Receipts of U.S. residents from foreign residents for the launching of commercial satellites.	277.0	BE-577 Survey: Direct Transactions of U.S. Reporter with Foreign Affiliate BE-605 Survey: Transactions of U.S. Affiliate, except a U.S. Banking Affiliate, with Foreign Parent BE-22 Survey: Annual Survey of Selected Services Transactions with Unaffiliated Foreign Persons Launch data from the Federal Aviation Administration
XE11	Rail freight, ITA other transportation: Receipts of U.S. residents from foreign residents to move freight via railroad.	871.0	Statistics Canada

Table 7.A Services Exports: Categories and Sources (Page 2 of 10)

INPUT CATEGORY	DESCRIPTION	2002 (MILLIONS OF DOLLARS)	SOURCE
XE13	Ocean freight, ITA other transportation: Receipts of U.S. residents from foreign residents to move freight via the oceans.	3724.0	BE-30 Survey: Ocean Freight Revenues and Foreign Expenses of United States Carriers Census Bureau Tabulation SM 711: U.S. Water-Borne Exports, Domestic and Foreign Merchandise Census Bureau Tabulation SM 311: U.S. Water-Borne Imports Customs Bureau Form 1400: Record of Vessels Engaged in Foreign Trade and Entered or Arrived Under Permit to Proceed U.S. Department of Agriculture
XE14	Great Lakes freight, ITA other transportation: Receipts of U.S. residents from foreign residents to move freight via the Great Lakes.	9.0	Census Bureau Tabulation SM 704: U.S. Water-Borne BE-30 Survey: Ocean Freight Revenues and Foreign Expenses of United States Carriers
XE16	Air freight, ITA other transportation: Receipts, including receipts for aircraft leasing with crew, of U.S. residents from foreign residents to move freight via air.	5787.0	BE-37 Survey: U.S. Airline Operators' Foreign Revenues and Expenses Census Bureau Tabulation SM 754: U.S. Exports by Air
XE17	Crude or refined petroleum pipeline freight, ITA other transportation: Receipts of U.S. residents from foreign residents to move freight via pipeline.	152.0	Submissions from U.S. affiliates of Canadian pipeline companies
XE18	Natural gas freight, ITA other transportation: Receipts of U.S. residents from foreign residents to move natural gas freight via pipeline.	163.0	Submissions from U.S. affiliates of Canadian pipeline companies
XE19	Motor freight, ITA other transportation: Receipts of U.S. residents from foreign residents to move freight using trucking or courier services.	1306.0	DOT, Bureau of Trade Statistics
XE21	Ocean port expenditures in the United States by foreigners, ITA other transportation: Goods and services provided by U.S. residents to foreign vessel operators in connection with their transportation operations in the United States. Port expenditures include items such as food purchases (including catered food), fuels, rent, bracing lumber, stationery, utensils, aircraft parts, ship repairs, communications, insurance, advertising, legal services, etc.	8533.0	BE-29 Survey: Foreign Ocean Carriers' Expenses in the United States Census Bureau Tabulation SM 711: U.S. Water-Borne Exports, Domestic and Foreign Merchandise Census Bureau Tabulation SM 311: U.S. Water-Borne Imports BLS U.S. Producer Prices Index for Services Census Bureau Tabulation FT 810: Bunker Fuels

Table 7.A Services Exports: Categories and Sources (Page 3 of 10)

INPUT CATEGORY	DESCRIPTION	2002 (MILLIONS OF DOLLARS)	SOURCE
XE22	Great Lakes port expenditures in the U.S. by foreigners, ITA other transportation: Great Lakes port expenditures at U.S. Great Lakes ports by foreign carriers.	30.0	Statistics Canada
XE23	Air port expenditures in the U.S. by foreigners, ITA other transportation: Goods and services provided by U.S. residents to foreign airline operators in connection with their transportation operations in the United States. Port expenditures include items such as eating and drinking expenses (including catered food), jet fuel, landing fees, airport and flying field services, rent, advertising, travel agencies, aircraft parts, ship repairs, communications, insurance, advertising, legal services, etc.	8183.0	BE-36 Survey: Foreign Airline Operators' Revenues and Expenses in the United States (1997). For 2002 BE-9 Survey. Census Bureau Tabulation SM 354: U.S. General Imports by Air
XE24	Rail port expenditures in the U.S. by foreigners, ITA other transportation: Support activities for rail transportation provided by U.S. residents to foreign rail port operators in connection with their transportation operations in the United States.	160.0	Statistics Canada
XF11	Royalties and license fees receipts from affiliated foreigners, gross, before deduction of withholding tax: Receipts of U.S. firms from affiliated foreign firms (for example, foreign-parent firms, subsidiaries, and branches) for the rights to use patents, copyrights, industrial processes, and other intellectual property.	32658.0	BE-577 Direct Transactions of U.S. Reporter with Foreign Affiliate BE-605 Transactions of U.S. Affiliate, except a U.S. Banking Affiliate, with Foreign Parent
XF21	Royalties and license fees receipts from unaffiliated foreigners: Receipts of U.S. firms from foreign residents for the rights to use patents, copyrights, industrial processes, and other intellectual property.	11561.0	BE-93 Survey: Annual Survey of Royalties, License Fees, and Other Receipts and Payments for Intangible Rights Between U.S. and Unaffiliated Foreign Persons (1997) Beginning in 2002 BE-25 Survey: Quarterly Survey of Transactions Between U.S. and Unaffiliated Foreign Persons in Selected Services and in Intangible Assets
XG11	Rental receipts from affiliated foreigners, gross, for use of tangible property, excluding film rental: Receipts of U.S. firms from affiliated foreigners (for example, foreign-parent firms, subsidiaries, and branches) for the use of property—including computers (and peripherals), furniture, office machinery, and other commercial and industrial machinery. Rental receipts for tangible property are part of ITA other private services.	2464.0	BE-577 Direct Transactions of U.S. Reporter with Foreign Affiliate BE-605 Transactions of U.S. Affiliate, except a U.S. Banking Affiliate, with Foreign Parent

Table 7.A Services Exports: Categories and Sources (Page 4 of 10)

INPUT CATEGORY	DESCRIPTION	2002 (MILLIONS OF DOLLARS)	SOURCE
XG12	Film rental receipts from affiliated foreigners, gross: Receipts of U.S. firms from affiliated foreigners (for example, foreign-parent firms, subsidiaries, and branches) for the distribution of commercial theater films, and television programs. Film rental receipts are part of ITA other private services.	2742.0	BE-577 Direct Transactions of U.S. Reporter with Foreign Affiliate BE-605 Transactions of U.S. Affiliate, except a U.S. Banking Affiliate, with Foreign Parent
XG14	Other private services receipts, less rentals, from affiliated foreigners, gross: Receipts of U.S. firms from affiliated foreigners (for example, foreign-parent firms, subsidiaries, and branches) for providing services, such as management consulting, custom computer programming, and other support services.	38123.0	BE-577 Direct Transactions of U.S. Reporter with Foreign Affiliate BE-605 Transactions of U.S. Affiliate, except a U.S. Banking Affiliate, with Foreign Parent
XG210	Education, foreign-student expenditures in the United States: Receipts of U.S. residents from foreign residents while studying in the United States. Classified in the NIPAs as a component of personal consumption expenditures (PCE) travel by foreigners in the United States.	12626.8	Institute of International Education U.S. Department of Education BLS (living expenses)
XG211	Financial services: Receipts of U.S. financial firms from foreigners for a variety of financial services, such as securities commissions, revenue from underwriting securities, income from trading securities and commodities, etc.	16091.0	BE-82 Survey: Annual Survey of Financial Services Transactions Between U.S. Financial Services Providers and Unaffiliated Foreign Persons (1997) Beginning in 2002 BE-85 Survey: Quarterly Survey of Financial Services Transactions Between U.S. Financial Services Providers and Unaffiliated Foreign Persons.
XG214	Primary insurance premiums received from foreign residents net of losses plus the NIPA estimate of premium supplements: Receipts of U.S. insurance firms for various types of insurance—including fire, property, medical malpractice, inland marine, and product liability.	893.3	BE-48 Survey: Annual Survey of Reinsurance and Other Insurance Transactions by U.S. Insurance Companies with Foreign Persons NIPA estimate of insurance premium supplements
XG215	Reinsurance premiums ceded from foreign insurance companies, net of losses (BE-48) plus the NIPA estimate of premium supplements (up to 2003). Beginning in 2004 I-O uses BPD estimates based on NIPA definition of insurance.	4169.5	BE-48 survey and NIPA estimate of reinsurance premium supplements (up to 2003) Beginning in 2004 BE-45 Survey: Quarterly Survey of Insurance Transactions by U.S. Insurance Companies with Foreign Persons

Table 7.A Services Exports: Categories and Sources (Page 5 of 10)

INPUT CATEGORY	DESCRIPTION	2002 (MILLIONS OF DOLLARS)	SOURCE
XG216	Construction, engineering, architectural, and mining services: Receipts of U.S. firms from foreigners for engineering, architectural, geophysical, and surveying mapping services.	2432.0	BE-47 Survey: Annual Survey of Construction, Engineering, Architectural, and Mining Services Provided by U.S. Firms to Unaffiliated Foreign Persons (up to 2003). Beginning in 2004 BE-25 Survey: Quarterly Survey of Transactions Between U.S. and Unaffiliated Foreign Persons in Selected Services and in Intangible Assets, for construction, engineering and architectural. BE-22: Annual Survey of Selected Services Transactions Between U.S. and Unaffiliated Foreign Persons, for mining services.
XG217	Medical services: Receipts of U.S. firms from foreigners for medical services. Classified in the NIPAs as a component of PCE travel by foreigners in the United States.	1900.6	BPD (Special Studies Branch) estimates for hospital administrators from major medical centers, university hospitals and hospitals in major visitor centers BLS U.S. Consumer Price Index
XG218	Installation, maintenance, and repair of equipment services: Receipts of U.S. firms from foreigners for services involving installation, maintenance, and repair of equipment.	3510.5	Census Bureau estimate and BE-25 (up to 2001). Beginning in 2002 Census Bureau and BE-22 Annual Survey of Selected Services Transactions Between U.S. and Unaffiliated Foreign Persons, for mining services.
XG219	Foreign government expenditures in the United States: Expenditures by foreigners in the United States working for foreign governments.	774.9	U.S. State Department BLS U.S. Consumer Price Index Statistics Canada
XG220	International organization expenditures in the United States: Expenditures by foreigners in the United States working for international organizations.	2467.9	Various international organizations and direct BEA contact with fiscal officers (Current Account Services Branch of BPD).
XG222	Film rental receipts from unaffiliated foreigners: Receipts by U.S. firms from foreign firms for the distribution of commercial theater films and television programs to cable and television networks.	6695.0	BE-93 Survey: Annual Survey of Royalties, License Fees, and Other Receipts and Payments for Intangible Rights Between U.S. and Unaffiliated Foreign Persons (up to 2003). Beginning in 2004 BE-25 Survey: Quarterly Survey of Transactions Between U.S. and Unaffiliated Foreign Persons in Selected Services and in Intangible Assets, for construction, engineering and architectural.

Table 7.A Services Exports: Categories and Sources (Page 6 of 10)

INPUT CATEGORY	DESCRIPTION	2002 (MILLIONS OF DOLLARS)	SOURCE
XG223	Mexican workers purchases (BPD) and West Indian workers' purchases (BE-40) less money taken back to Mexico (BPD): Purchases by West Indian and Mexican workers in the United States is estimated by BPD (earnings less money sent back to home country equals estimated purchases).	347.6	Local authorities, U.S. Citizenship and Immigration Service (CIS), U.S. Customs Service, bankers, retailers, and U.S. employers in border areas BE-40 Survey: Institutional Remittances to Foreign Countries British West Indies Central Labour Organization
XG225	Trade union dues paid by Canadian workers to U.S. unions operating in Canada.	112.5	Statistics Canada
XG2A2	Agricultural and mining services: Receipts of U.S. firms from foreigners for miscellaneous agricultural services and mining services, such as surveying and mapping services.	221.0	Mining data from BE-22 Annual Survey of Selected Services Transactions Between U.S. and Unaffiliated Foreign Persons. Agriculture data from BE-20 Benchmark Survey of Selected Services Transactions with Unaffiliated Foreign Persons.
XG2A3	Waste treatment and depollution services: Receipts of U.S. firms from foreigners for waste treatment and depollution services—including hazardous and nonhazardous waste treatment, remediation services, and other miscellaneous waste management services.	32.0	BE-22 Annual Survey of Selected Services Transactions Between U.S. and Unaffiliated Foreign Persons, for mining services.
XG22B	Telecommunications services: Receipts of U.S. firms from foreigners for wired telecommunications long distance services.	5016.0	BE-22 Annual Survey of Selected Services Transactions Between U.S. and Unaffiliated Foreign Persons, for mining services (up to 2003). Beginning in 2004 BE-25 Quarterly Survey of Transactions Between U.S. and Unaffiliated Foreign Persons in Selected Services and in Intangible Assets.
XG22D	Computer and data processing services: Receipts of U.S. firms from foreigners for custom computer programming and support services, computer system integrators, and other computer related services.	3147.0	BE-22 Annual Survey of Selected Services Transactions Between U.S. and Unaffiliated Foreign Persons, for mining services (up to 2003). Beginning in 2004 BE-25 Quarterly Survey of Transactions Between U.S. and Unaffiliated Foreign Persons in Selected Services and in Intangible Assets
XG22E	Database and other information systems services: Receipts of U.S. firms from foreigners for computer database and other computer related services.	2234.0	BE-22 Annual Survey of Selected Services Transactions Between U.S. and Unaffiliated Foreign Persons, for mining services (up to 2003). Beginning in 2004 BE-25 Quarterly Survey of Transactions Between U.S. and Unaffiliated Foreign Persons in Selected Services and in Intangible Assets

Table 7.A Services Exports: Categories and Sources (Page 7 of 10)

INPUT CATEGORY	DESCRIPTION	2002 (MILLIONS OF DOLLARS)	SOURCE
XG22F	Management consulting and public relations services: Receipts of U.S. firms from foreigners for administrative and general management services, except the management of health care facilities; consulting services, except engineering (reported on BE-47); computer, environmental, and consulting services in which management and operating staff are provided; public relations services, excluding those that are an integral part of an advertising campaign.	1674.0	BE-22 Annual Survey of Selected Services Transactions Between U.S. and Unaffiliated Foreign Persons, for mining services (up to 2003). Beginning in 2004 BE-25 Quarterly Survey of Transactions Between U.S. and Unaffiliated Foreign Persons in Selected Services and in Intangible Assets
XG22G	Research, development, commercial testing, and lab services: Receipts of U.S. firms from foreigners for testing, laboratory services, and research and development in the physical, engineering, and life sciences.	1099.0	BE-22 Annual Survey of Selected Services Transactions Between U.S. and Unaffiliated Foreign Persons, for mining services (up to 2003). Beginning in 2004 BE-25 Quarterly Survey of Transactions Between U.S. and Unaffiliated Foreign Persons in Selected Services and in Intangible Assets
XG22H	Miscellaneous disbursements: Expenditures in the United States by residents of foreign countries to fund the news gathering costs of broadcasters and print media; production costs of foreign motion picture companies; production costs of foreign broadcasting companies for program material other than news; expenditures by foreign governments to maintain offices in the United States to sponsor and promote tourism and business; and foreign-company expenditures for maintaining offices in the United States for sales promotion, representational public-relation-type activities, and the gathering of marketing information.	733.2	BE-22 Annual Survey of Selected Services Transactions Between U.S. and Unaffiliated Foreign Persons, for mining services.
XG22J	Advertising: Receipts of U.S. firms from foreigners for advertising services.	484.0	BE-22 Annual Survey of Selected Services Transactions Between U.S. and Unaffiliated Foreign Persons, for mining services.
XG22E	Database and other information systems services: Receipts of U.S. firms from foreigners for computer database and other computer related services.	2234.0	BE-22 Annual Survey of Selected Services Transactions Between U.S. and Unaffiliated Foreign Persons, for mining services (up to 2003). Beginning in 2004 BE-25 Quarterly Survey of Transactions Between U.S. and Unaffiliated Foreign Persons in Selected Services and in Intangible Assets

Table 7.A Services Exports: Categories and Sources (Page 8 of 10)

INPUT CATEGORY	DESCRIPTION	2002 (MILLIONS OF DOLLARS)	SOURCE
XG22K	Legal services: Receipts of U.S. firms from foreigners for legal services.	3184.0	BE-22 Annual Survey of Selected Services Transactions Between U.S. and Unaffiliated Foreign Persons, for mining services (up to 2003). Beginning in 2004 BE-25 Quarterly Survey of Transactions Between U.S. and Unaffiliated Foreign Persons in Selected Services and in Intangible Assets
XG22L	Industrial engineering: Receipts of U.S. firms from foreigners for industrial-engineering services related to the design of movable products, including product design. (Immovable products engineering is reported on BE-47.)	770.0	BE-22 Annual Survey of Selected Services Transactions Between U.S. and Unaffiliated Foreign Persons, for mining services (up to 2003). Beginning in 2004 BE-25 Quarterly Survey of Transactions Between U.S. and Unaffiliated Foreign Persons in Selected Services and in Intangible Assets
XG22M	Accounting, auditing, and bookkeeping services: Receipts of U.S. firms from foreigners for accounting services.	413.0	BE-22 Annual Survey of Selected Services Transactions Between U.S. and Unaffiliated Foreign Persons, for mining services (up to 2003). Beginning in 2004 BE-25 Quarterly Survey of Transactions Between U.S. and Unaffiliated Foreign Persons in Selected Services and in Intangible Assets.
XG22N	Sports and performing arts: Receipts of U.S. residents from foreign residents for entertainment services provided by theater, performing arts (excluding circuses) and dance companies, musical groups and artists, sports teams and clubs, professional athletes, promoters of arts, sports, and similar events.	171.0	BE-22 Annual Survey of Selected Services Transactions Between U.S. and Unaffiliated Foreign Persons, for mining services.
XG22P	Training services: Receipts of U.S. firms from foreigners for educational or training services provided on a contract basis, including fees for distance-learning technologies using the internet but excluding services provided by higher education where the student attends the institution and excluding training done by corporations in connection with the sale of a good.	596.0	BE-22 Annual Survey of Selected Services Transactions Between U.S. and Unaffiliated Foreign Persons, for mining services.
XG22Q	Installation, maintenance, and repair of equipment: Receipts of U.S. firms from foreigners for installation, maintenance, and repair of equipment—including auxiliary truck transportation, warehousing, and data-processing-services equipment.	1720.5	BE-22 Annual Survey of Selected Services Transactions Between U.S. and Unaffiliated Foreign Persons, for mining services (up to 2003). Beginning in 2004 BE-25 Quarterly Survey of Transactions Between U.S. and Unaffiliated Foreign Persons in Selected Services and in Intangible Assets

Table 7.A Services Exports: Categories and Sources (Page 9 of 10)

INPUT CATEGORY	DESCRIPTION	2002 (MILLIONS OF DOLLARS)	SOURCE
XG22R	Operational leasing: Receipts of U.S. firms from foreign residents for the rental or lease of commercial ships and barges (without crew), railroad car rental and leasing (without operators), aircraft rental and leasing (without pilots), computer and computer peripheral equipment rental and leasing (without operators), and passenger car, truck, SUVs, and vans (without drivers).	3590.0	BE-22 Annual Survey of Selected Services Transactions Between U.S. and Unaffiliated Foreign Persons, for mining services (up to 2003). Beginning in 2004 BE-25 Quarterly Survey of Transactions Between U.S. and Unaffiliated Foreign Persons in Selected Services and in Intangible Assets
XG22T	Other business, professional, and technical services: Receipts of U.S. firms from foreigners for services such as language translation and interpreting services; investigation and security services; collection services; salvage services; satellite photography and remote sensing/ satellite imagery services; mapping and surveying services (both geophysical and nongeophysical); mailing reproduction and commercial art services; personnel supply services; management of health care facilities, and miscellaneous services.	390.0	BE-22 Annual Survey of Selected Services Transactions Between U.S. and Unaffiliated Foreign Persons, for mining services.
XG22U	Trade-related services: Receipts of U.S. firms from foreigners for a basket of business-to-business services—including auction services, services of independent sales agents, and subscription/access fees from online services (except internet access only).	348.0	BE-22 Annual Survey of Selected Services Transactions Between U.S. and Unaffiliated Foreign Persons, for mining services.
XG22S	Lease rights to natural resources: Royalty income of U.S. firms from foreigners for the use of oil and mining resources in the United States.	3.0	BE-22 Annual Survey of Selected Services Transactions Between U.S. and Unaffiliated Foreign Persons, for mining services.
XG229	Agricultural and nonagricultural back and forth migratory workers, foreign professionals, other foreign-worker expenditures while working in the United States, excluding foreign-embassy and international-organization workers.	3588.7	BPD estimates
XG228	NIPA definitional revision to the ITAs: Imputed bank-service charges to foreigners on depositors and borrowers services.	9565.0	NIWD
XH01	U.S. Government receipts for miscellaneous services including post office services and air mail transport: Receipts of the U.S. Government from foreigners for mail services, navigational, and port and harbor operations.	795.0	U.S. Postal Service U.S. Government nonmilitary agencies, NASA, St. Lawrence Seaway Development Corporation U.S. State Department, Peace Corps, Agency for International Development.

Table 7.A Services Exports: Categories and Sources (Page 10 of 10)

INPUT CATEGORY	DESCRIPTION	2002 (MILLIONS OF DOLLARS)	SOURCE
XC02	Travel in the United States by Puerto Rico (PR) residents less foreign travel in PR per I-O\NIPA territorial adjustment. This adjustment to ITA exports and imports of services is made so that NIPA and I-O estimates are limited to the 50 states and the District of Columbia. Under the territorial adjustment, PR-resident travel in the United States is added to U.S. exports, similarly to travel in the United States by other foreigners. Correspondingly, foreign-resident travel in PR is not considered a part of foreign-resident travel in the United States, so it is subtracted from ITA exports.	199.0	Puerto Rico Balance of Payments Accounts (Puerto Rico ITA)
XD02	Passenger fares receipts of PR carriers from foreign residents per I-O\NIPA territorial adjustment. The purchase of air or ocean fares by foreign residents from PR carriers is not considered a part of U.S. passenger fares exports, so it is subtracted from ITA exports.	-397.0	Puerto Rico ITA
XE20	Freight receipts of U.S. ocean and air carriers from PR residents for transporting goods to PR per I-O\NIPA territorial adjustment. The purchase of air or ocean freight by PR residents is considered a part of the exports of U.S. ocean and airfreight, so it is added to ITA exports.	2191.1	Puerto Rico ITA
XE25	PR-resident expenditures in U.S. ocean ports and airports less foreign-resident crew spending in PR ocean ports and airports per I-O\NIPA territorial adjustment. Expenditures Include items such as jet fuel, heavy fuels, airport and flying field services, and marine cargo handling. PR-resident expenditures in U.S. ports are a part of U.S. exports of port goods and services, so these expenditures must be added to ITA exports. Crew spending in PR ports by foreign residents is not part of U.S. exports, so these expenditures must be subtracted from ITA exports.	7.5	Puerto Rico ITA
XF12	Royalties and license fees receipts from affiliated and unaffiliated PR residents per 'I-O\NIPA' territorial adjustment.	166.5	Puerto Rico ITA
XG224	PR-seasonal-workers expenditures in the United States per I-O\NIPA territorial adjustment.	1.8	Puerto Rico ITA
XG227	Other private services receipts from unaffiliated foreigners per I-O\NIPA territorial adjustment PR.	2287.1	Puerto Rico ITA

Table 7.B Services Imports: Categories and Sources (Page 1 of 7)

INPUT CATEGORY	DESCRIPTION	2002	SOURCE
MB01	U.S. international transactions accounts (ITAs), direct defense expenditures (DDE), including military goods: Defense expenditures abroad by U.S. military agencies for the following major categories: (1) Expenditures by U.S. personnel abroad, (2) payments of wages to foreign residents, (3) construction expenditures abroad, (4) foreign contractual services, (5) procurement of foreign goods, (6) purchases of goods and services for military assistance programs, (7) North Atlantic Treaty Organization (NATO) support projects payments, and (8) purchases of goods and services by the U.S. Coast Guard. I-O excludes two items from ITA DDE: (1) Military goods identified in Census documents (I-O includes these goods in I-O merchandise (input category MA01)) and (2) reimbursable funds spent on the behalf of foreign governments.	18121.2	U.S. ITA estimates based on U.S. military agency reports, prepared by the Balance of Payments Division (BPD)
MC01	Travel by U.S. residents abroad: Expenditures by U.S. residents for travel abroad, including business travel.	58044.0	U.S. and foreign immigration authorities (numbers of travelers)
MD01	Passenger fares paid by U.S. residents to foreign ocean carriers for travel between the United States and foreign countries and between two foreign points.	780.0	BLS U.S. Consumer Price index U.S. Travel and Tourism Administration (USTTA) Statistics Canada BE-536 Survey: Survey of U.S. Travelers Visiting Canada U.S. Citizenship and Immigration Service (CIS) U.S Customs and Border Protection Inspectors BE-575 Survey: Expenditures of U.S. Travelers in Mexico and Canada BPD estimate of cruise fares, based on prices from *Official Steamship Guide International* and other data
MD02	Passenger fares payments by U.S. residents to foreign air carriers for travel between the United States and foreign countries and between two foreign points.	19189.0	U.S. Citizenship and Immigration Service and U.S. Travel and Tourism Administration
ME109	Space transport, ITA other transportation: Payments to foreign firms by U.S. residents for commercial satellite launching.	45.0	Federal Aviation Administration data on launches.

Table 7.B Services Imports: Categories and Sources (Page 2 of 7)

INPUT CATEGORY	DESCRIPTION	2002	SOURCE
ME110	Rail freight, ITA other transportation: Payments from U.S. residents to foreign residents to move freight via railroad.	228.0	BE-22 Survey: Annual Survey of Selected Services Transactions with Unaffiliated Foreign Persons Statistics Canada
ME112	Ocean freight, ITA other transportation: Payments from U.S. residents to foreign residents for ocean water freight transportation services.	18619.0	Census Bureau Tabulation SM 304: U.S. Water-Borne Imports Customs Bureau Form 1400: Record of Vessels Engaged in Foreign Trade and Entered or Arrived Under Permit to Proceed
ME113	Great Lakes freight, ITA other transportation: Payments from U.S. residents to foreign residents for Great Lakes freight transportation services.	29.0	Census Bureau Tabulation SM 311: U.S. Water-Borne Imports
ME115	Air freight, ITA other transportation: Payments from U.S. residents to foreign residents for air freight services and aircraft leasing with crew.	4879.0	BE-36 Survey: Foreign Airline Operators' Revenues and Expenses in the United States Census Bureau Tabulation SM 354: U.S. General Imports by Air
ME116	Motor freight, ITA other transportation: Payments from U.S. residents to foreign residents for motor freight transportation services.	2171.0	U.S. Department of Transportation, Bureau of Transportation Statistics
ME210	Ocean port expenditures in foreign ports, ITA other transportation: Payments from U.S. residents to foreign residents for ocean port expenditures. (See input category XE21 for a list of typical ocean port expenditures.)	1656.0	BE-30 Survey: Ocean Freight Revenues and Foreign Expenses of United States Carriers
ME211	Great Lakes port expenditures in Canada, ITA other transportation: Payments from U.S. residents to foreign residents for Great Lakes port expenditures.	6.0	Census Bureau Tabulation SM 704: U.S. Water-Borne Exports, Domestic and Foreign Merchandise Census Bureau Tabulation SM 304: U.S. Water-Borne Imports
ME212	Air port expenditures in foreign ports, ITA other transportation: Payments from U.S. residents to foreign residents for air port expenditures. (See input category XE23 for a list of typical airport expenditures.)	10670.0	BE-37 Survey: U.S. Airline Operators' Foreign Revenues and Expenses
ME213	Rail port expenditures, ITA other transportation: Payments from U.S. residents to Canadian residents for rail port expenditures.	104.0	Annual submissions from U.S. rail companies (up to 2002). Beginning in 2003 Statistics Canada
MF101	Royalties and license fees payments to affiliated foreigners, gross, before the deduction of withholding tax: Payments from U.S. firms to affiliated foreign firms (for example, foreign-parent firms, subsidiaries, and branches) for the rights to use patents, copyrights, industrial processes, and other intellectual property.	15084.0	BE-577 Direct Transactions of U.S. Reporter with Foreign Affiliate BE-605 Transactions of U.S. Affiliate, except a U.S. Banking Affiliate, with Foreign Parent

Table 7.B Services Imports: Categories and Sources (Page 3 of 7)

INPUT CATEGORY	DESCRIPTION	2002	SOURCE
MF201	Royalties and license fees payments to unaffiliated foreigners: Payments from U.S. firms to unaffiliated foreign firms for the rights to use patents, copyrights, industrial processes, and other intellectual property.	4151.0	BE-93 Survey: Annual Survey of Royalties, License Fees, and Other Receipts and Payments for Intangible Rights Between U.S. and Unaffiliated Foreign Persons
MG11	Rental payments to affiliated foreigners, gross, for use of tangible property, excluding film rental: Payments from U.S. firms to affiliated foreigners (for example, foreign parent firms, subsidiaries, and branches) for the use of property—including computers (and peripherals), furniture, office machinery, and other commercial and industrial machinery. Rental payments for tangible property are part of ITA other private services.	838.0	BE-577 Direct Transactions of U.S. Reporter with Foreign Affiliate BE-605 Transactions of U.S. Affiliate, except a U.S. Banking Affiliate, with Foreign Parent
MG12	Film rental payments to affiliated foreigners, gross: Payments from U.S. firms to affiliated foreign firms (for example, foreign-parent firms, subsidiaries, and branches) for the distribution of commercial theater films to theater.	5.0	BE-577 Direct Transactions of U.S. Reporter with Foreign Affiliate BE-605 Transactions of U.S. Affiliate, except a U.S. Banking Affiliate, with Foreign Parent
MG14	Other private services payments to affiliated foreigners, gross: Payments from U.S. firms to affiliated foreign firms (for example, foreign-parent firms, subsidiaries, and branches) for providing services, such as management consulting, custom computer programming, and other support services.	31005.0	BE-577 Direct Transactions of U.S. Reporter with Foreign Affiliate BE-605 Transactions of U.S. Affiliate, except a U.S. Banking Affiliate, with Foreign Parent
MG211	Education, U.S. student expenditures abroad: Payments from U.S. residents to foreign residents while studying abroad. Classified in the NIPAs as a component of PCE travel (PCE offset) by U.S. residents abroad.	2447.0	U.S. Department of Education Institute of International Education
MG212	Financial services (BE-82): Payments from U.S. residents to foreign firms for a variety of financial services, such as securities commissions, revenue from underwriting securities, income from trading securities and commodities, etc.	3823.0	BE-82 Survey: Annual Survey of Financial Services Transactions Between U.S. Financial Services Providers and Unaffiliated Foreign Persons
MG213	Primary insurance premiums paid to foreign insurance companies net of normal losses plus the BPD estimate for premium supplements. Payments from U.S. residents to foreign insurance firms for various types of insurance—including fire, earthquake, ocean marine, inland marine, and medical malpractice.	3768.5	BE-22 Survey: Annual Survey of Selected Services Transactions with Unaffiliated Foreign Persons BPD estimates of insurance premium supplements

Table 7.B Services Imports: Categories and Sources (Page 4 of 7)

INPUT CATEGORY	DESCRIPTION	2002	SOURCE
MG214	Reinsurance premiums ceded to foreign insurance companies net of normal losses plus the BPD estimate of premium supplements.	20320.3	BE-45 Quarterly Survey of Insurance Transactions by U.S. Insurance Companies with Foreign Persons BPD estimates of reinsurance premium supplements
MG216	Expenditures of U.S. residents abroad: Expenditures of nongovernment U.S. residents abroad (working less than 1 year)	333.2	Internal Revenue Service corporate tax records Statistics Canada Bundesbank (Germany) Office of National Statistics (U.K.)
MG218	Trade union activity: Payments from U.S. residents to Canadian locals for trade union activity and strike benefits.	127.3	Statistics Canada
MG220	Film rental payments to unaffiliated foreigners: Payments from U.S. residents to foreign residents for the distribution of commercial theater films and television programs to cable and television networks.	230.0	BE-93 Survey: Annual Survey of Royalties, License Fees, and Other Receipts and Payments for Intangible Rights Between U.S. and Unaffiliated Foreign Persons.
MG2A2	Agricultural and mining services: Payments from U.S. residents to foreign residents for agricultural and mining services.	320.0	BE-22 Survey: Annual Survey of Selected Services Transactions with Unaffiliated Foreign Persons
MG2A3	Waste treatment and depollution services: Payments from U.S. residents to foreign residents for waste treatment and depollution services.	16.0	BE-22 Survey: Annual Survey of Selected Services Transactions with Unaffiliated Foreign Persons
MG22B	Telecommunications services: Payments from U.S. residents to unaffiliated foreign residents for telecommunications services.	4647.4	BE-22 Survey: Annual Survey of Selected Services Transactions with Unaffiliated Foreign Persons
MG22D	Computer and data processing services: Payments from U.S. residents to foreign residents for computer and data processing services, including customer computer programming and support services, computer system integrators, and other computer related services.	1525.0	BE-22 Survey: Annual Survey of Selected Services Transactions with Unaffiliated Foreign Persons
MG22E	Database and other information systems services: Payments from U.S. residents to foreign residents for database, information systems, and other computer related services.	248.0	BE-22 Survey: Annual Survey of Selected Services Transactions with Unaffiliated Foreign Persons
MG22F	Management consulting and public relations services: Payments from U.S. residents to foreign residents for administrative and general management consulting services and public relations services.	898.0	BE-22 Survey: Annual Survey of Selected Services Transactions with Unaffiliated Foreign Persons

Table 7.B Services Imports: Categories and Sources (Page 5 of 7)

INPUT CATEGORY	DESCRIPTION	2002	SOURCE
MG22G	Research, development, commercial testing, and lab services: Payments from U.S. residents to foreign residents for research and development services in the physical, engineering, and life sciences and for laboratory testing services.	911.0	BE-22 Survey: Annual Survey of Selected Services Transactions with Unaffiliated Foreign Persons
MG22H	Miscellaneous disbursements: Payments from U.S. residents to foreign residents for miscellaneous services, including administrative and general management consulting services and public relations services.	1538.3	BE-22 Survey: Annual Survey of Selected Services Transactions with Unaffiliated Foreign Persons
MG22J	Advertising: Payments from U.S. residents to foreign residents for advertising services.	828.0	BE-22 Survey: Annual Survey of Selected Services Transactions with Unaffiliated Foreign Persons
MG22K	Legal services: Payments from U.S. residents to foreign residents for services of lawyers' offices.	780.0	BE-22 Survey: Annual Survey of Selected Services Transactions with Unaffiliated Foreign Persons
MG22L	Architecture, engineering (including industrial engineering), and other technological services: Payments from U.S. residents to foreign residents for engineering, architectural, landscaping, and surveying and mapping (both nongeophysical and geophysical) services.	559.0	BE-22 Survey: Annual Survey of Selected Services Transactions with Unaffiliated Foreign Persons
MG22M	Accounting, auditing, and bookkeeping services: Payments from U.S. residents to foreign residents for payroll services, public accountant services, and other accounting services.	468.0	BE-22 Survey: Annual Survey of Selected Services Transactions with Unaffiliated Foreign Persons
MG22N	Sports and performing arts: Payments from U.S. residents to foreign residents for entertainment services provided by theater, performing arts (excluding circuses) and dance companies, musical groups and artists, sports teams and clubs, professional athletes, promoters of arts, sports, and similar events.	159.0	BE-22 Survey: Annual Survey of Selected Services Transactions with Unaffiliated Foreign Persons
MG22P	Training services: Payments from U.S. residents to foreigners for educational or training services provided on a contract basis, including fees for distance learning technologies using the internet and excluding services provided by higher education where the student attends the institution and excluding training done by corporations in connection with a sale of a good.	325.0	BE-22 Survey: Annual Survey of Selected Services Transactions with Unaffiliated Foreign Persons

Table 7.B Services Imports: Categories and Sources (Page 6 of 7)

INPUT CATEGORY	DESCRIPTION	2002	SOURCE
MG22Q	Installation, maintenance, and repair of equipment: Payments from U.S. residents to foreign residents for installation, maintenance, and repair of equipment—including auxiliary truck transportation, warehousing, and data-processing-services equipment.	668.0	BE-22 Survey: Annual Survey of Selected Services Transactions with Unaffiliated Foreign Persons
MG22R	Operational leasing: Payments from U.S. residents to foreign residents for services—including commercial ships and barges rental and leasing (without crew), railroad-car rental and leasing (without operators), aircraft rental and leasing (without pilots), computer and computer peripheral equipment rental and leasing (without operators), and passenger cars, trucks, SUVs, and vans (without drivers).	181.0	BE-22 Survey: Annual Survey of Selected Services Transactions with Unaffiliated Foreign Persons
MG22S	Lease rights to natural resources: Royalty payments from U.S. residents to foreign residents for the rights to lease natural resources in other countries, such as oil and mining resources.	1.0	BE-22 Survey: Annual Survey of Selected Services Transactions with Unaffiliated Foreign Persons
MG22T	Other business, professional, and technical services: Payments from U.S. residents to foreign residents for various services. (See input category XG22T for a list of types of services.)	229.0	BE-22 Survey: Annual Survey of Selected Services Transactions with Unaffiliated Foreign Persons
MG22U	Trade-related services: Payments from U.S. residents to foreign residents for trade-related services—excluding merchandising services but including payments from U.S. residents to foreign residents for auction services (including online), transaction fees for business-to-business exchanges conducted over the Internet, and commissions or "finders fees" to independent sales agents.	45.0	BE-22 Survey: Annual Survey of Selected Services Transactions with Unaffiliated Foreign Persons
MH01	U.S. Government payments for miscellaneous services: Payments from the U.S. Government to foreign residents for miscellaneous services, including foreign post office services and air mail transportation.	2920.0	U.S. Postal Service
MB07	Direct defense expenditures per I-O\NIPA territorial adjustment.	466.3	U.S. Government nonmilitary agencies Income tax returns withholdings, Overseas offices of U.S. Banks Puerto Rico ITA
MC02	Travel by U.S. residents in Puerto Rico and on Puerto Rican cruise ships, less Puerto Rican resident travel in foreign countries per I-O\NIPA territorial adjustment.	1036.0	Puerto Rico ITA

Table 7.B Services Imports: Categories and Sources (Page 7 of 7)

INPUT CATEGORY	DESCRIPTION	2002	SOURCE
MD03	Passenger fares per I-O\NIPA territorial adjustment	-633.0	Puerto Rico ITA
ME118	Other transportation per I-O\NIPA territorial adjustment. Water freight purchases by U.S. residents in Puerto Rico.	2.5	Puerto Rico ITA
ME214	Port expenditures per I-O\NIPA territorial adjustment: Water port and airport expenditures by U.S. carriers in Puerto Rico.	1653.5	Puerto Rico ITA
MF102	Royalties and license fees payments to affiliated foreigners per I-O\NIPA territorial adjustment.	22.7	Puerto Rico ITA
MF202	Royalties and license fees payments to unaffiliated foreigners per I-O\NIPA territorial adjustment.	8.3	Puerto Rico ITA
MG13	Rental payments to affiliated foreigners for the use of tangible property per I-O\NIPA territorial adjustment.	0.0	Puerto Rico ITA
MG15	Other private services payments to affiliated foreigners per I-O\NIPA territorial adjustment.	0.0	Puerto Rico ITA
MG222	Other private services payments to unaffiliated foreigners per I-O\NIPA territorial adjustment.	1236.8	Puerto Rico ITA
MH04	U.S. Government payments to foreign residents for post office services per NIPA\I-O territorial adjustment.	1511.9	Puerto Rico ITA

APPENDIX TO CHAPTER 7

Nonmonetary Gold in the National Income and Product Accounts

As stated in this chapter, gold is afforded special treatment in transiting from the international transactions accounts (ITA) measures of exports and imports to those used in the national income and product accounts (NIPAs) and the input-output (I-O) accounts. Specifically, gold is removed from both exports and imports, and *NIPA gold* is added back to net exports. This appendix explains the need for these adjustments and describes the sources and methods used.

Need for the gold adjustments

The current methodology was implemented in 1979 and was described in "Gold in the NIPA's," a note on pages 4-7 in the July 1979 issue of the *Survey of Current Business*, from which much of this appendix has been adapted. A number of legal and institutional changes that occurred in the mid-1970s rendered the previous treatment of gold inadequate: Beginning in 1975, U.S. citizens have been allowed to own gold; beginning in 1976, the International Monetary Fund began to sell gold; and beginning in 1978, the U.S. Treasury has sold gold to help stabilize the value of the dollar in foreign exchange markets.[19] The major impetus for adopting the new treatment was the recognition that the previous treatment was distorting the measurement of gross domestic product (GDP). Purchases of gold by households was not included in personal consumption expenditures (PCE), but the production of gold was properly reflected in income (for example, in profits and wages), thus contributing to the NIPA statistical discrepancy.

Changes in U.S.-owned official reserves of monetary gold located outside the United States are included in the capital and financial account of the ITAs.[20] Exports and imports of nonmonetary gold—such as inputs for the manufacture of jewelry, specialty coins, and medals, and electronics and dental applications—are included in the ITA current account. Thus, to the extent that the purchase of nonmonetary gold is viewed as an investment, the transaction may distort net goods exports, potentially distorting the value of domestic output for GDP. Similarly, the inclusion of nonmonetary gold in other NIPA and I-O final-use categories may distort their accuracy.

The following are some examples of the possible distortions of treating gold as a typical commodity: (1) Households probably consider purchases of gold as a form of investment, so that including gold in PCE could distort the analysis of consumption and saving; (2) if the sale of gold by banks is registered as a decrease

[19] In subsequent revisions of the NIPAs, the new treatment has been carried back to 1967, the earliest year for which detailed NIPA estimates of exports and imports of goods are available.

[20] Since the late 1970s, changes in U.S. official reserves of gold located outside the United States have been zero because all U.S. Treasury-owned gold has been held in the United States.

in inventories, the usual type of inventory analysis could be distorted; and (3) treating the purchase of gold by the Federal Government as government consumption might impair the usefulness of the surplus or deficit for fiscal impact analysis. The concept of investment discussed here is broader than the NIPA and I-O concepts, which cover fixed assets (structures, equipment, software) that are used in production over a period of years and inventories. Under the broader concept, the investment asset represents a store of value from which the owner can derive economic benefits by holding or using it.[21]

NIPA gold adjustment

BEA uses a solution that largely maintains the integrity of the final-use categories. This treatment consists of recording exports and imports of gold as well as all changes in inventories of mined and reclaimed gold, other than for industrial use, as a single entry in net exports. In order to improve the measurement of GDP and to eliminate the effect of gold on the statistical discrepancy, GDP for gold is estimated as the gross income associated with gold production. The demand for production of gold for domestic industrial use is then subtracted from GDP gold leaving NIPA gold, which is recorded as a single entry in net exports and replaces the ITA measures of exports and imports. Placing all changes in gold inventories held in the United States, other than for industrial use, in net exports is tantamount to treating the stock of gold to which these changes give rise as part of the foreign sector.

Under this treatment, PCE is not distorted by the inclusion of gold along with consumption commodities, the change in private inventories includes only gold for industrial use, and government transactions in gold are not counted in measuring the surplus or deficit. However, the inclusion of any entry for gold in exports and imports is not strictly appropriate for analyses of international competitiveness. On the other hand, if the net values involved remain small and stable, this treatment will not significantly affect such analyses.

Sources and methods

These adjustments are implemented by estimating two aggregates for gold. The two aggregates and the specific data sources used are the following:

- Gross domestic income (GDI) gold: Sum of mine and secondary gold production estimates provided by the U.S. Geological Survey's *Mineral Industry Surveys—Precious Metals*.
- Fabrication demand for gold: Calculated using data provided by Gold Fields Mineral Services. This estimate of fabrication demand measures the amount of gold demanded for production into end-use

[21] See the *System of National Accounts 1993*, by the Inter-Secretariat Working Group for the National Accounts (Commission for the European Communities, International Monetary Fund, Organization for Economic Co-operation and Development, United Nations, and World Bank): 217.

products, such as jewelry, specialty coins, and medals, and electronics and dental applications. It is not a measure of actual sales or shipments of these end-use goods, but rather the value of gold used in their production.

Next, GDP for gold is set as the value for GDI, and NIPA gold, calculated as GDP for gold less fabrication demand, is entered as net exports. Because U.S. production historically has not been sufficient to satisfy the demand for industrial uses, we follow the convention of setting exports to zero and entering the adjustment as an import (in the NIPAs with the opposite sign of net exports, in the I-O with the same sign as net exports).

The example below summarizes the NIPA gold adjustment (millions of dollars, hypothetical values):

1. Gross domestic income, gold (estimated from data source)	70
2. Gross domestic product, gold (= line 1)	70
3. Fabrication demand for gold (estimated from data source)	90
4. NIPA gold (line 2 less line 3)	-20
5. ITA net exports, gold (line 6 plus line 7)	-40
6. ITA exports, gold	5
7. ITA imports, gold	-45
Recording of gold in NIPAs	
8. Net exports, gold (line 9 less line 10)	-20
9. Exports, gold	0
10. Imports, gold	20
Recording of gold in I-O final uses	
11. Net exports, gold (line 12 plus line 13)	-20
12. Exports, gold	0
13. Imports, gold	-20

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CHAPTER 8: COMMODITY TAXES, TRANSPORTATION COSTS, AND WHOLESALE AND RETAIL MARGINS

Commodity taxes, transportation costs, and wholesale and retail trade margins measure critical links between the producer and the user of a commodity. This chapter describes how these charges are treated in the input-output use table. It summarizes and illustrates the principal steps for preparing each of these types of charges, and it provides some guidelines for evaluating the estimates. Definitions of some key terms are provided at the end of the chapter.

As noted in Chapter 5, "Output" and Chapter 6, "Transactions," commodity taxes, transportation costs, and wholesale and retail trade margins require special treatment in the input-output (I-O) accounts in order to ensure that output is properly measured and that transactions are properly valued. Margins and transportation costs are treated as separate commodities in the use table. Commodity taxes, because they are part of the producers' value of output, are not shown explicitly in the use table.

In the economy, commodities generally move from the producer or importer through a wholesaler and then to the purchaser (and in the case of consumer goods, through a retailer and then to the purchaser) and are usually carried by some mode of transportation. In the I-O accounts, transactions show the direct flow of commodities to users, but the associated information on the flows of goods through transportation and trade channels is also recorded as part of each transaction. However, the detailed information necessary to link the transport costs and the wholesaling and retailing costs to specific transactions is generally not available, so we have developed a methodology that allows us to distribute these costs across various types of transactions.

Commodity taxes, transportation costs, and trade margins in the use table

Commodity taxes—which consist of sales and excise taxes—are part of commodity output and are included in the producers' value of transactions. These taxes are included in producers' prices because they are collected by the producer and are paid by the purchaser. Because the use table shows all transactions in producers' prices, commodity taxes are not shown separately. Commodity taxes are collected from purchasers by businesses on the behalf of government and so, in business accounting, they do not represent a direct business expense of the firm. Thus, they differ from some of the other types of taxes, such as property taxes, that constitute a direct business expense. In the I-O use table, all of these taxes are included in the row "taxes on production and imports less subsidies."

Transportation costs—the costs of transporting goods by rail, truck, water, air, liquid pipelines, and gas pipelines—are included in the commodity rows for transportation. These costs represent the total purchases of the respective transpor-

tation cost by the industry or final user for all goods purchased. For example, the cell in the use table that is at the intersection of the row for the rail commodity and of the industry column for coal includes the total cost of rail transportation for all goods purchased by the coal industry—such as fuel, chemicals, and machinery parts. In addition to these transportation costs for goods used, the commodity rows for transportation include the transportation costs for direct purchases of services. For example, the use-table row for the commodity "rail transport" includes both rail freight (a transportation cost) and rail fares (a transportation service purchased by business and consumers).

Trade margins—the costs of marketing goods between producers and final purchasers—are included in the commodity rows for wholesale and retail trade. They consist of the wholesalers' or retailers' margins in basic prices plus any applicable sales and excise taxes. The margins shown in the commodity rows represent the total margin included in all of the goods purchased by the industry or final user. For example, the use-table cell where the wholesale commodity intersects with the coal-industry column consists of the sum of all wholesale margins on goods purchased by the coal industry—that is, the margins on fuel, chemicals, machinery parts, and all other goods—plus purchases of wholesale output that is not margin.

Estimation

In general, commodity taxes, transportation costs, and trade margins are estimated as part of the output controls discussed in chapter 5. The transportation costs and margin commodity output values are distributed to industries and final uses by associating the output to commodity supply, calculating a rate, and applying that rate to the "firm value" of the transaction (either the basic value, purchasers' value through wholesale, or purchasers' value). The following are the general rules for assigning taxes, transportation costs, and trade margins to transactions.

- Transport costs and margins generally apply only to goods. However, some also apply to services, such as software, where the retailer includes a markup.
- The application of taxes, transport costs, or margins is always specific to the item sold and to the user of the item. Thus, they are not applied to transactions involving items that are exempt from taxes or do not move through transportation or trade channels.
- Imports at their domestic port values do not include taxes, transportation costs, or margins.[1]
- Finished-product and work-in-process inventories do not include taxes, transportation costs, or margins.

[1] Aside from any customs duties, the value of the import at point of importation is not taxed (see Chapter 7, "Foreign Trade Transactions"). Rather, taxes are collected as the goods move from the point of importation to the user.

Commodity taxes

Commodity taxes are collected as part of the transaction and are included in the estimation of item output. Sales taxes and Federal excise taxes are primary examples of these types of commodity taxes. The sources and estimation methods are included in each industry's documentation. Table 8.A at the end of this chapter lists the major commodity taxes and the industries where the taxes are collected.

Commodity taxes are included in the output of the industry that is responsible for collecting the tax and for passing the tax receipts to the government. For excise taxes, the industry collecting the tax is usually the industry producing the primary product being taxed, and the excise tax included in output is the tax levied on the entire supply of the item, not just on the domestic production of the item.[2] For example, the excise tax on liquor, which is included in the measure of the output of the liquor industry, includes Federal excise taxes collected both on the domestic production and on imports of liquor.

For all commodity taxes except customs duties, the tax rates for each item are calculated by taking the total tax collected and dividing it by the domestic supply of the item adjusted to exclude transactions that are exempt from commodity taxes. The rate is then applied to all transactions for items that are subject to tax.

Customs duties on imports are also considered commodity taxes, but they require special treatment. For imports by commodity, these duties are included in the domestic port value of imports by commodity, which is the basis for valuing imported goods transactions.[3] The source for the customs duties on imports is Census Bureau's data on trade in goods. (For more information on the treatment of customs duties, see Chapter 7, "Foreign Trade Transactions.")

Transportation costs

Total transportation costs by mode of transportation are estimated as part of the development of output controls.[4] The costs are first distributed to commodities, then the costs are distributed to items and rates are calculated, and then those rates are applied to transactions.

Transportation costs by mode are distributed to commodities based on the proportion of total transportation receipts derived from moving the particular com-

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[2] In the tax database for BEA's Regional Economic Analysis Division (READ), all taxes are assigned where collected, whereas in the I-O accounts, taxes are shown in the industry where the product is primary. For example, in the READ database, the tax on liquor produced in the United States is included in alcoholic beverage manufacturers, and the tax on imported liquor is included in wholesale trade. In the I-O accounts, all of the tax is included in alcoholic beverage manufacturing.

[3] Beginning with the 2002 benchmark accounts, duty on imports will be shown separately in the database. This change is in preparation for conversion to show I-O tables in basic prices, as recommended in the1993 SNA.

[4] The specific modes to be distributed to transactions are identified in the I-O database—the table names are "item," which contains the type of margin identifier, and "martype," which contains the names for the different transportation modes. These tables specifically identify the output controls that are transportation costs.

modity. The most comprehensive data source available is the Census Bureau's Commodity Flow Survey (see Chapter 3, "Data Sources"). This survey shows the ton-miles shipped and the value of the goods shipped by rail, truck, water, air, and pipeline, but it does not show the shipping revenue by type of commodity.[5] Thus, we begin by assuming that the revenue received from shipping each ton of goods is consistent among the different types of commodities.[6] The revenue is then distributed to items using the value of domestic supply of goods as a supplement to the limited detail provided in the Commodity Flow Survey. We use the supply of the item excluding any transactions that are not subject to transportation costs.

The following summarizes the principal steps in estimating and allocating transportation costs:

(1) Distribute the transportation cost to commodities.

(2) For each commodity, a distribution proportion for each item of that commodity is calculated as the interim supply of the item less the value of transactions not using transportation divided by the interim supply of the commodity less the value of transactions not using transportation.

(3) The total transportation cost for each commodity is allocated to its items by multiplying this cost by the distribution proportion for each item.

(4) Rates for each mode of transportation used for the commodity are calculated by dividing the transport cost for that mode by the total value of transactions receiving transport costs.

(5) For each item, the rates for each mode are applied to all transactions using that mode of transportation.[7]

The following simplified example illustrates each step in the methodology. In the example, there are three transportation modes—rail, truck, and air—and annual revenues (in millions of dollars) for moving goods *within the country* from producers and importers to users. The total revenue by mode is the following: Rail, $1,000; truck, $2,500; and air, $200.

(1) There are six commodities, four of which use transportation to move goods. The freight revenue by mode is distributed to these commodities using fac-

[5] The Service Annual Survey now collects annual data on trucking revenue by broad commodity group, which are used by the annual I-O accounts. Data on rail revenue by commodity are available from the Association of American Railroads.

[6] Transportation rates are not determined solely by weight. Other factors—such as size, ease of transport, and distance traveled—also affect the transport cost. Unfortunately, sufficient data are not available for refining the distributions to take account of these factors.

[7] The rate for all transactions within a commodity will be the same. Transportation costs are distributed to items and the unallocated transportation costs by item are calculated and distributed during the balancing process (see Chapter 11, "Final Review and Balancing").

tors developed from source data (table 8.1). Note that although four commodities use transportation, not every mode of transportation is used for each commodity.

Table 8.1 Simplified Example of the Costs of Transportation

COMMODITY	RAIL	TRUCK	AIR
I	100	200	0
II	300	600	0
III	400	1,000	80
IV	200	700	120
V	0	0	0
VI	0	0	0
TOTAL	**1,000**	**2,500**	**200**

(2) Table 8.2 shows the calculation of the factors used to distribute transportation costs by commodity to items for commodity III. In this example, commodity III consists of four items (A through D), the first three of which are designated to receive transportation costs. For example, for item A, the factor is 10,500/28,700=.366.

Table 8.2 Distribution of Commodity III Transportation Cost by Item

ITEM	ITEM DESIGNATED TO RECEIVE TRANSPORTATION COSTS	OUTPUT A	IMPORTS B	INTERIM SUPPLY (A+B) C	TRANSACTIONS NOT USING TRANSPORTATION D	TRANSACTIONS WITH TRANSPORT COSTS (C-D) E	DISTRIBUTION PROPORTION (E/SUM OF E) F
A	Y	5,000	6,000	11,000	500	10,500	.366
B	Y	2,000	500	2,500	300	2,200	.077
C	Y	15,000	2,000	17,000	1,000	16,000	.557
D	N	3,000	0	3,000	3,000	0	0
TOTAL	**…**	**25,000**	**8,500**	**33,500**	**4,800**	**28,700**	**1.000**

(3) As shown in table 8.3, the transportation costs for commodity III from table 8.1 are distributed to items A-D using the proportions calculated in column F of table 8.2. For example, for item A for rail transport, the cost is 400*.366=146.

(4) The rates of each mode of transportation are calculated by dividing the transport cost by the total value of transactions receiving transport costs. For example, the rate for rail transport is 400/28,700=.014.

Table 8.3 Transportation Costs and Rates for Commodity III

ITEM	TRANSACTIONS WITH TRANSPORT COSTS	DISTRIBUTION PROPORTION	RAIL		TRUCK		AIR	
			TRANSPORT COST	RATE	TRANSPORT COST	RATE	TRANSPORT COST	RATE
TOTAL	**28,700**	**1.000**	**400**	**.014**	**1,000**	**.035**	**80**	**.003**
A	10,500	.366	146		366		29	
B	2,200	.077	31		77		6	
C	16,000	.557	223		557		45	
D	0	0	0		0		0	

(5) These rates are then applied to all the item transactions using each mode of transportation.

Wholesale trade margins and taxes

The wholesale industry is made up of several types of wholesalers: Merchant, agents and brokers, and manufacturers' sales offices and branches. In the I-O accounts, the outputs of merchant wholesalers and of agents and brokers (on own-account) and the expenses of manufacturers' sales branches are treated as wholesale margin. In contrast, the commission sales of merchant wholesalers and of agents and brokers and the expenses of manufacturers' sales offices are treated as services that are sold directly to the user of these wholesaler services.[8]

Wholesale margins and taxes are estimated as part of the development of output controls.[9] Wholesale taxes consist of sales taxes and "other wholesale taxes" (the latter are listed in table 8.B). The Economic Census for wholesale trade provides data on sales, on costs of purchases, and on inventory, and the Annual Trade Survey (ATS) provides data on the cost of purchases, sales taxes, and inventory for most North American Industry Classification System (NAICS) industries in the wholesale sector.[10] In these sources, specific wholesale industries are referred to as "kinds of business" (KBs). The Economic Census also provides data on sales by wholesale product line for each KB; the Census Bureau's product lines approximate groupings of NAICS products.[11] The product-line receipts data cover sales of both goods and services, and these two categories are distinguished on the

[8] In the 1997 North American Industry Classification System (NAICS), all wholesalers were classified together, but in the 2002 NAICS, merchant wholesalers are separated from nonmerchant wholesalers. Merchant wholesalers includes manufacturers' sales branches and offices, while nonmerchant wholesalers includes agents and brokers and e-commerce wholesalers.

[9] Items that are wholesale margins or taxes can be identified in the database using the "Martype" identifier found in the database tables "item" and "martype."

[10] Although both sources provide data to calculate margins, it is not clear which source provides the better measure to use. Previous I-O benchmarks have not been consistent about the proper source, and further research is required. Although the Economic Census may be the best measure for margins, the I-O inventory estimates need to be consistent with those in the NIPAs, which are based on the ATS.

[11] Beginning with the 2002 Economic Census, "product lines" is the name used to refer to sales by type of product for wholesalers. Previously, these data were referred to as "commodity lines."

basis of their product line. Table 8.C shows a sample of these product lines. Each KB sells multiple product lines. However, one line is the primary product-line for a KB; for example, the primary product line for clothing wholesalers is clothing.

Margins and taxes are distributed to I-O commodities using the Census Bureau product-line sales data. Wholesaler markups vary from commodity to commodity. In the absence of actual margin rates for each product line, we make two key assumptions: The margin rate charged for a product line will be similar across all KBs, and the margin rate of the primary wholesaler of the good represents the best available measure of the margin rate for this product line. For example, the margin rate for footwear wholesalers is applicable to product-line sales of footwear by all wholesalers. In I-O nomenclature, this margin rate is referred to as the most appropriate kind of business (MAKB) margin rate.

The initial approximations of the margin rates for each KB are calculated by dividing the margin value from the output controls by the sum of commodity sales by the KB (total product-line sales less receipts for services).[12] After applying the MAKB margin rates to each product line, the calculated margins for each KB are scaled to the output control margins. Margins for secondary products (including redefinitions) are then added to assigned product lines.[13]

The following summarizes the principal steps in estimating and allocating wholesale margins:

(1) The margin on sales for each product line sold by a KB is calculated by multiplying the product-line sales by the margin rate for the KB that is the primary wholesaler of that product line.

(2) Within each KB, the calculated margin for each product line is proportionately scaled up or down so that the sum of the product-line margins for the KB is equal to the total margin for that KB.

(3) Any “secondary margins” are added to yield a total margin for each product line.

(4) The product-line margins are distributed to I-O commodities using the interim supply of the commodities as weights.

(5) The margin for each commodity is distributed to the items composing that commodity using interim supply less the sum of transactions not receiving wholesale as weights.

(6) Margin rates for each item are calculated by dividing the margin for that item by the interim supply less the sum of transactions not receiving wholesale margin.

(7) For each item, the margin rate is applied to all transactions receiving wholesale margin.

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[12] There must be a separate item control for margin for each KB in the product-line sales data.

[13] “Redefinitions” involve the reassigning of the output of a secondary product of the industry that produced it to the industry where the product is primary (see Chapter 4, “Classification and Secondary Products”).

Tables 8.4-8.10 provide a simplified example of these steps for wholesale trade. Table 8.4 shows the sales, margins, and primary product line for each of the three example KBs.

Table 8.4 Wholesale Sales and Margins by KB

KB	SALES	MARGIN	MARGIN RATE	PRIMARY PRODUCT LINE
A	5000	2000	.40	1
B	1000	500	.50	5
C	3000	2000	.67	9

(1) The first two columns of table 8.5 show the product-line sales for KB A (of KB A's total sales of 5,000, we assume that 3,500 was of primary product-line 1, etc.). The margin on sales is calculated by multiplying the product-line sales by the most appropriate margin rate. For example, for product-line 5, the most appropriate rate is that of KB B (.50), because 5 is its primary product line.

Table 8.5 Calculated Wholesale Margin by Commodity for KB A

PRODUCT LINE	SALES	MOST APPROPRIATE KB FOR MARGIN RATE	MARGIN RATE	CALCULATED MARGIN
1	3500	A	.40	1400
5	1000	B	.50	500
9	500	C	.67	335
TOTAL	**5000**			**2235**

(2) After applying the MAKB margin rates to each product line, the sum of the calculated margin for each KB will not equal the output control for margin on that KB. Thus, the calculated margin for each product line must be adjusted proportionally up or down so that the sum of the margin by product line equals the total margin for the KB. This process results in margins for each product line by each KB that are consistent with our output controls for wholesale trade. For KB A, the sum of the calculated margin is 2,235 (from table 8.5), which is higher than 2,000, the total margin for KB A (from table 8.4). So, as shown in table 8.6, the calculated margin is scaled down to equal the total margin.

Table 8.6 Wholesale Margins Adjusted to KB Totals

PRODUCT LINE	SALES	CALCULATED MARGIN	ADJUSTMENT FACTOR	ADJUSTED MARGIN
1	3500	1400	2000/2235	1253
5	1000	500	2000/2235	447
9	500	335	2000/2235	300
TOTAL	**5000**	**2235**		**2000**

(3) The adjusted product-line margin for all KBs is summed together with the margins associated with redefinitions. For example, as shown in table 8.7, the total margin for product-line 1 is 1,796. It is derived as the sum of the product-line 1 margins for KBs A, B, and C plus a redefined margin of 10.

Table 8.7 Product-Line Margin from All KBs and Redefinitions

PRODUCT LINE	MARGIN BY KB			REDEFINED MARGIN	TOTAL MARGIN
	A	B	C		
1	1253	133	400	10	1796
5	447	250	236	140	1073
9	300	117	1364	55	1836
TOTAL	**2000**	**500**	**2000**	**205**	**4705**

(4) Census wholesale product lines are generally more aggregated than I-O commodities; consequently, we must build a concordance that shows the I-O commodities that are likely to be included in the Census wholesale product lines (also, an I-O commodity can be included in more than one Census product line). The Census product-line margin is distributed to I-O commodities using as weights output plus imports (interim supply).[14] Table 8.8 shows the calculation of the weights used for the distribution of wholesale product-line 1 among three I-O commodities. For commodity 0110, the distribution weight for commodity 0110 (15,950) divided by the total distribution weight (28,455) equals the margin distribution factor (0.56). This factor times the total margin for product-line 1 from table 8.7 (1,796) equals the margin distributed to commodity 0110 (1,007).

Table 8.8 Distribution of Product-Line-1 Margin to I-O Commodities

COMMODITY	OUTPUT	IMPORTS	DISTRIBUTION WEIGHT (A + B)	MARGIN DISTRIBUTION FACTOR	DISTRIBUTED MARGIN (D*1796)
	A	B	C	D	E
0110	13950	2000	15950	0.56	1007
0120	6505	4000	10505	0.37	663
0130	1500	500	2000	0.07	126
TOTAL	**21955**	**6500**	**28455**		**1796**

The distribution of margins to commodities is done for each wholesale product line. The margins distributed to commodities are then summed by com-

[14] For the 1992 and earlier tables, data on manufacturing sales by class of customer was used to estimate the portion of manufacturing output that flows through merchant wholesalers, but these data are no longer available.

modity. In table 8.9, wholesale product lines 1 and 5 are distributed to commodities 0110, 0120, and 0130.

Table 8.9 Sum of Distributed Margins by Commodity

COMMODITY	PRODUCT LINE		TOTAL WHOLESALE MARGIN
	1	5	
0110	1007	565	1572
0120	663	0	663
0130	126	508	634
TOTAL	**1796**	**1073**	**2869**

(5) Margins by commodity are distributed to items receiving margin using "interim supply less the sum of transactions not receiving wholesale margin" as the weighting factor. In table 8.10, the total margin for commodity 0110 from table 8.9 (1,572) is distributed to three items. Item 01101 receives 60 percent of the margin (939) and item 01102 receives 40 percent (633). Item 01103 receives no margin because all of the transactions involving this item receive no wholesale margin.

(6) Margin rates are calculated by dividing the margin for each item by the interim supply less transactions not receiving wholesale margin. Note that the margin rate (0.10) is the same for all items receiving margin.

Table 8.10 Distribution of Margin to Items in Commodity 0110

ITEM	INTERIM SUPPLY A	TRANSACTIONS NOT RECEIVING WHOLESALE MARGIN B	DISTRIBUTION WEIGHT (A-B) C	DISTRIBUTION FACTOR D	DISTRIBUTED MARGIN (D * 1572) E	MARGIN RATE (E/C) F
01101	9566	100	9466	0.60	939	0.10
01102	6384	0	6384	0.40	633	0.10
01103	400	400	0	0.00	0	
	15950	500	15850		1572	

(7) The item wholesale rates are then applied to all transactions that receive wholesale margin.

"Other wholesale taxes" are distributed directly to items (see table 8.D for a concordance that assigns wholesale taxes to items receiving the tax). Rates are calculated for each item by dividing the tax by the interim supply less the transactions that do not receive these taxes. The rates are applied to all transactions that receive other wholesale taxes.

Retail trade margins and taxes

Retail margins and taxes are estimated as part of the development of the output controls.[15] The Economic Census for retail trade provides data on total

retail sales by KB (either a NAICS industry or an aggregation of NAICS industries) and on retail sales by product line.[16] The Annual Retail Trade Survey provides data on the cost of purchases, sales taxes, and inventories; these data are adjusted by the Census Bureau to be consistent with the sales data collected in the Economic Census.

The allocation of retail margins and taxes to product lines is very similar to that for wholesale trade. However, retail margins are distributed to only those transactions that move through retail establishments, so they are not distributed as widely to transactions as wholesale margins. Therefore, beginning with the step in the methodology where the margins are distributed to transactions, the methodology for retail trade differs from that described above for wholesale trade. Once retail margins are assigned to product lines, they are distributed directly to a select group of transactions. In contrast, wholesale margins are first distributed to items and then to most of the transactions within those items.

Separate controls are developed for each KB where data on sales, cost of purchases, and product-line sales are available. Retail trade uses a Census Bureau classification that groups commodities sold by retailers into a standard set of product lines across all retail establishments. These product-line sales are collected as part of the Economic Census and are available for each retail KB (see table 8.E for a sample list of product lines.) It is essential that there is a one-to-one match between the controls and the KB level of detail used for product-line sales. Separate controls are developed for "other retail taxes" (see table 8.F). These special retail taxes are distributed directly to the transactions to which the tax is applicable.

The product-line sales data include receipts for both goods and services. Before using these data to distribute the retail margin, the services-receipts lines must be removed from the data files; this separation is based on the product-line descriptions. The services-receipts lines are used during the development of the controls to estimate the secondary products of retail trade.

Retail margins and sales taxes from the controls are distributed to product lines based on the following two assumptions: Margin rates on product lines are similar wherever sold (for example, the margin rate on motor oil sold by auto parts stores is similar to the rate on motor oil sold by grocery stores), and the margin on all product lines sold by a KB is equal to the total margin for that KB. First, margin rates for each KB are calculated (retail margin from the controls divided by total product-line sales excluding receipts for services). These rates are matched to appropriate product lines. For example, the margin rate for meat market stores (a KB) is applied to product-line 101 meat, fish, and poultry sales in each KB where these sales appear. The calculated margins on sales by each KB are then adjusted so that the sum of margins by product line is equal to the total margin for each KB.

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[15] Items that are retail margins or taxes can be identified in the database using the "Martype" identifier found in the database tables "item" and "martype."

[16] Beginning with the 2002 Economic Census, "product lines" is the name used to refer to sales by type of product for retailers. Previously, these data were referred to as "merchandise lines."

The level of detail for product-line sales varies by KB. Where the KB is the primary seller of a product line, the product-line detail is greater (for example, grocery stores show product lines for several different categories of food—such as meat, produce, and frozen foods). However, KBs that are not the primary seller show a more aggregated product line (for example, gasoline service stations show food sales using only the product-line "groceries").[17]

As stated earlier, after retail margin is assigned to product lines, it is distributed directly to selected transactions. These selected transactions are identified by analysts as moving through retail establishments to consumers or to business. The distribution is accomplished by means of *retail category codes* (RCCs) that link transactions to product lines (see table 8.G). Product lines are grouped into RCCs, which are then distributed to transactions having those RCCs.[18]

The following summarizes the principal steps in estimating and allocating retail margins (the first two steps are the same as those for wholesale trade):

(1) The margin on sales for each product line sold by a KB is calculated by multiplying the product-line sales by the margin rate for the KB that is the primary retailer of that product line.

(2) The calculated margin for each product line is proportionately scaled up or down so that the sum of the product-line margins for the KB is equal to the total margin for that KB.

(3) The product-line margins are aggregated into margins by retail category.

(4) Any "redefined margins" are added to yield a total margin for each retail category.

(5) The transactions receiving retail margin are assigned to the appropriate retail category.

(6) The transactions are summed for each retail category, with the PCE and non-PCE transactions being kept separate.

(7) The margins for each retail category are allocated to the PCE and non-PCE transactions using percentages based on data on sales by class of customer.

(8) Margin rates are calculated separately for the PCE and non-PCE transactions for each retail category.

(9) For each transaction, the appropriate margin rate is applied to that transaction.

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[17] Currently, we do not split these aggregated product lines except where more detail is required for distribution to detailed retail categories.

[18] In the past, RCCs were aligned with PCE categories. However, in 1997, the PCE categories in the NIPAs were expanded to show more detail, but because of the lack of good estimates of margin rates by product line, we were not able expand the level of detail of the RCCs to match this expansion.

The following simplified example of the distribution of margins for retail trade builds on the earlier example for wholesale trade. Steps (1) and (2) are the same for retail trade as they are for wholesale trade (see tables 8.4-8.6). This example picks up after the calculation of adjusted margin on each product line (table 8.6), the point at which the wholesale and retail methods begin to differ.

(3) The retail margins are aggregated into retail categories. In table 8.11, product-lines 1 and 5 are assigned to retail category X1, and product-line 9 is assigned to retail category X2 (the retail margins shown in column 3 are from table 8.6).

(4) Additionally, retail margin originating in other industries (that is, "redefined-in retail margin") is added to the total retail margin by category.

Table 8.11 Retail Product Lines by Retail Category

PRODUCT LINE	RETAIL CATEGORY	RETAIL MARGIN	REDEFINED-IN RETAIL MARGIN	TOTAL RETAIL MARGIN
1	X1	1253	20	1273
5	X1	447	10	457
9	X2	300	0	300

(5) Table 8.12 shows the total retail margins that are to be distributed for retail categories X1 and X2. For category X1, the total margin (1,730) is the sum of the margins for product-lines 1 (1,273) and 5 (457) from table 8.11.

Table 8.12 Retail Margin by Retail Category

RETAIL CATEGORY	MARGIN
X1	1730
X2	300

In our example, table 8.13 shows the six transactions for which the appropriate retail margins need to be calculated. The value (purchasers' value through wholesale) of the first transaction is 4,000.

Table 8.13 Transactions Receiving Retail Margin

COMMODITY	INDUSTRY	RETAIL CATEGORY	PURCHASERS' VALUE THROUGH WHOLESALE
A	PCE	X1	4000
A	PES	X1	1000
A	B	X1	60
B	PCE	X1	600
C	PCE	X2	200
D	PCE	X2	500

PCE personal consumption expenditures
PES private equipment and software

(6) The transactions are summed by retail category, but the PCE and the non-PCE transactions are kept separate. In table 8.14, for example, the first cell (4,600) is the sum of rows 1 (4,000) and 4 (600) in table 8.13.

Table 8.14 Transactions Summed by Retail Category

RETAIL CATEGORY	PCE	NON-PCE
X1	4600	1060
X2	700	0

(7) The share of margin allocated to PCE and non-PCE transactions is based on Economic Census data on sales by class of customer. In this example, we assume that 90 percent of the margin for retail category X1 is used for PCE transactions and 10 percent is used for business purchases, and we assume that all of the transactions for retail category X2 are for PCE. Thus, in table 8.15, for category X1, the implied margin for PCE is 1,730*.90=1,557. For category X2, all the retail margin, 300, is for PCE, and the PCE rate is 300/700=.429.

(8) Margin rates for the PCE and non-PCE transactions are calculated by dividing the margin by the transaction value from table 8.14. For category X1, the implied margin rate for PCE is 1,557/4,600=.338.

Table 8.15 Calculation of Retail Margin Rates on Transactions

RETAIL CATEGORY	PERCENT PCE	PERCENT NON-PCE	RETAIL MARGIN	MARGIN FOR PCE	MARGIN FOR NON-PCE	PCE RATE	NON-PCE RATE
X1	90	10	1730	1557	173	.338	.163
X2	100	0	300	300	0	.429	0

(9) The margin rates are then applied to the transaction values to get the retail margin on the transactions. For the first transaction in table 8.16, for example, the transaction value (4,000) from table 8.13 is multiplied by the margin rate for PCE for retail category X1 from table 8.15 (.338) to derive the retail margin (1,352).

Table 8.16 Retail Margin Applied to Transactions

COMMODITY	INDUSTRY	RETAIL CATEGORY	WPURVAL	MARGIN RATE	MARGIN
A	PCE	X1	4000	.338	1352
A	PES	X1	1000	.163	163
A	B	X1	60	.163	10
B	PCE	X1	600	.338	203
C	PCE	X2	200	.429	86
D	PCE	X2	500	.429	215

Evaluation of estimates and allocations

As discussed in the preceding section, the methodologies for estimating and distributing commodity taxes, transportation costs, and wholesale and retail margins are based on limited source data and on broad assumptions. Thus, it is particularly important that the results be evaluated to ensure that they are consistent and reasonable. This concluding section provides some guidelines and hints to assist I-O analysts in evaluating estimates and allocations. In general, tax rates, transportation rates, and margin rates should be compared with earlier I-O benchmark tables to make sure that large differences can be explained.

Taxes

Commodity taxes should only appear on transactions that are taxable. Examples of transactions that generally are not taxable are sales to government, to nonprofit organizations, and to foreigners (exports). Each tax must be investigated to determine which transactions are exempt. It cannot be assumed, especially for excise taxes, that the exemptions are consistent across the various taxes. Exempt transactions must be specifically identified by commodity analysts. Tax rates should be evaluated for reasonableness based on the tax law.

Taxes are included in the output of the industry that is responsible for collecting the tax and for passing the tax receipts to the government. For excise taxes, the industry collecting the tax is usually the industry producing the primary product being taxed. The excise tax included as output is for the entire supply of the taxed item, not just the tax on the item produced. Materials and supplies inventories in manufacturing and all wholesale and retail inventories are assumed to have been taxed when placed in inventory.[19] As the previously taxed items are withdrawn from inventory, the tax is passed on to the purchaser.

Taxes included in output must be consistent with taxes included in the value-added row “taxes on production and imports less subsidies.” For example, the cigarette excise tax included in the output of the cigarette industry must be consistent with the input of excise taxes to this industry. Additionally, the taxes on production and imports must be reconciled with the tax data by industry developed by the Regional Economic Analysis Division from information collected from the individual states.[20]

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[19] In the 1997 benchmark I-O accounts, taxes were inadvertently excluded from all inventory transactions. In the future, applicable taxes should be included on the transactions for materials and supplies inventories and for trade inventories. However, there should not be any taxes on the transactions for finished product and work-in-process inventories.

[20] As noted earlier, in the regional accounts, excise taxes on imports are assigned to wholesale, while in the industry accounts, they are assigned to the industry where the product is primary. This difference in treatment should be resolved.

Transportation costs

Transportation cost rates should be evaluated for reasonableness. As part of the evaluation, analysts should search for additional information on for-hire transportation-cost rates on selected goods. Transportation costs include only for-hire services and do not include the use of company-owned trucks (unless those trucks are operated from separate auxiliary establishments).

Margins

Some commodities do not typically move through wholesale trade channels, and even for those that do, a portion of the sales may bypass wholesale. Therefore, wholesale margin rates should be lower than the rates calculated by type of wholesaler. For example, the margin rate on groceries should be lower than the margin rate for the wholesale grocery and related products kind of business. Similarly, retail margin rates should be lower than the margin rate for the appropriate kind of business.

KEY TERMS FOR CHAPTER 8

Types of industry-collected taxes

- *Commodity taxes* are collected directly from purchasers and forwarded to the taxing authority. They include most sales taxes and excise taxes, and they are part of the measure of industry and commodity output. In the I-O accounts, commodity taxes are explicitly charged to the purchaser. Commodity taxes do not include property taxes, business license fees, income taxes, and social security taxes.

- *General sales taxes* are typically shown separately on sales receipts and are typically levied as a standard percentage of the commodity's price. They include sales taxes collected by retail establishments, by wholesalers, and by service establishments.

- *Selective sales taxes* are taxes that are levied on a specific commodity at a rate that differs from that of the general sales tax. Selective sales taxes include taxes on motor fuels, tobacco products, alcoholic beverages, public utilities, meals, hotel occupancy, and amusements. These taxes are usually levied by state and local governments. For services, the selective sales taxes are included in the output of services. For goods, *other wholesale taxes* are the selective sales taxes that are collected by wholesalers; they are treated separately from general sales taxes so that they can be allocated to the correct commodities. *Other retail taxes* are the selective sales taxes collected by retailers; since the repeal of the Federal luxury tax on expensive cars at the beginning of 2003, there are no selective sales taxes for retail.

- *Excise taxes* are levied by the Federal Government on the manufacture, sale, or consumption of specific items, usually on a per-unit basis rather than a percentage basis. For example, cigarettes are taxed by the pack or carton, alcoholic beverages are taxed by the bottle, and gasoline is taxed by the gallon.

- *Purchases* are the costs of merchandise purchased for resale during the year (regardless of whether the merchandise is actually sold during the year). *Cost of goods sold* is calculated by adding purchases to beginning-of-year inventories of merchandise and by subtracting end-of-year inventories.

- *Trade margins* are the costs of marketing goods between producers and purchasers after they leave the producer and until they are purchased. They can be viewed as the "markup" of wholesale and retail establishments, and they are measured as sales less the cost of goods sold.

KEY TERMS FOR CHAPTER 8 *(CONTINUED)*

- *Transportation costs* are the costs of moving goods from the producer to the user by for-hire transportation services. These for-hire transport services may include transportation services provided by producers themselves, but only if the producer owns and operates a separate auxiliary establishment for this purpose. Transportation costs consist of rail, truck, water, air, oil pipeline, and gas pipeline charges.
- *Most appropriate kind-of-business* (MAKB) is the link between margin rates by kind-of-business (KB) product lines. Margin rates are derived from Census data by KB. The KB margin rate is assumed to be the most appropriate margin rate to apply to the primary products of the respective KB. For example, the margin rate for wholesale grocery stores is applicable to all product-line sales of groceries in any KB.

Valuation of transactions

- The *basic value*, which is the receipts value (such as shipments), used in the output-estimation process for the industry.[21]
- The *commodity tax*, which consists of the sales or excise taxes collected by the seller of a good or service for the transaction.
- The *producers' value*, which is the sum of the basic value and commodity tax.
- The *transportation costs*, which are the costs of moving a good by for-hire transport services. These costs are for rail, truck, water, air, and oil and gas pipeline.
- *Margins*, which are the wholesale and retail costs of marketing goods or services to users. These costs include the trade margin, which is measured as sales less the costs of the goods sold, and sales and excise taxes.
- The *purchasers' value through wholesale*, which is the sum of producers' value, transportation costs, and margins excluding retail margins and retail taxes.
- The *total purchasers' value*, which is the sum of producers' value, transportation costs, and margins.

KEY TERMS FOR CHAPTER 8 *(CONTINUED)*

- The *firm value*, which signifies the valuation in the I-O transaction record that is considered the most statistically reliable—that is, the value most closely based on hard data, such as the Economic Census, and least dependent on adjustments and judgmental estimation. The firm value may be the basic value, purchasers' value through wholesale, or the total purchasers' value.

21. In the I-O accounts, subsidies are not included in basic value, while as defined in the 1993 SNA, they are included in basic value.

APPENDIX TO CHAPTER 8

Table 8.A Major Commodity Taxes and Industries Collecting the Taxes, 1997 Benchmark Input-Output Accounts (Page 1 of 2)

I-O INDUSTRY	INDUSTRY DESCRIPTION	TAX DESCRIPTION	1997 TAX (MILLIONS)
FEDERAL EXCISE TAXES BY INDUSTRY			
312120	Breweries	Federal tax on beer, domestic and imported	3189
312130	Wineries	Federal tax on distilled spirits, domestic and imported	196
312130	Wineries	Federal tax on wine, domestic and imported	607
312140	Distilleries	Federal tax on distilled spirits, domestic and imported	3207
312221	Cigarette manufacturing	Federal cigarette and part of "other tobacco" tax	5863
325120	Industrial gas manufacturing	Federal ozone chemicals excise tax	4
325199	All other basic organic chemical manufacturing	Federal ozone chemicals excise tax	84
325410	Pharmaceutical and medicine manufacturing	Federal vaccines excise tax	147
326210	Tire manufacturing	Federal excise tax on tires and tubes	78
326210	Tire manufacturing	Federal excise taxes on tires and tubes	297
332992	Small arms ammunition manufacturing	Federal tax on pistols and firearms	55
332994	Small arms manufacturing	Federal tax on pistols and firearms	90
333618	Other engine equipment manufacturing	Federal tax on fishing equipment	2
334511	Search, detection, navigation, guidance, aeronautical manufacturing	Federal tax on fishing equipment	2
336110	Automobile and light-duty motor vehicle manufacturing	Federal fuel economy tax	43
339920	Sporting and athletic goods manufacturing	Federal tax on bows and arrows	23
339920	Sporting and athletic goods manufacturing	Federal tax on fishing equipment	84
420000	Wholesale trade adjustments, including duty and redefinitions	Net collected duty	19617
421100	Motor vehicle and motor vehicle parts and supplies wholesalers	Other wholesale tax—Federal tax on trucks, trailers, and bodies	1698
422700	Petroleum and petroleum products wholesalers	Other wholesale tax—Federal tax on aviation fuel (nongas)	175
422700	Petroleum and petroleum products wholesalers	Other wholesale tax—Federal tax on diesel fuel	7005
422700	Petroleum and petroleum products wholesalers	Other wholesale tax—Federal tax on gasoline	22825
422700	Petroleum and petroleum products wholesalers	Other wholesale tax—Federal tax on leaking underground storage tanks	505
422700	Petroleum and petroleum products wholesalers	Other wholesale tax—State and local tax on gasoline	28607
422800	Beer, wine, and distilled alcoholic beverage wholesalers	Other wholesale tax—State and local tax on alcoholic beverages (distilled spirits)	2009
422800	Beer, wine, and distilled alcoholic beverage wholesalers	Other wholesale tax—State and local tax on alcoholic beverages (malt liquors)	1105
422800	Beer, wine, and distilled alcoholic beverage wholesalers	Other wholesale tax—State and local tax on alcoholic beverages (wines)	875
422900	Miscellaneous nondurable goods wholesalers	Other wholesale tax—State and local tax on tobacco	7724
481000	Air transportation	Federal tax on personal transport—air travel facilities	241
481000	Air transportation	Federal tax on personal transport—domestic	4010
481000	Air transportation	Federal tax on personal transport—international	302
481000	Air transportation	Federal tax on personal transport—property transport	297
483000	Water transportation	Federal cruise ship excise tax	15
487210	Scenic and sightseeing transportation, water	Federal cruise ship excise tax	3

Table 8.A Major Commodity Taxes and Industries Collecting the Taxes, 1997 Benchmark Input-Output Accounts (Page 2 of 2)

INDUSTRY	TAX DESCRIPTION	1997 TAX (MILLIONS)
OTHER TAXES		
Electric power generation	State and local utility tax—to electric generation	3666
Electric bulk power transmission and control	State and local utility tax—to electric transmission	71
Electric power distribution	State and local utility tax—to electric distribution	3395
Natural gas distribution	State and local utility tax	5034
Wholesale trade	Sales taxes	21929
Retail	Sales taxes	98605
Transportation	Sales taxes	154
Services	Sales taxes	62640

Table 8.B Other Wholesale Taxes, 1997 Benchmark Input-Output Accounts

ITEM CODE	DESCRIPTION OF TAX	TAX (MILLIONS)
42110042111002	Other wholesale tax—Federal tax on trucks, trailers, and bodies	1698
42270042271002	Other wholesale tax—State and local tax on gasoline	28607
42270042271004	Other wholesale tax—Federal tax on gasoline	22825
42270042271005	Other wholesale tax—Federal tax on diesel fuel	7005
42270042271006	Other wholesale tax—Federal tax on leaking underground storage tanks	505
42270042271008	Other wholesale tax—Federal tax on aviation fuel (nongas)	175
42280042282002	Other wholesale tax—State and local tax on alcoholic beverages (distilled spirits)	2009
42280042282004	Other wholesale tax—State and local tax on alcoholic beverages (wines)	875
42280042282005	Other wholesale tax—State and local tax on alcoholic beverages (malt liquors)	1105
42290042294002	Other wholesale tax—State and local tax on tobacco	7724

Table 8.C Sample Product Lines in Wholesale Trade

PRODUCT LINE	DESCRIPTION
100	New and used automobiles, motorcycles, etc.
111	New automobiles
112	Used automobiles
113	Motorcycles
114	Motorscooters, mopeds, snowmobiles, and utility trailers
120	Buses, campers, and motor homes
121	Buses
122	Motor homes, car trailers, and campers
130	Light trucks and vans (14,000 lb or less)
131	New light trucks
132	Used light trucks
133	Vans and cargo vans (new and used)
140	Medium trucks and tractors (14,001 to 26,000 lb)
150	Heavy trucks and tractors (over 26,000 lb)
151	New heavy trucks (one piece)
152	New heavy truck tractors
153	New truck trailers
154	New truck bodies
155	Used heavy trucks, tractors, and trailers
200	New and rebuilt automotive parts and supplies
211	Batteries
212	Engines (complete)
213	Electrical engine parts (including ignition parts)
214	Brake parts (including fluid and all disk and drum parts)
215	Exhaust system parts
216	Glass
217	Hoses, belts, gaskets, and wiper blades
218	Filters (oil, air, gas, and transmission)

Table 8.D Concordance of "Other Wholesale Taxes" to Input-Output Items from the 1997 Benchmark Input-Output Accounts

WHOLESALE ITEM	TAX	ITEM RECEIVING TAX	ITEM DESCRIPTION
42110042111002	Federal tax on trucks, trailers and bodies	3361201	Trucks, truck tractors, and bus chassis (chassis of own manufacture) 14,001 to 33,000 lb
42110042111002	Federal tax on trucks, trailers and bodies	3361202	Trucks, truck tractors, and bus chassis (chassis of own manufacture) 33,001 lb and over
42110042111002	Federal tax on trucks, trailers and bodies	3362111	Truck, bus, and other vehicle bodies including passenger car bodies and kit cars
42110042111002	Federal tax on trucks, trailers and bodies	336211W	Motor vehicle bodies not specified by kind
42110042111002	Federal tax on trucks, trailers and bodies	336212S	Truck Trailer mfg
42270042271002	State and local tax on gasoline	3241101	Gasoline, including finished base stocks and blending agents
42270042271004	Federal tax on gasoline	3241101	Gasoline, including finished base stocks and blending agents
42270042271005	Federal tax on diesel fuel	324110A	Light fuel oils
42270042271006	Federal tax on leaking underground storage tanks	324110A	Light fuel oils
42270042271008	Federal tax on aviation fuel (nongas)	3241104	Jet fuel
42280042282002	State and local tax on alcoholic beverages (distilled spirits)	3121404	Bottled liquor, except brandy
42280042282002	State and local tax on alcoholic beverages (distilled spirits)	312140W	Distilled and blended liquors, not specified by kind
42280042282004	State and local tax on alcoholic beverages (wines)	312130S	Wines, brandies, and brandy spirits
42280042282005	State and local tax on alcoholic beverages (malt liquors)	312120S	Breweries
42290042294002	State and local tax on tobacco	312221S	Cigarettes
42290042294002	State and local tax on tobacco	3122291	Cigars
42290042294002	State and local tax on tobacco	3122294	Chewing and smoking tobacco
42290042294002	State and local tax on tobacco	312229W	Other tobacco products, not specified by kind

Table 8.E Sample of Retail Product Lines

PRODUCT LINE	DESCRIPTION
0100	Groceries and other foods for human consumption off the premises
0101	Meat, fish, and poultry (including prepackaged and canned meats requiring refrigeration)
0102	Produce (including fresh and prepackaged fruits and vegetables)
0103	Frozen foods (including packaged foods sold in a frozen state)
0104	Dairy products and related foods (including milk, cheese, butter, yogurt, ice cream, eggs, etc)
0105	Bakery products baked on premises
0106	Bakery products not baked on the premises, except frozen
0107	Delicatessen items (including deli meats and other service delicatessen items only)
0108	Bottled, canned, or packaged soft drinks
0109	Candy
0111	All other foods (including dry groceries, canned and bottled foods, and other food items)
0112	All other foods (including dry groceries; canned, frozen, and bottled foods; packaged snacks; produce; etc)
0113	All other foods (dry groceries, canned and bottled foods, candy, packaged snacks, bakery products, etc)
0114	All other foods (including dry groceries, canned and bottled foods, etc)
0120	Meals, unpackaged snacks, sandwiches, and nonalcoholic beverages (including soup and salad bars, party platters, and hand-dipped ice cream)
0123	Soup and salad bars
0124	All other meals and snacks
0130	Alcoholic drinks (served at this establishment)
0140	Packaged liquor, wine, and beer
0141	Distilled spirits (including liquor, brandy, and liqueurs)
0142	Wine
0143	Beer and ale
0150	Cigars, cigarettes, tobacco, and smokers' accessories (excluding sales from vending machines operated by others)
0160	Drugs, health aids, and beauty aids (including cosmetics)
0161	Prescriptions
0162	Nonprescription medicines
0163	Vitamins, minerals, and other dietary supplements
0164	Health aids (including first-aid, foot, and eye/contact lens care products; prescription access; convalescent aids; orthopedic equip; artificial limbs)
0165	Cosmetics (including face cream, make-up, perfumes and colognes, etc)
0166	Other hygiene needs (including deodorants; hair and shaving products; oral, feminine, and baby hygiene needs; hand products; etc)
0167	Hearing aids and supplies
0168	Eye/contact lens care products
0169	All other drugs and health & beauty aids (including prescription and nonprescription drugs, etc)
0180	Soaps, detergents, and household cleaners
0190	Paper and related products (including paper towels, toilet tissue, wraps, bags, foils, etc)

Table 8.F "Other Retail Taxes," 1997 Benchmark Input-Output Accounts

ITEM CODE	DESCRIPTION	TAX (MILLIONS OF DOLLARS)
4411104411100T	Other retail tax—Federal luxury retail excise tax on cars	386
4412224412220T	Other retail tax—Federal luxury retail excise tax on boats	0
4412294412290T	Other retail tax—Federal luxury retail excise tax on aircraft	0
4481594481590T	Other retail tax—Federal luxury retail excise tax on furs	0
4483104483100T	Other retail tax—Federal luxury retail excise tax on jewelry	0

NOTE: The Federal tax on luxury cars expired at the beginning of 2003. Currently, the Federal Government levies no luxury retail excise taxes.

Table 8.G Retail Category Codes, 1997 Benchmark Input-Output Accounts (Page 1 of 2)

RETAIL CATEGORY CODE	DESCRIPTION
1070	Jewelry and watches
1091	New autos—personal consumption expenditures
1093	New trucks—personal consumption expenditures
1095	Used autos
1096	Used trucks and vans
1098	New autos—producers' durable equipment
1099	New trucks—producers' durable equipment
1100	Mobile homes
1112	Recreational vehicles and trailers
1130	Furniture and fixtures
1140	Kitchen and other household appliances
1150	China, glassware, tableware, and utensils
1170	Floor coverings
1181	Other durable house furnishings (including telephones)
1182	Office equipment and writing equipment (excluding computer equipment)
1280	Ophthalmic products and orthopedic appliances
1315	Tires and tubes, accessories, and other parts
1390	Video and audio equipment
1391	Records, tapes, CDs, video tapes, and other video and audio products
1392	Musical instruments
1394	Computer equipment and software for personal use
1396	Computer equipment and software for business use
2010	Food purchased for off-premise consumption
2015	Alcoholic beverages for off-premise consumption
2020	Tobacco products
2030	Shoes and other footwear
2041	Women's, girls', infants', and toddlers' clothing and accessories
2051	Men's and boys' clothing and accessories
2060	Sewing, knitting, and needlework goods

Table 8.G Retail Category Codes, 1997 Benchmark Input-Output Accounts (Page 2 of 2)

RETAIL CATEGORY CODE	DESCRIPTION
2070	Luggage and leather goods
2120	Toilet articles and preparations
2210	Semidurable house furnishings
2220	Cleaning and polishing preparations
2230	Paper products
2241	Stationery, writing and office supplies
2242	Greeting cards
2250	Liquified petroleum gas and other fuels (except fuel oil)
2251	Fuel oil
2271	Prescription and nonprescription drugs
2272	Medical sundries
2330	Gasoline
2331	Lubricating oils and greases
2361	Books and maps
2362	Magazines, newspapers, and sheet music
2400	Flowers, seeds, potted plants
3310	Retread tires
4110	Boats
4120	Airplanes
4130	Toys, sport supplies, and sporting equipment (including guns)
4140	Photographic supplies and photographic equipment
4150	Bicycles and motorcycles
4260	Construction materials
4280	Tools, lighting supplies, other durables
4350	Pets, stamps, coins
4400	Funeral and burial expenses

CHAPTER 9: REALLOCATIONS

Reallocation is the means by which the inputs associated with the production of redefined secondary products are identified and reassigned from the producing industry to the industry for which the product is primary. This chapter discusses the composition of inputs as the basis for identifying the secondary products that should be redefined, and it discusses how reallocations are treated in the input-output use table. It illustrates the process for estimating reallocations, and it provides some checks for evaluating the estimates.

In the input-output (I-O) accounts, the industry-input transactions include the inputs for both the primary and the secondary products of the industry. As discussed in Chapter 4, "Classification and Secondary Products," there are three types of secondary products—redefinitions, reclassifications, and "other secondary products." Redefinitions are secondary products that are produced using input patterns that differ substantially from that of the primary product of the industry in which they are produced. In preparing the supplementary use table—that is, the use table after redefinitions—these products are treated as though they are produced by the industry for which they are primary. As part of this process, the intermediate inputs and value added associated with these products are reallocated to the primary industry. In contrast, reclassifications and other secondary products are assumed to have input patterns that are similar to that of the primary product of the industry in which they are produced. As a result, in the use table after redefinitions, these secondary products remain with that industry.

For example, the inputs for the meal-service activities of a hotel (such as purchases of food) differ considerably from the inputs for lodging (such as purchases of sheets and pillowcases), the hotel's primary activity. Thus, the meal-service activities of hotels are redefined to the eating and drinking industry. In contrast, nursing-home services of hospitals are assumed to have similar inputs to hospital services—medications, cleaning supplies, and food are inputs to both activities. Thus, nursing-home services are treated as other secondary products rather than being redefined to another industry. These two examples seem pretty clear cut, but in some cases, the decision as to whether or not a secondary product should be redefined must be based on judgment. The decisions about redefinitions are particularly important because the make and use tables after redefinitions are used to derive the total requirements tables.

As was noted in chapter 4, the following activities are always redefined and their inputs reallocated.

- Construction activities performed by other industries are redefined to construction.
- Manufacturing activities in nonmanufacturing industries are redefined to manufacturing.
- Trade activities in nontrade industries are redefined to trade. Redefinitions are not made between wholesale and retail trade.

- Rental activities in nonrental industries are redefined to real estate and rental industries.
- Service activities in nonservice industries are redefined to services.

It is often difficult to determine whether service-industry-to-service-industry activities should be handled as redefinitions or as other secondary products. If the secondary activity is small (less than $5 million, for example), it is generally acceptable to treat it as other secondary rather than as a redefinition. However, if there are two service industries with secondary activities going back and forth between them, their activities should be treated the same—either as redefinitions or as other secondary. In general, the decision is made based on common sense—are the production functions of the two activities similar, or are there important inputs to one that are not inputs to the other? If the inputs are not similar, then the activities should be redefined.

Reallocations in use table

Reallocations are the inputs associated with output that is *redefined*. The reallocated inputs include both the intermediate inputs and the value-added components.

Reallocations are used to transit from the use table before redefinitions to the use table after redefinitions. The use table before redefinitions shows the inputs for all of the output produced by each industry, whether that output is primary or secondary to the industry. For each industry, the use table after redefinitions shows (1) the inputs associated with the industry's production of its primary product, (2) the inputs associated with the production of the industry's primary product by other industries using production processes that differ from that used for their primary products, and (3) the inputs associated with the production of the industry's secondary products that are produced using production processes that are similar to that used for its primary product. In other words, the use table after redefinition includes in each industry the inputs associated with output that has been *redefined in* from other industries, and it excludes the inputs associated with output that has been *redefined out* of the industry (that is, moved to other industries).

Methodology

Generally, reallocations are estimated using the input pattern for the industry to which they are being moved. For example, restaurant meals that are produced in the hotel industry should have an input pattern similar to that of the restaurant industry. For example, if compensation amounts to 30 percent of industry inputs in the restaurant industry, then compensation should amount to about 30 percent of the value of the redefinition.

The following is a simplified example using two industries and two commodities. Industry A produces both commodities, and industry B produces only commodity B. Because the inputs used to produce commodity B differ substan-

tially from those used to produce commodity A, the output of commodity B by industry A is redefined to industry B (tables 9.1 and 9.2).

Table 9.1 Make Table Before Redefinitions

	COMMODITY A	COMMODITY B	INDUSTRY OUTPUT
INDUSTRY A	90	10	**100**
INDUSTRY B		100	**100**
COMMODITY OUTPUT	**90**	**110**	

Table 9.2 Make Table After Redefinitions

	COMMODITY A	COMMODITY B	INDUSTRY OUTPUT
INDUSTRY A	90		**90**
INDUSTRY B		110	**110**
COMMODITY OUTPUT	**90**	**110**	

Note that the outputs of commodity A and commodity B are not affected by the redefinition, but the output of industry A is reduced from $100 to $90, and the output of industry B is raised from $100 to $110.

After the output is redefined, the associated inputs are then moved, or reallocated, to the receiving industry. In our example, the inputs associated with the production of commodity B by industry A are reallocated to industry B, using the assumption that the input composition for the production of commodity B is similar for the two industries. In order to to produce commodity B, industry B uses the following inputs: $20 of commodity A, $30 of commodity B, and $50 of value added (table 9.3).

Table 9.3 Use Table Before Redefinitions

	INDUSTRY A	INDUSTRY B	FINAL USES	COMMODITY OUTPUT
COMMODITY A	52	20	18	**90**
COMMODITY B	3	30	77	**110**
VALUE ADDED	45	50		
INDUSTRY OUTPUT	**100**	**100**		

The value of the reallocations of the inputs can be calculated using the direct requirements coefficients to industry B.[1] Calculating from table 9.3, the $10 of inputs to be reallocated is composed as follows: $2 of commodity A (($20/$100)*$10), $3 of commodity B (($30/$100)*$10), and $5 of value added (($50/

[1] The commodity-by-industry direct requirements table is derived from the use table by relating commodity inputs used by an industry to the industry's output. The values in this table, referred to as "direct requirements coefficients," are in ratio format and show the dollar amount of a commodity required directly by an industry to produce a dollar of the industry’s output.

$100)*$10). These values are then subtracted from industry A and added to industry B (table 9.4).

Table 9.4 Use Table After Redefinitions

	INDUSTRY A	INDUSTRY B	FINAL USES	COMMODITY OUTPUT
COMMODITY A	52-2=50	20+2=22	18	**90**
COMMODITY B	3-3=0	30+3=33	77	**110**
VALUE ADDED	45-5=40	50+5=55		
INDUSTRY OUTPUT	**100-10=90**	**100+10=110**		

Note that commodity output and final uses are not affected by the reallocation, but the inputs and the output of industry A are reduced by $10 and the inputs and the output of industry B are raised by $10.

In our example, the inputs to be redefined were already included in the estimated inputs for industry A, so the reallocation of those inputs was straightforward. However, in some cases, it may be necessary to adjust the inputs so the reallocation does not result in negative values for inputs in the use table. Negative inputs generally indicate that the inputs as originally estimated did not include the inputs for the secondary production, possibly because those inputs were not large enough to be captured in detail in the source data.

Detailed reallocations are specifically prepared for large redefinitions. The large redefinitions that were made for the1997 benchmark included the following:

- Own-account construction by homeowners, by electric utilities, and by telephone companies (redefined to construction),
- Auto repair services by new car dealers (redefined to auto repair services),
- Gaming at casino hotels (redefined to casino gambling),
- Meals at lodging places (redefined to food services),
- Auto leasing by finance companies (redefined to auto leasing).

For some redefinitions, such as own-account software, a standard distribution of the inputs—that is, employee compensation, rent, electricity, office supplies, and depreciation—was used for all industries.

For smaller redefinitions, the reallocations may include only a few inputs. For example, the reselling activities of most manufacturing industries are redefined to wholesale trade. These redefinitions, which are usually small, represent the “margin” on the reselling activities. Consequently, these reallocations involve only employee compensation and other value added (gross operating surplus).

The estimates for reallocations are generally made after inputs to most industries have been estimated from source data. Reallocations should be done when inputs are estimated in order to ensure that inputs to secondary products are included. For own-account construction, we must make assumptions about the type of construction produced, so that the right input patterns can be used to estimate the reallocations. Other reallocations—such as the reallocations for own-

account software and for wholesaling activities of manufacturers—are made using fairly mechanical methods.

Review and adjustment of reallocations

After the reallocations are completed, the use tables before and after redefinitions should be reviewed and adjusted, as needed, so that each industry includes the correct inputs in the appropriate amounts. Among the types of checks that should be performed are the following:

- Verify that the appropriate inputs for the reallocation are present in the initially estimated inputs for the industry. For example, in redefining hotel restaurant activities to the food and beverage industry, do the inputs for the hotel industry include the necessary inputs of beef and potatoes for the reallocation? If not, the reallocations and/or the inputs to the hotel industry have to be adjusted, so that the use table after redefinitions does not include negative inputs.
- Evaluate the inputs to each industry after redefinitions to ensure that inappropriate inputs do not remain in that industry. For example, if large inputs of beef and potatoes remain in the hotel industry, the reallocations and/or the inputs for beef and potatoes have to be adjusted.
- Verify that the reallocations (including taxes) in purchasers' value equal the value of the corresponding redefinition (including taxes). For example, the sum of beef and potatoes and the other inputs that are reallocated from the hotel industry to the food and beverage industry must equal the value of the output that was redefined from the hotel industry to the food and beverage industry.

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CHAPTER 10: RECONCILIATION OF FINAL USES

As part of the preparation of the input-output (I-O) benchmark accounts, the I-O estimates of gross domestic product and its final-use components must be reconciled with their counterparts in the national income and product accounts (NIPAs). This chapter discusses the reconciliation process and briefly outlines the sources and methods for the NIPA estimates.

Final uses is the term used by the input-output (I-O) accounts for the final expenditure components of gross domestic product (GDP). The final-use components are personal consumption expenditures (PCE), private equipment and software investment (PES), private structures investment, the change in private inventories, exports, imports, and government consumption expenditures and gross investment.

In the I-O accounts, final uses are estimated as part of the process of creating the use table. The methodologies for estimating the components of final uses vary. For example, the estimates for PCE and PES are largely based on commodity-flow methodologies, while those for exports and imports are based mostly on detailed foreign trade data. (For more information, see Chapter 6, "Transactions.")

The benchmark I-O accounts are considered the single most important source for the 5-year comprehensive revisions of the national income and product accounts (NIPAs). The I-O estimates incorporate more recent and more detailed source data that have become available since the last comprehensive NIPA revision, and they incorporate other definitional, statistical, and presentational improvements. Thus, the levels of GDP and its major components that are published in the benchmark I-O accounts are used as the basis for the "preliminary revised NIPA estimates" that provide the first look at the impact of the forthcoming comprehensive revision.[1] Because of this important role played by these I-O estimates, they are subject to an intensive review and reconciliation process that involves the staffs of both the industry and national accounts.

A major difference between the I-O accounts and the NIPAs is that the I-O accounts are designed to provide a detailed snapshot of the economy for a given year (the benchmark year for the benchmark I-O), while the focus of the NIPAs (particularly for GDP and related series) is on changes in the economy from one period to the next. Thus, the NIPAs strive to provide estimates on a "best-change" basis, generally by using the best available current source data to extrapolate benchmark-level estimates. The levels for the NIPA estimates are revised to a "best-level" basis about every 5 years in the comprehensive revision by incorporating the I-O estimates for the benchmark year and revising the estimates for the nonbenchmark years to provide consistent time series.

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[1] See Stephanie H. McCulla and Carol E. Moylan, "Preview of Revised NIPA Estimates for 1997: Effects of Incorporating the 1997 Benchmark I-O Accounts and Proposed Definitional and Statistical Changes," *Survey of Current Business* 83 (January 2003): 10-16.

Reconciliation of the I-O accounts and the NIPAs

The reconciliation of I-O final uses with the NIPAs consists of a review of the estimates developed as part of the benchmark I-O tables prior to their publication. The goal of this process is to ensure that the estimates that are incorporated into the I-O accounts are "reasonable" for incorporation into the NIPAs in the forthcoming comprehensive revision. The documentation prepared for the I-O benchmark should include information to assist in this reconciliation process. For example, it should cover any changes in methods, sources, or content of categories (such as new items). In order to facilitate the reconciliation, both the I-O and NIPA estimates should reflect all of the definitional and statistical changes, including the improved methodologies, that were introduced in the last comprehensive NIPA revision.

It is the responsibility of the I-O analysts to prepare the best set of estimates possible and to review them internally before the reconciliation process with the NIPAs begins. We are responsible for providing information to support our estimates and for explaining the causes of differences between the I-O and NIPA estimates. To accomplish this effectively, we must understand the methodologies used to prepare the NIPA estimates.

For the I-O estimates that are based on the commodity-flow procedure (PCE and PES), there are a number of places to look for explanations of the differences. We should compare the I-O and NIPA commodity-flow percentages, gross output, adjustments to calculate domestic supply, intermediate purchases, transportation cost rates, margin rates, and tax rates.

- Is new information available to update commodity-flow percentages?
- Have new users of the commodity been identified?
- Has the item composition of the categories changed?
- Has the item coding of exports or imports changed?
- Has the share purchased by government changed?

The answers to these questions can help to explain the differences so that a joint decision can be made on the preferred level for the estimate.

Personal consumption expenditures

The I-O estimates of PCE are developed and reconciled for over 200 detailed categories, usually in greater detail than is published in the NIPAs (see NIPA Table 2.4.5, Personal Consumption Expenditures by Type of Product). In general, the I-O estimates are based on estimates of the supply of various goods that have been calculated using the latest Economic Census for estimates of output and wholesale and retail margin and tax rates and using current information on imports and exports. The NIPA estimates of PCE goods are generally made using the retail-control-group methodology, in which product-line sales at various retail kinds of business from the preceding Economic Census are used to weight annual retail sales and create extrapolators for PCE categories. The weighting system is intended to yield accurate estimates of PCE categories from annual sales by type

of store. Because the NIPA retail-control-group methodology assumes that the product-line sales from the preceding Economic Census have remained a constant share of each kind of business, differences between the I-O and the NIPA estimates are to be expected.

For PCE goods, large differences between the I-O and the NIPA estimates must be evaluated and reconciled—for example, food and alcoholic beverages in purchased meals has traditionally been a category where such differences occur. Information from the Economic Census on sales by class of customer should be used to evaluate the PCE estimates. For the goods for which the NIPA estimates are based on the retail-control-group methodology, the I-O estimates tend to be regarded as the more accurate, because they are based on the latest Economic Census. For the other goods—specifically autos and trucks, gasoline, and drugs—the NIPA estimates tend to be accepted, because they are based on more sophisticated methodologies that incorporate source data specific to those categories of goods.

For PCE services, there are generally two sets of estimates available from the NIPAs. The "published" estimates are generally "best-change" estimates—that is, they are part of a consistent time series of estimates that are based on the preceding benchmark I-O table and have been extrapolated annually using the Service Annual Survey and other sources. For some services categories, another set of estimates, the "best-level" estimates, is generated using other data, such as the most recent Economic Census. If available, the NIPA best-level estimates are the estimates that should be compared with the I-O estimates.

The reconciliation for PCE services starts by obtaining a set of spreadsheets from the National Income and Wealth Division (NIWD) that document the NIPA estimates. In many cases, the values are similar, but where there are differences, they must be explained. Differences may relate to adjustments that are made for the I-O based on updated census values, such as tax rates, detailed information from the Economic Census product-line data, or nonemployer or misreporting adjustments. In other cases, the values may be different because of new information—for example, where newly available product-line data reveal secondary products that were not previously identified.

Gross private domestic investment

There are several components of investment—equipment and software, structures, and inventory. Equipment and software and structures can also be split between residential and nonresidential investment.

Private equipment and software: NIWD spreadsheets provide detail on over 30 categories of private investment in equipment and software (see NIPA Table 5.5.5 "Private Fixed Investment in Equipment and Software by Type" for the published categories). The NIPA estimates are prepared using a methodology that is similar to the commodity-flow methodology employed for the industry accounts. Information from the annual survey of manufactures (ASM) and foreign trade data compiled by the industry accounts staff are used to estimate supply; then, government purchases are estimated, and benchmark relationships for commodity-flow percentages, margin and tax rates, and transportation costs are used to make the NIPA estimates. In general, differences are due to differences between

the ASM and Economic Census shipments levels and to changes in transportation and margin and tax rates. Because many of the PES estimates are derived as residuals in the commodity-flow procedure (after intermediate and other final uses), the differences may also be due to the use of different government investment estimates or to differences in the coding of exports and imports.

Structures: Generally, the NIPA estimates of structures by category are accepted and used in the I-O tables. In many cases, these are not the published values, but rather the "best-level" estimates that are developed for the NIPAs. Because all new structures are part of final uses (either private or government), inconsistencies between output and final uses generally result in changes to gross output for the construction industries.

The NIPA estimates are based on data on the value put-in-place, which includes information on construction performed by contractors and on construction performed by the employees of firms doing construction for their own use (own-account construction). Generally, information from the Economic Census is not used to make estimates of construction output, because of substantial double counting that results from the inclusion of general contractors and subcontractors. NIPA estimates for petroleum mining are based on information from the American Petroleum Institute. NIPA estimates of commissions on residential structures are based on sales of new and existing structures and commission rates; a similar methodology is used for commissions on nonresidential structures.

Change in private inventories: Estimates of inventory by item and holding industry are developed by IAD, but the total change in private inventories and the inventory change by holding industry must match the value from the NIPAs. The NIPAs use detail on inventory change by item along with data on prices and inventory valuation methods used by business to calculate the inventory valuation adjustment (IVA) (see Chapter 5, "Output"). In the past, the IVA used in the NIPAs has differed from that used in the I-O table. In the I-O accounts, the I-O "change in book value" and the I-O IVA were both adjusted to include the "adjustment for LIFO reserve" reported by business to the Census Bureau. (Because both the "book value" and the IVA are adjusted for the LIFO reserve, the change in private inventories in the I-O was consistent with the change in private inventories in the NIPAs.) A different I-O treatment is being evaluated, and the methodology is being changed for the 2002 I-O table. The new methodology will allocate the IVA to holding industries and commodities; the IVA will not be shown separately in the 2002 tables.

Exports and imports

The estimates of exports and imports for goods are based on information from the Census Bureau, and the estimates of exports and imports for services are based on information from the international transactions accounts prepared by BEA's Balance of Payments Division. Because the NIPA estimates for equipment and software rely on the exports and imports based on the concordances from the preceding I-O benchmark, the harmonized-code-to-item-code concordance should be reviewed carefully when differences between the I-O and NIPA equipment and software categories are discovered.

The value for net exports is the same in the NIPAs and the I-O accounts, except for some possible statistical timing differences. However, the totals for exports and imports differ because of the way reexports, reimports, and certain government agency transactions are handled. (For more information, see Chapter 7, "Foreign Transactions.")

Government consumption expenditures and gross investment

The estimates of government consumption expenditures and gross investment and of the gross output of government as producer are based on NIPA estimates, but the detail on the commodities included is estimated in the I-O accounts. Totals are from the NIPAs, and they are the best-level estimates rather than the published estimates. In addition, with the new treatment of government as producer, the content of the final-use categories has changed—the current-account purchases of government are now intermediate inputs, and the final-use column shows purchases of government services as well as the detailed government investment expenditures shown in the past.

The estimates prepared for the I-O table show the item content of every input category (or expense category). For current-account purchases, the detail is shown as inputs to the new intermediate industries for government as producer. Purchases of materials and supplies and of compensation and consumption of fixed capital are shown as purchases of these intermediate industries. Government sales, formerly shown as negatives in final uses, are now shown as secondary products of the new government industry. Changes in inventories and sales of used goods, as well as government investment expenditures, are still shown in the I-O government final-use categories.[2]

[2] Under the Government Division's new treatment of government as producer, the change in Commodity Credit Corporation inventories and the sale of used goods by governments are considered intermediate transactions. In addition, sales of goods are measured in output as sales rather than as margin. These treatments are not consistent with I-O conventions, so some resolution is needed.

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CHAPTER 11: FINAL REVIEW AND BALANCING

At the end of the input-output (I-O) process, final review and balancing ensure that the I-O accounts present a complete and consistent picture of the interrelationships among industries and commodities in the U.S. economy. This chapter first lists the activities that must be completed before final review and balancing can begin. It then describes the process for conducting the final review of the estimates and the process for balancing the transactions that are used to construct the I-O use table.

The use table of the input-output (I-O) accounts is a *balanced* national-accounting framework. Therefore, "balancing" is the final step in the preparation of the set of transactions that record the flows of commodities between establishments and from establishments to final users. Once the detailed transactions are in balance, the output of each commodity shown in the use table will be equal to the sum of the transactions for that commodity, and the output of each industry shown in the table will be equal to the sum of input transactions for that industry.

Chapters 6-10 discussed the process of estimating transactions, which record the flows of commodities to industries and final users. However, this process rarely produces a set of transactions that satisfies the requirement of being in balance. After incorporating all of our source data, making estimates of inputs to industries, and setting levels for final uses, the table will almost surely be out of balance. In particular, there will likely be unallocated commodity output—that is, commodity output less the sum of transactions is greater than zero—that must be distributed to individual industries.

In final review and balancing, the unallocated commodity output is distributed to various industries, but the initially estimated transactions are not changed. In the first phase of this process, the initial estimates are reviewed to see whether additional transactions can be estimated; in essence, this activity represents an attempt to balance the table by hand. In the second phase, balancing transactions are used to distribute the remaining commodity output.

This chapter describes the final review and balancing process as it was carried out in preparing the 1997 and earlier benchmark I-O tables. With integration of the industry accounts for the 2002 benchmark, the process will probably change. In particular, increased attention will be focused on the input category controls and on the estimates of gross operating surplus. However, the same steps for preparation, review, and balancing will have to take place.

Preparation for final review and balancing

Before beginning the process of final review and balancing, the estimates for the following transactions must be finalized. These estimates will not change as a result of balancing, which affects only intermediate consumption by industries.

- *Final-uses.* The estimates of final uses—personal consumption expenditures, private fixed investment, change in private

inventories, exports less imports, and government consumption expenditures and gross investment—must be reconciled with those of the national income and product accounts (NIPAs) (see Chapter 10, "Reconciliation of Final Uses").

- *Compensation and taxes on production and imports less subsidies.* With integration of the industry accounts, these value-added components must be reconciled with the gross domestic product (GDP) by industry, national, and regional accounts.
- *Reallocations.* These transactions reassign the inputs associated with the output of secondary products that are redefined from one industry to another (see Chapter 9, "Reallocations").

Final review

This phase of the process involves a thorough review of the initial input and output estimates for commodities and industries. Ideally, we will be able to use our knowledge of industries and commodities to create additional transactions that can account for unallocated commodity output and therefore move us toward balancing the transactions table. The following activities constitute this phase of the work:

(1) Review the distribution of item output;

(2) Check that each item is not overallocated (that is, an item's output less the sum of transactions must not be negative);

(3) Check that taxes, transport costs, and margin assigned to each commodity are not overallocated;

(4) Compare the share of item supply to intermediate with the shares in prior I-O tables;

(5) Review the inputs to industries; and

(6) Ensure that inputs to selected industries are fixed to predetermined levels of value added.

(1) *The flow of item supply to industries must be reviewed.* All items must be reviewed for missing transactions, for the level of unallocated (output less the sum of transactions), and for the share of supply flowing to intermediate. Items with high levels of unallocated should be examined for possible additional transactions. Are there particular industries that should be using this item? Are there items with unallocated supply that should have none (for example, an equipment item for which all supply is not distributed to the final use of private equipment and software)? Should the use of an item by all industries be scaled up or down? Or, is there not enough information at this detailed level to make an estimate?

If there are specific products that have definite user industries, the item transactions should be scaled to the supply, or adjustments should be made to specific transactions. For example, if 30 percent of the item "auto paint" is unallocated, then the industries that perform auto repair and/or the automotive industry need to buy more paint. The unallocated paint should not be left for the commodity balancing.

(2) *No item should be overallocated—that is, output less the sum of transactions cannot be less than zero.* Balancing cannot create negative transactions. Additionally, within the commodity distribution, overallocated items should not be offset by underallocated items. For example, in table 11.1, all items are either fully allocated or underallocated, which is acceptable. However, in table 11.2, item A is overallocated, while items C and D are underallocated to offset the overallocation of item A. Such balancing may lead to problems for the associated transport costs and margins. The overallocation of item A will result in overallocated transport costs and margins that may not be balanced by the underallocation of transport costs and margins for items C and D.

Table 11.1 Sample Set of Acceptable Unallocated Items for a Commodity

ITEM	OUTPUT	SUM OF TRANSACTIONS	UNALLOCATED
A	330	245	85
B	200	200	0
C	505	450	55
D	50	45	5
TOTAL FOR COMMODITY	**1085**	**940**	**145**

Table 11.2 Sample Set of Unacceptable Unallocated Items for a Commodity

ITEM	OUTPUT	SUM OF TRANSACTIONS	UNALLOCATED
A	330	345	-15
B	200	200	0
C	505	495	10
D	50	45	5
TOTAL FOR COMMODITY	**1085**	**1085**	**0**

(3) *For commodities that have transportation costs and margins on transactions, a check must also be made to ensure that any of these costs are not overallocated.*[1] The sum of each tax, transportation cost, and margin on transactions for a commodity must be less than or equal to the respective tax or transportation cost or margin assigned to the commodity (table 11.3). Retail margins and taxes are always fully allocated on transactions and therefore will not have unallocated output.

[1] Overallocated taxes, transportation costs, or trade margins usually result from overallocated item basic values (item output in basic prices less the sum of all transactions in basic prices is less than zero).

Table 11.3 Transportation Costs, Margins, and Taxes Unallocated for Commodity A

	VALUE OF TRANSPORTATION COSTS, MARGINS, AND TAXES ASSIGNED TO COMMODITY A	SUM OF TRANSPORTATION COSTS, MARGINS, AND TAXES ON TRANSACTIONS	UNALLOCATED	ACTION
RAIL	100	105	-5	Rail on selected transactions must be reduced
TRUCK	50	45	5	Okay
WATER	14	13	1	Okay
WHOLESALE MARGIN	250	251	-1	Wholesale margin on a transaction must be reduced
WHOLESALE TAX	45	44	1	Okay

A check should also be made to see if there are commodities that are fully allocated in basic prices but have unallocated transportation costs or margins. This problem may occur for commodities that have many small-value transactions where the calculated transportation costs or margins round to zero. In these cases, the transportation cost or the margin on transactions needs to be increased.

The programs that calculate transportation costs, taxes, and margins should be turned off at this time. Any hand adjustments made will be overwritten if the programs continue to run.

(4) *The share of item supply flowing to intermediate industries must be evaluated.* The evaluation is generally done by comparing the current estimates of the share of item supply flowing to total intermediate and the current estimates of the consumption of the item by industries with the corresponding estimates from the prior benchmark. The validity of these comparisons rests on the assumptions that the prior benchmark was accurate, that the use of the item has not changed, and that the flows should be similar for both periods. For example, the flow of breakfast cereals to intermediate industries, such as the meals and beverages industry, and to PCE should remain relatively stable from one period to the next. Large differences should be verified and explained.

(5) *Industry inputs must be reviewed.* This review should take place at the input-category-control level as well as at the overall industry level. Each input control should be examined to determine if the inputs included are appropriate and if the levels of these inputs are reasonable (or alternatively, the difference between the control and the sum of transactions may be checked for reasonableness). Input category controls that are either underallocated or overallocated may require adjustments to the controls themselves or adjustments to their inputs—these adjustments may involve scaling, reassignment, or changing the value of specific transactions.[2] Factors that may affect decisions on adjustments include the following: How firm is the input-category-control value, how will adjustments of the transaction affect the unallocated of the item, and are there similar problems for

similar input categories in other industries? Additionally, the total inputs to each industry must be examined: Are there missing inputs, and what effect will the sum of inputs have on gross operating surplus (GOS)?

(6) *Several specific industries must be balanced—that is, all inputs must be estimated and levels set for GOS.* These industries include those for which the I-O accounts accept the NIPA estimates for GOS: Farms, government enterprises, government as a producer, private households, and inventory valuation adjustment. They also include those for which a specified level for GOS must be met: Nonprofit institutions (GOS is always zero), imputed rents of nonprofits, and auxiliaries.

All of the above activities affect the allocations of commodities and items, so this phase involves an iterative process of reviewing and re-adjusting the item flows. The hands-on refining of the estimates usually ends when deadline constraints dictate the need to move on to the balancing phase of the process.

Balancing

After making our best estimates of commodity and industry transactions, we now turn to more mechanical methods of ensuring that the balancing requirements for preparing the I-O use table are met. While this actual balancing is performed by computer programs, the industry/commodity analysts are substantially involved in the process of setting up for balancing. As in the first phase of the process, balancing affects only inputs to industries—that is, all unallocated output is distributed to intermediate industries and not to final uses. However, in this phase, the distributions are made using separate balancing transactions.

In the 1997 benchmark I-O accounts, balancing was done at the commodity and industry working level of detail.[3] Balancing at a finer level of detail was not thought to be useful and was thought to imply that we had better information on inputs than what we actually had. Thus, items were usually not balanced or fully allocated, and input categories were not usually balanced.

In addition, the balancing typically focused on the distribution of unallocated commodity output to industries without much regard to the effect of this distribution on "other value added," or gross operating surplus (GOS). In the future, with integration of the accounts, the I-O estimates will be used to establish the levels for GOS by industry, and so GDP by industry will equal I-O value added by industry. Achieving this goal will require increased attention on the balancing of commodities with the input category controls, which represent our best estimates of total inputs and particularly of GOS by industry.

Balancing is composed of the following steps:

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[2] Input category controls may need to be adjusted on the basis of information about the supply of particular commodities. For example, we have input controls for electricity for almost all industries. If the sum of these input category controls is greater than the supply of electricity and if we feel the electricity supply is the correct level, then the industry input controls for electricity must be reduced. This adjustment will require offsetting adjustments to other input categories.

[3] The working-level detail is defined by the set of codes in the database tables—"indcode" for industry and "comcode" for commodity.

(1) Identify missing transactions at the commodity and industry working level of detail and create balancing transactions;
(2) Compare the estimated balancing transactions with the unallocated commodity;
(3) Scale the balancing transactions to fully allocate commodity output, taxes, transport costs, and margin;
(4) Adjust industry GOS so that inputs are equal to industry output;
(5) Evaluate industry inputs and GOS after balancing; and
(6) Perform final checks prior to preparing the use table.

(1) *Identify missing transactions.* Missing transactions are industry inputs that should exist but have not yet been estimated. Analysts need to review the industry inputs at the commodity level and search for any inputs that are likely to be used by the industry but are not among the currently purchased inputs. These inputs can be identified in a number of ways, including the following: By reviewing the list of unallocated commodities and asking whether this industry should be purchasing any of those commodities, by consulting industry experts about what goods and services are typically used by the industry, and by comparing the input structure of the industry in the current benchmark with that in the prior benchmark. While evaluating inputs, keep in mind that inputs are required for both the primary and secondary products of the industry. For example, the inputs to the hotel industry should include inputs for the preparation of meals (a secondary product) as well as the inputs for hotel services (the primary product).

In the most recent two I-O benchmarks, this step relied heavily on comparisons of the input structure in the current benchmark with that of the prior benchmark. Such comparisons were used to identify inputs that were missing in the current benchmark. In addition, where the value of inputs in the current benchmark was much lower than in the prior benchmark, it was assumed a balancing transaction was needed. Ideally, before these comparisons are made, the prior benchmark's inputs should be scaled to adjust for between-benchmark changes in industry output and in prices (table 11.4).[4] However, relying on comparisons with prior benchmarks is still far from ideal. As the use of inputs changes over time, the composition of inputs from earlier benchmarks may move further and further away from an accurate description of the current composition. Thus, this method should be replaced with, or at least supplemented by, current information whenever possible.[5]

[4] Changes in real output and in prices were not accounted for in the last two benchmarks, so this method probably did not provide the best weights for balancing.

[5] For example, it would be better to estimate inputs by asking industry experts or by conducting special studies. However, time and resource constraints may limit the ability to conduct such analyses for every industry.

Table 11.4 Comparison of Current and Prior Benchmark Inputs and Proposed Balancing Records

COMMODITY	INDUSTRY A		
	PRIOR BENCHMARK (ADJUSTED FOR INDUSTRY OUTPUT AND PRICES)	CURRENT BENCHMARK	PROPOSED BALANCING TRANSACTION
A	500	600	0
B	150	10	140
C	55	0	55
D	250	200	0
E	0	15	0

The missing transactions, or balancing transactions, are created with an initial value. This value may be based on a "best guess," or it may be the value from the prior benchmark. The sum of these initial balancing estimates plus the previously estimated inputs for each industry should be consistent with—that is, nearly equal to—the sum of the estimates of the intermediate input category controls.[6] Although, these initial estimates will be adjusted by the balancing program, it is best to begin with estimates that fit the industry input controls because the initial weight for the input estimate will have a significant influence on the value that results from the computerized scaling.

The balancing transactions are loaded into the database and treated as all other transactions. In past benchmarks, all balancing records have been given an item code that begins with the commodity code and ends with the letters "BR." The balancing transactions can also have input category controls associated with them, but in the past, these have not been required. However, it is preferable to try and link balancing transactions to particular input category controls in order to maintain our link to the source data on inputs (this may be a requirement as the benchmark moves to full integration, and a much tighter conformance between input controls and transactions is required). For balancing transactions, the firm value is always the basic value (see Chapter 6, "Transactions").

(2) *Compare commodity unallocated with balancing transactions.* The balancing transactions are summed by commodity and compared with the unallocated output for commodities.[7] A large difference between the two values implies further evaluation is required prior to scaling the balancing records. The commodity and industry analysts must either re-evaluate their initial balancing transactions or create additional balancing transactions (see table 11.5).

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[6] Because balancing records are measured in basic prices and have no estimates for transport costs and margins, it is difficult to make a precise estimate of the sum of balancing transactions.

[7] A database program is run nightly to compute the unallocated commodity output, the unallocated transportation costs, taxes, and margins by commodity, and the sum of balance records for each commodity. These data are used to prorate the unallocated commodity supply in basic value to the balancing records.

Table 11.5 Sample Unallocated by Commodity

COMMODITY	UNALLOCATED	SUM OF BALANCING RECORDS	EVALUATION AND PROPOSED ACTION
A	10,150	500	Missing balancing records. Look for additional industries using this commodity. Scaling of the balancing records is not appropriate.
B	5,150	4,500	Okay.
C	300	3,005	Balancing records are too high. Re-evaluate balancing records by looking for records that should not be included or by scaling down transactions.
D	0	500	Balancing records should be eliminated.
E	6,500	0	Balancing records need to be created.

Comparison of balancing records with unallocated commodity output may indicate the need for further adjustments to the initial balance-record values. These adjustments require us to review the impact of balance records on the industry input structure and GOS. Further adjustments may be made to the balancing records (in essence we are attempting to balance the larger differences by hand). This process continues until the differences between the balancing records and the unallocated output are relatively small, at which point the balancing program can be run.

(3) *Scale the balancing records.* The computer program scales the balancing records so that the sum of the basic values of the balancing transactions is equal to the unallocated output.[8] Unallocated commodity taxes, transport costs, and wholesale margins by commodity are also distributed to the balancing records. For each of these costs, implicit rates for taxes, transport costs, and wholesale margins are calculated and applied to the basic value of the balancing records for the respective commodity (table 11.6).

[8] The database program prorates the unallocated supply to the balancing records. The program also calculates implicit transportation, tax, and margin rates by dividing the unallocated transportation, tax, or margin by the unallocated basic value supply. The rates are then applied to the prorated balancing-record basic value to distribute these other values.

Table 11.6 Balancing-Records Tax, Transport Cost, and Wholesale Margin Rates, Commodity A

TAX, TRANSPORT COSTS, OR WHOLESALE MARGIN	UNALLOCATED COMMODITY OUTPUT (BASIC VALUE)	UNALLOCATED TAX, TRANSPORT COSTS, OR MARGIN	IMPLICIT RATE
COMTAX	1,500	15	.010
RAIL	1,500	200	.133
TRUCK	1,500	350	.233
WHOLESALE MARGIN	1,500	300	.200
WHOLESALE TAX	1,500	30	.020

(4) *Adjust industry GOS so that inputs are equal to industry output.* The next step is to adjust the GOS balancing records. The balancing records in purchasers' prices are summed by industry, and the balancing record for GOS is adjusted by the value of that sum times negative one. For example, if the sum of the balancing-records purchasers' values for industry A is $550 million, then the GOS balancing record for industry A is adjusted by –$550 million.

(5) *Evaluate industry GOS and inputs after balancing.* Finally, the final input structure and the new GOS for each industry are evaluated to determine whether the input structure is reasonable and whether the GOS estimate reflects the expected value added by industry. This review includes the following: Compare direct coefficients from the prior benchmark with the current benchmark before and after balancing for each industry, compare the sum of transactions by input category with the input category control before and after balancing for each industry, and compare the estimated GOS and the actual GOS. This evaluation may indicate that further adjustments are required to the balancing records and that the transactions must be rebalanced.

(6) *Perform final checks.* As part of the final evaluation of the transactions data file, the following checks should be made prior to preparing the use table:

- No negative intermediate transactions,
- No negative margins or transport costs on intermediate transactions,
- Final uses in purchasers' prices are at previously agreed upon levels,
- Compensation and taxes on production and imports less subsidies are at previously agreed levels,
- Total value added equals total final product,
- All I-O codes included in the transaction are included in the concordance to publication level codes.

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CHAPTER 12: INPUT-OUTPUT MODELING AND APPLICATIONS

The input-output (I-O) accounts consist of a set of tables that provide a detailed model of the interworkings of the U.S. economy and that provide tools for analyzing these interworkings. This chapter first describes the I-O make and use tables, the national income and product account bridge tables, the capital flow table, and the import matrix. It then describes the four I-O requirements tables, shows how they are calculated, and discusses their analytical uses and additional applications.

As noted in Chapter 1, "Overview of the U.S. Input-Output Accounts," the input-output (I-O) accounts provide detailed statistics on economic processes and relationships. This information enables users to study changes in the structure of the U.S. economy and to assess the impact of specified events on economic activity.

There are two broad applications of the I-O accounts: As an economic accounting model and as an analytical model. The accounting model shows the relationship between the producing sectors, final demand, and income by industry. It shows industry purchases of goods and services that are used to produce commodities; in turn, these commodities serve as inputs for other industries or as purchases by final users. It also accounts for the income originating from each industry as a result of its production. This income is in the form of compensation, taxes on production and imports less subsidies, and gross operating surplus. In the I-O accounts, the standard make and use tables, the national income and product account (NIPA) "bridge" tables, and the capital flow table constitute the major elements of the accounting model.

The analytical model is derived from the accounting model and is used to show the relationship between final demand and industry production. Industry production is usually measured in terms of gross output, income, or employment. The model may be used to evaluate the interrelationships among industries and the relationships between industries and the commodities they use and produce. In the I-O accounts, the supplementary make and use tables, the requirements tables, and the import matrix constitute the major elements of the analytical model.

Make and use tables

The make table is prepared at a highly disaggregated level of detail, the so-called "working level."[1] Two make tables are prepared—the standard make table *before redefinitions* of secondary products, and the supplementary make table *after redefinitions* of secondary products (see Chapter 4, "Classification and Secondary

[1] The make table is prepared from detailed output control data and is aggregated to working-level industries and commodities. The output control data contain secondary-products data at the more detailed item level for nonmanufacturing but not for manufacturing, so preparation of an item-level make table is not possible.

Products"). The standard make table is derived first, and then the supplementary table is derived by subtracting the redefined secondary products from the producing industries and adding them to the industries in which they are defined as primary. Thus, the output of each industry in one table differs from the output of that industry in the other table by the amount of the redefinitions, but the output of each commodity is the same in both tables.

The transactions table, which underlies the use table, is prepared at the item level for commodities and at the industry working level for industries. In addition, *reallocations*—the intermediate and value-added inputs required to produce the redefined output—are also prepared at the item and industry working level. The transactions tables are aggregated to the use tables at the working level for commodities and industries. Two use tables are prepared—the standard use table *before redefinitions and reallocations*, and the supplementary use table *after redefinitions and reallocations*. The standard use table is derived first by aggregating the transactions table to commodities and industries. Then, the supplemental use table is derived by subtracting reallocations from industries whose output is redefined out and by adding those reallocation inputs to the industries who receive the redefined output. (For more information, see Chapter 9, "Reallocations.")

The make and use tables at the working level of detail are far too disaggregated to be practical for publication and doing so may imply an overstated degree of accuracy in the data. Instead, a concordance is prepared in order to aggregate the working-level tables to the three levels used for publication: *Detailed*—the most detailed published level, usually around 500 industries and commodities; *summary*—the publication level for the *Survey of Current Business*, usually around 100 industries and commodities; and *sector*— approximately the North American Industry Classification System (NAICS) sectors, about 15 industries and commodities.

As much as possible, the concordance attempts to adhere to the fundamental I-O principle of homogeneity, which argues against combining industries with widely differing input structures.[2] However, construction of the published tables is constrained by several practicalities—such as publication limitations on the number of industries/commodities, the relative size and importance of industries, consistency with prior tables,[3] and the accuracy of the underlying data used to derive the inputs to industries and the distribution of commodities to industries and final uses.[4] The tables must provide a reasonably sized economic model.[5] Factors to be considered in aggregating include relative size and importance; small industries should be combined with other industries, and sectors that are growing or rapidly changing should have more detail than those that are more static or not as relevant to analyzing changes in the current economy. The desire for consistency with prior

[2] According to this principle, each industry's output is produced with a unique set of inputs (see chapter 1). In the 1997 benchmark, the industry aggregations were based on the NAICS coding structure, with little analysis of the input structures of the industries prior to aggregation.

[3] The benchmark tables from 1963 through 1992 used a coding structure that was based on the Standard Industrial Classification system, which enabled comparisons of industries across the benchmark tables. However, the 1997 benchmark table was the first based on NAICS, and so its coding structure is not consistent with the earlier tables.

I-O tables may affect the aggregation of industries; in order to evaluate industries over time, it is useful to limit changes in the aggregation structure. Finally, data should not be published at a level of detail that implies a degree of accuracy that cannot be supported by the underlying source data.[6]

NIPA bridge tables

In addition to the make and use tables, tables are prepared that show the relationship between the personal consumption expenditures (PCE) and private equipment and software (PES) categories in the NIPAs and the I-O accounts. These tables, usually referred to as bridge tables, show the commodities included in each expenditure category and the value of the transactions in producers' and purchasers' prices as well as the associated transportation costs and trade margins. These tables are frequently used by analysts to estimate the current composition of the NIPA PCE and PES expenditure categories.

A sample portion of the 1997 PCE bridge table for the PCE category "kitchen and other household appliances" is shown in table 12.1. The total for purchasers' value, $26,314 million, is the NIPA expenditure value published in NIPA tables 2.4.5 and 2.5.5.[7] The rows of the bridge table show the commodities included in the PCE category, the producers' value of the commodity, and the transport costs and the trade margins (including sales taxes) that are required to move the commodity from producer to consumer. For example, the producers' value of household vacuum cleaners sold to PCE was $1,996 million; $3 million of rail transportation and $68 million of truck transportation was used to transport the vacuums to consumers; wholesalers marked up the costs by $278 million, and retailers, by $850 million; and households paid $3,194 million for the vacuums.

The bridge tables enable users to see the commodities that define the NIPA expenditure categories and to estimate the commodity composition of an expenditure category for years other than the benchmark year. For example, in 2003, the NIPA estimate of expenditures for kitchen and other household appliances is $33,100 million. Using proportions calculated from the I-O bridge table, the pro-

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[4] The concordance maps the final uses to the broad NIPA categories of personal consumption expenditures, private fixed investment, inventory, exports, imports and the various levels of government (Federal defense expenditures and investment, Federal general government expenditures and investment, state and local education expenditures and investment, and other state and local government expenditures and investment).

[5] Until the preparation of the 1987 benchmark table, the number of industries and commodities was dependent on the amount of information on industries collected in the Economic Census. Beginning with the 1987 Economic Census, the number of industries covered has increased, reaching over 1,000 in the 2002 Census. The publication of this many industries in the I-O tables is not possible, partly due to practicality and partly due to data quality. For the past several tables, BEA has chosen to keep the number of industries/commodities at around 500.

[6] See BEA's "Information Quality Guidelines" at http://www.bea.gov/bea/about/infoqual.htm. Further research is required to develop methods of aggregation that meet these requirements.

[7] The values in an I-O bridge table may differ from the current published NIPA values because of NIPA revisions that take place after the completion of the I-O benchmark.

ducers' values and associated transportation costs and trade margins for each commodity can be estimated. In 1997, the producers' value for vacuum cleaners accounted for 7.58 percent of total kitchen appliances (1,996/26,314); rail transportation accounted for .01 percent (3/26,314); truck transportation, for .26 percent (68/26,314); wholesale, for 1.05 percent (278/26,314); retail, for 3.23 percent (850/26,314); and purchasers' value, for 12.14 percent (3,194/26,314). Applying these percentages to the 2003 NIPA value of $33,100 million for the category gives us estimates of the values for vacuum cleaners in 2003. For example, the estimated producers' value for 2003 is $2,510 million (.0758x33,100).

Table 12.1 Kitchen and Other Household Appliances from the 1997 PCE Bridge Table
(Millions of dollars)

COMMODITY CODE	COMMODITY DESCRIPTION	PRODUCERS' VALUE	TRANSPORTATION COSTS						TRADE MARGINS		PURCHASERS' VALUE
			RAIL	TRUCK	WATER	AIR	PIPE	GAS PIPE	WHOLESALE MARGIN	RETAIL MARGIN	
331491	Nonferrous metal, except copper and aluminum, shaping	57	0	0	0	1	0	0	6	23	87
333298	All other industrial machinery	284	0	0	0	0	0	0	46	120	450
333414	Heating equipment, except warm air furnaces	758	8	24	0	3	0	0	138	338	1268
333415	AC, refrigeration, and forced air heating	843	0	11	0	1	0	0	145	363	1363
335211	Electric housewares and household fans	2390	2	96	0	7	0	0	374	1016	3885
335212	Household vacuum cleaners	1996	3	68	0	0	0	0	278	850	3194
335221	Household cooking appliances	3148	2	88	0	0	0	0	448	1349	5035
335222	Household refrigerators and home freezers	2782	4	106	0	0	0	0	341	1172	4405
335224	Household laundry equipment	2819	3	92	0	5	0	0	353	1185	4456
335228	Other major household appliances	1065	1	108	0	0	0	0	298	534	2006
335999	Miscellaneous electrical equipment	15	0	0	0	0	0	0	3	7	25
S00402	Used and secondhand goods	40	0	0	0	0	0	0	0	102	141
	TOTAL	**16198**	**23**	**593**	**0**	**16**	**0**	**0**	**2429**	**7057**	**26314**

Capital flow table

The capital flow table expands the data contained in the private fixed investment (PFI) column of the I-O use table to show the investment in equipment, software, and structures by industries. PFI in the capital flow table differs slightly from PFI in the use table. The capital flow table presents only investment in new equipment, software, and structures and does not show purchases of used assets. The structures portion of the table includes only real estate commissions on the

sales of new structures. PFI in the use table includes the sale of used equipment and structures and real estate commissions on existing structures.[8]

Import matrix

I-O tables are frequently used to calculate the impact of changes in final uses on domestic output, income, or employment of industries using the total requirements matrix. However, the I-O tables used to develop these requirements include commodity inputs from foreign as well as domestic sources. Before calculating the domestic portion of the requirements, the industry inputs from foreign sources need to be removed. This removal is accomplished using an import matrix—that is, a matrix that shows the use of the imports by industries and final uses.[9]

Unfortunately, data on the use of imports by industries and final uses are not available from our statistical data sources. Thus, to develop an import matrix, we make the assumption that imports are used in the same proportion across all industries and final uses. This assumption enables us to calculate an import ratio—that is, imports used as a share of the total use of the respective good or service—for each item. The import ratio is equal to imports divided by the domestic supply (domestic shipments or receipts plus imports less exports and change in private inventories) of the item.

The sum of imports in the import matrix is larger than the total imports in the use table because the import matrix values imports at domestic port value without the offsets for domestically produced transportation and duty that are included in the use table (see the section “Exports and imports in the use table” in Chapter 7, “Foreign Transactions”). In the import matrix, we are interested in showing the imports at their substitution value for domestically produced goods or services—that is, at their value entering the U.S. economy. The use of imports by industries is valued at the domestic port value of imports plus customs duty, which is approximately equivalent to basic prices.

Two matrices are prepared, one consistent with the standard use table (before reallocation of inputs) and one consistent with the supplementary use table (after the reallocation of inputs). The import matrix is most frequently used with the supplementary use table to prepare domestic requirements tables, as covered later in this chapter.

The format of the import matrix is similar to that of the use table; the rows show the use of commodity imports by industries and by PCE, PFI, and government, and the columns show industry inputs of imported commodities.[10] The import matrix does not include a column for exports (by definition, all exports are

[8] For more information, see Douglas S. Meade, Stanislaw J. Rzeznik, and Darlene C. Robinson-Smith, “Business Investment by Industry in the U.S. Economy for 1997,” *Survey of Current Business* 83 (November 2003): 18-70.

[9] For each I-O benchmark, an import matrix of the benchmark table is prepared for use by the Regional Economic Analysis Division for their Regional Input-Output Multiplier (RIMS) model. For the 1997 benchmark, the import matrix was also made available to the public for the first time.

from domestically produced products) or for imports. It also does not include value-added rows.

Tables 12.2 through 12.4 show a sample use table, import matrix, and domestic inputs table. The import matrix shows the use of imports by industries and final uses. The domestic inputs table shows the use of domestically produced goods and services by industries and final uses. This table is the result of subtracting the import matrix from the use table.

Table 12.2 Sample Use Table

	INDUSTRIES		TOTAL INTER-MEDIATE	FINAL USES					COMMODITY OUTPUT
	A	B		PCE	GOVERNMENT	IMPORTS	EXPORTS	TOTAL	
COMMODITY A	10	50	60	10	5	-7	2	10	70
COMMODITY B	34	18	52	31	12	-16	4	31	83
TOTAL INTERMEDIATE	**44**	**68**	**112**						
VALUE ADDED	26	15						41	
INDUSTRY OUTPUT	70	83		41	17	-23	6		153

[10] Imports are not distributed to change in private inventories. This arbitrary exclusion was made for the sake of simplicity.

Table 12.3 Sample Import Matrix

	Industries		Total intermediate	Final uses			
	A	B		PCE	Government	Total	Total imports
Commodity A	1	5	6	1	0	1	7
Commodity B	6	4	10	4	2	6	16
Total imports	**7**	**9**	**16**	**5**	**2**	**7**	**23**

Table 12.4 Sample Domestic Inputs Table

	Industries		Total intermediate	Final uses				Total
	A	B		PCE	Government	Exports	Total	
Commodity A	9	45	54	9	5	2	16	70
Commodity B	28	14	42	27	10	4	41	83
Total intermediate	**37**	**59**	**96**					
Industry output	70	83		36	15	6		

Requirements tables

The I-O requirements tables are analytical tables that are designed to show the level of industry gross output that is required to produce a specified level of final uses. The industry gross output can be for all industries or for each industry in the model, and the specified final uses can be for all commodities or for one or more commodities purchased by final demand. For example, the 1997 benchmark I-O analytical model shows that the production of a $20,000 car for sale to final uses will require approximately $53,000 of gross output by all domestic industries. The shares of this output range from $16,000 for auto manufacturers, $8,700 for auto parts manufacturing, and $3,700 for retail trade, down to $20 for livestock farms.[11]

There are four requirements tables—a direct requirements table and three total requirements tables.

The *direct requirements table* shows the amount of a commodity that is required by an industry to produce a dollar of the industry's output.

- The *commodity-by-commodity total requirements table* shows the production required, both directly and indirectly, of the commodity at the beginning of each row per dollar of delivery to final use of the commodity at the top of the column.

[11] These figures are derived from the 1997 benchmark summary industry-by-commodity total requirements table. The $20,000 purchasers' price was separated into the basic price of the automobile and the retail trade margin using the 1997 PCE bridge table.

- The *industry-by-commodity total requirements table* shows the production required, both directly and indirectly, from the industry at the beginning of the row per dollar of delivery to final use of the commodity at the top of the column.
- The *industry-by-industry total requirements table* shows the production required, both directly and indirectly, from the industry at the beginning of the row per dollar of delivery to final use of the industry at the top of the column.

Mathematics of the requirements tables

The following mathematical example illustrates the derivation of the total requirements tables. In order to keep the description simple, we have assumed that we are beginning with a symmetric industry-by-industry table. A later example provides a more complex version of this process using the make and use tables.

The model begins with a formula that states output is equal to final demand plus industry inputs:

$x = y + F$, where x = output, y = final uses, and F = industry inputs.

To simplify the formula and enable algebraic manipulation, industry inputs are expressed in terms of portions of industry output by dividing industry inputs by industry output:

$A = F/x$, where A is the coefficient matrix—that is, inputs (F) as a proportion of industry output (x). This formula is usually referred to as the direct coefficients or the direct requirements matrix.

Rearranging the coefficient formula in terms of F gives:

$Ax = F$.

Substituting for F in the first formula expresses the equation in similar terms:

$x = Ax + y$.

The formula is rearranged to solve for y, in order to show the relationship between output and final uses. The formula is then solved to describe output as a function of final uses:

$x-Ax= y$.

This formula can be simplified by applying the distributive rule:

$(I-A)x = y$, where I is an identity matrix of 1's.

Finally, the matrix is solved for x in terms of y by dividing (I-A) into both sides of the equation. In matrix algebra, the division is accomplished by inverting the matrix. In I-O terminology, the inverse—that is, the function that relates final uses to output—is referred to as the total requirements matrix:[12]

$$x = (I-A)^{-1}y.$$

Deriving the requirements tables from the make and use tables

The above illustration of the total requirements matrix begins with a square industry-by-industry matrix—that is, the number of rows and the number of columns in the matrix are the same and the sums of the corresponding rows and columns are equal. The square matrix is usually referred to as a symmetric I-O table. However, the make and use tables prepared for the I-O accounts are not square, and they have commodities and industries for rows and columns. In addition, the U.S. I-O tables include scrap, which is sold as a commodity but is produced only as a byproduct of industry output. These problems must be resolved before the total requirements matrices can be derived.

The supplementary make and use tables, which already incorporate the "redefined" secondary products, are transformed into a symmetric I-O table (either commodity-by-commodity or industry-by-industry) by making adjustments to the inputs for the nonredefined secondary products—that is, the "reclassified" and "other secondary products." These adjustments are similar to those that were made in "redefining" secondary products in order to derive the supplementary make and use tables (for an explanation, see chapter 4). By identifying and moving the associated inputs for the nonredefined secondary products, we are able to derive a symmetric table of industries using industry products (industry-by-industry) and a symmetric table showing commodity inputs to producing commodities (commodity-by-commodity).[13]

As discussed in chapter 4, two possible assumptions are suggested regarding the identification and treatment of inputs for secondary products—the industry-technology assumption and the commodity-technology assumption. Under the industry-technology assumption, the best estimate of the inputs used for secondary products comes from the producing industry. Thus, for example, the inputs required to produce ice cream by the milk industry would be the same as those used for the entire milk industry. A benefit of using this assumption is that the inputs related to the secondary products are estimated as a portion of the total

[12] For a complete description of the mathematics of I-O, see *Handbook of Input-Output Table Compilation and Analysis,* United Nations, 1999.

[13] For a detailed discussion of secondary products and their treatment in the preparation of symmetric tables, see Jiemin Guo, Ann M. Lawson, and Mark A. Planting, "From Make-Use to Symmetric I-O Tables: An Assessment of Alternative Technology Assumptions," a paper presented at the 14th International Conference on Input-Output Techniques, October 10-15, 2002, Montreal, Canada. This paper is available on BEA's website at http://www.bea.gov/bea/dn2/iedguide.htm#bioa.

inputs to the producing industry, so the values of these inputs will never exceed the total values of the industry's inputs.

Under the commodity-technology assumption, the best estimate of inputs for secondary products comes from the inputs to the industry in which the product is primary. Thus, in contrast to the example above, the inputs required to produce ice cream by the milk industry would be the same inputs as those used by the ice cream industry. However, practical problems may arise because of the differences in inputs. For example, the inputs for producing ice cream that need to be reallocated from the milk industry may not be included in, or may have a substantially different composition from, the total inputs to the milk industry, so the values of these inputs may exceed the total values of the inputs to the milk industry.

The U.S. I-O accounts make use of both assumptions—a hybrid approach. In preparing the supplementary make and use tables, BEA uses an approximation of the commodity-technology assumption to identify the reallocations.[14] In deriving the symmetric I-O table from the supplementary make and use tables, BEA uses the industry-technology assumption to produce the symmetric table for calculating the inverse.

All of the calculations that are made to derive the total requirements tables are done using proportions or coefficients. We do not produce symmetric tables in dollars: Such tables would imply that we have statistical data showing the dollar value of inputs of commodities required to produce commodity output or the dollar value of industry inputs required to produce industry output. The following description of the derivation of the requirements tables references the variables and symbols used in the appendix "Mathematical Derivation of the Total Requirements Tables for Input-Output Analysis" at the end of this chapter.

The first step is to calculate the direct requirements table (matrix B in the appendix) from the use table (matrix U in the appendix). The industry inputs in the use table (table 12.5) are divided by each industry's output to derive the coefficients for the direct requirements table (table 12.6).

Table 12.5 Sample Use Table

COMMODITY/INDUSTRY	A	B	C	FINAL DEMAND	TOTAL COMMODITY OUTPUT
A	50	120	120	40	330
B	180	30	60	130	400
C	50	150	50	20	270
SCRAP	1	3	1	0	5
VALUE ADDED	47	109	34		190
TOTAL INDUSTRY OUTPUT	**328**	**412**	**265**	**190**	

[14] Reallocations use an input structure that is appropriate for the redefined output and not necessarily all inputs of the primary industry.

Table 12.6 Direct Requirements Table

COMMODITY/INDUSTRY	A	B	C
A	0.152	0.291	0.453
B	0.549	0.073	0.226
C	0.152	0.364	0.189
SCRAP	0.003	0.007	0.004
VALUE ADDED	0.143	0.265	0.128
TOTAL INDUSTRY OUTPUT	**1.000**	**1.000**	**1.000**

The second step is to derive the market shares matrix (appendix matrix D), which shows the proportion of commodity output produced by each industry. This matrix is derived from the make matrix (appendix matrix V) (table 12.7) by dividing each row by the total commodity output (table 12.8). After adjustments to remove scrap, which are described in the next paragraph, this matrix is used to calculate the inputs used to produce secondary products by industries by applying the industry-technology assumption.[15]

Table 12.7 Sample Make Table

INDUSTRY/COMMODITY	A	B	C	SCRAP	TOTAL INDUSTRY OUTPUT
A	300	25	0	3	328
B	30	360	20	2	412
C	0	15	250	0	265
TOTAL COMMODITY OUTPUT	**330**	**400**	**270**	**5**	

[15] Since 1992, the published I-O tables are derived by applying the industry-technology assumption at the aggregation level shown in the particular table. Thus, the commodity proportions are calculated at the detailed level for the detailed use table, at the summary level for the summary table, and so on. Previously, the secondary-product adjustment was always calculated at the detailed level and then aggregated to the higher levels. Although the earlier method is technically superior, BEA made the change so that users could produce inverses that are consistent with the published versions. Most users were not able to manipulate matrices as large as BEA's most detailed tables and thus were not able to duplicate our process for secondary products.

Table 12.8 Market Shares Matrix

INDUSTRY/COMMODITY	A	B	C
A	0.909	0.063	0.000
B	0.091	0.900	0.074
C	0.000	0.038	0.926
TOTAL COMMODITY OUTPUT	**1.000**	**1.000**	**1.000**

The third step is to make adjustments for scrap. The I-O accounts include a commodity for scrap, which is a byproduct of industry production. No industry produces scrap on demand; rather, it is the result of production to meet other demands. In order to make the I-O model work correctly—that is, not requiring industry output because of a demand for scrap inputs—we have to eliminate scrap as a secondary product. At the same time, we must also keep industry output at the same level. This adjustment is accomplished by calculating the ratio of nonscrap output to industry output for each industry and then applying these ratios to the market shares matrix in order to account for total industry output (table 12.9).[16]

Table 12.9 Derivation of the Nonscrap Ratio

INDUSTRY/ COMMODITY	A	B	C	SCRAP	TOTAL INDUSTRY OUTPUT (A)	INDUSTRY OUTPUT EXCLUDING SCRAP (B)	NONSCRAP RATIO (A/B)
A	300	25	0	3	328	325	0.991
B	30	360	20	2	412	410	0.995
C	0	15	250	0	265	265	1.000
TOTAL COMMODITY OUTPUT	**330**	**400**	**270**	**5**			

The market shares matrix is adjusted for scrap by dividing each row coefficient by the nonscrap ratio for that industry. In the resulting transformation matrix (appendix matrix W), the implicit commodity output of each industry has been increased. For example, the industry A/commodity A market-share coefficient of .909 is divided by the industry A nonscrap ratio of .991 to obtain an implicit market-share coefficient of .917 (table 12.10).

[16] The actual calculation is accomplished by adjusting make-table coefficients rather than the values.

Table 12.10 Transformation Matrix

INDUSTRY/ COMMODITY	A	B	C
A	0.917	0.063	0.000
B	0.091	0.904	0.074
C	0.000	0.038	0.926

The fourth step is to create the commodity-by-commodity direct requirements matrix by multiplying the commodity-by-industry direct requirements (B) times the transformation matrix (W). The transformation matrix is used to convert the commodity-by-industry direct requirements table (table 12.6) into a symmetric direct requirements table. The transformation matrix provides the proportions of the inputs to an industry that are needed to produce that industry's primary and secondary products. For example, industry A produces .917 of commodity A, therefore .917 of the inputs to the industry are inputs to make commodity A; industry B produces .091 of commodity A, therefore .091 of industry B inputs are used to make commodity A; industry C does not produce commodity A, therefore no inputs from industry C are included to produce commodity A (table 12.10). The result of applying the transformation matrix is commodity A needs .166 inputs from commodity A (.166 = (.152 * .917) + (.291 * .091) + (.453 * 0.0)) (table 12.11).

Table 12.11 Commodity-by-Commodity Direct Requirements

COMMODITY/COMMODITY	A	B	C
A	0.166	0.290	0.441
B	0.510	0.109	0.215
C	0.173	0.346	0.202

The fifth step is the calculation of the commodity-by-commodity total requirements matrix. We convert the commodity-by-industry direct requirements into commodity-by-commodity total requirements because the commodity-by-commodity matrix is considered more appropriate if it focuses on the total commodities that are needed to create commodities for final consumption. Following the formulas in the appendix, the direct requirements matrix is subtracted from an identity matrix—a matrix with 1's in the diagonals and zeros in all other cells (table 12.12), resulting in the identity matrix less commodity-by-commodity direct requirements (I-BW) (table 12.13). This table is then inverted to derive the commodity-by-commodity total requirements table (table 12.14).

Table 12.12 Identity Matrix

COMMODITY/COMMODITY	A	B	C
A	1	0	0
B	0	1	0
C	0	0	1

Table 12.13 Identity Matrix Less Commodity-by-Commodity Direct Requirements

COMMODITY/COMMODITY	A	B	C
A	0.834	-0.290	-0.441
B	-0.510	0.891	-0.215
C	-0.173	-0.346	0.798

Table 12.14 Commodity-by-Commodity Total Requirements

COMMODITY/COMMODITY	A	B	C
A	2.487	1.500	1.778
B	1.736	2.300	1.579
C	1.292	1.322	2.323

The sixth step is to create the industry-by-commodity total requirements. These can be calculated using the transformation matrix and the commodity-by-commodity total requirements matrix. By multiplying the transformation matrix (table 12.10) times the commodity-by-commodity total requirements matrix (table 12.14), we get the industry-by-commodity total requirements matrix (table 12.15).

Table 12.15 Industry-by-Commodity Total Requirements

INDUSTRY/COMMODITY	A	B	C
A	2.391	1.521	1.731
B	1.893	2.316	1.763
C	1.261	1.310	2.210

The final step is to test that the total requirements tables are correct. Each total requirements table should be multiplied times the total final uses by commodity. The commodity-by-commodity total requirements times final uses should equal the total commodity output for each commodity. The industry-by-commodity total requirements times the total final uses should equal the total industry output for each industry.

Uses of the requirements tables

The direct requirements table—sometimes referred to as the direct coefficients table—shows the proportion of inputs required to produce a dollar of an industry's output. The table is calculated by dividing each row element of the matrix by the column sum for each industry in the matrix. For example, from the 1997 benchmark summary table for each dollar of industry output, the crop-production industry uses 5.4 cents of crop production, 6.6 cents of agriculture services, and so forth.

The total requirements tables, as mentioned previously, relate final uses to gross output. For each dollar spent on final uses, they show the total output required by industries to meet that demand. These tables are usually prepared in one of three forms: industry-by-commodity, commodity-by-commodity, or industry-by-industry (see table 12.16).

Table 12.16 Total Requirements Tables and Uses

TABLE	USE
INDUSTRY-BY-COMMODITY	Final demand is in terms of commodities, and we are interested in deriving the industry output that is required. This table is the most useful because most of our information on final uses is in terms of commodities, and most of our other data—for example, employment—is in terms of industries.
COMMODITY-BY-COMMODITY	Final demand is in terms of commodities, and we are interested in deriving the commodity output that is required.
INDUSTRY-BY-INDUSTRY	Final demand is in terms of industry, and we are interested in deriving the industry output that is required.

The total requirements tables provide output requirements. For the industry-by-commodity requirements table, an output requirement is defined as the total value of output in all industries of the economy that is necessary to satisfy one unit of final demand for a selected commodity. The output requirement for a commodity is the column sum of the total requirements table for that commodity. Output requirements can be calculated for each form of the total requirements table. The output requirement is also referred to as the backward linkage.

I-O models are most commonly used to trace specified changes in final demand through the economy over short periods of time. In this function, they are called impact models. The Leontief model, $x = (I - A)^{-1} y$, is widely used in economic-impact analysis. In this model, final demand, *y,* is linked to total output, *x,* through the interindustry linkages represented by total requirement coefficients, $(I-A)^{-1}$. The relationship of final demand and total output can be illustrated using a simplified I-O table consisting of only two industries/commodities, goods and services:

$$x = (I - A)^{-1} y$$

$$x = \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} 1.7406 & 0.2002 \\ 0.4402 & 1.3549 \end{bmatrix} * \begin{bmatrix} 1803 \\ 4431 \end{bmatrix}$$

$$= \begin{bmatrix} 1.7406 * 1803 + 0.2002 * 4431 \\ 0.4402 * 1803 + 1.3549 * 4431 \end{bmatrix}$$

$$= \begin{bmatrix} 3138 + 887 \\ 794 + 6004 \end{bmatrix} = \begin{bmatrix} 4025 \\ 6798 \end{bmatrix}$$

where x is output, $(I-A)^{-1}$ is the total requirements table, and y is final demand. The example shows the value of output of goods ($4,025 billion) and services ($6,798 billion) that must be produced in order to satisfy the final demand for goods ($1,803 billion) and services ($4,431 billion).

In the total requirements table, the diagonal cells (the upper-left coefficient and the lower-right coefficient in the example) are almost always greater than one, indicating that in order to meet the one dollar of final demand more than one dollar of output is required of the primary industry.[17] The off-diagonal cells (the lower-left coefficient and the upper-right coefficient) are always less than one.

The relative size of the coefficient is an indicator of the strength of the relationship between final demand and output; the larger the coefficient the stronger the relationship. These relationships can be summarized using backward (the column sums of the total requirements table) and forward linkages (the row sums of the total requirements tables). Backward linkages show the relative strength of final demand on output; the higher the value, the stronger the linkage. In the example, the backward linkage for goods is 2.1808 (1.7406+.4402) Forward linkages show the strength of the particular industry's tie to final-demand changes; the higher the value the stronger the tie. In the example, the forward linkage for goods is 1.9408 (1.7406+.2002).

Economic-impact analysis in the I-O framework consists of modeling the changes in total output that are needed to satisfy a change in final demand. Using our same formula:

$\Delta x = (I - A)^{-1}\Delta y$, where Δy is the change in final demand, and Δx is the change in total output.

Continuing the above example, the following scenarios illustrate the application for impact analysis.

Impact analysis scenario 1: Assume final demand for goods increases 10 percent, or $180 billion ($1,803 x.10), and final demand for services is unchanged,

[17] The diagonal may be less than one if a large part of the commodity output is from secondary products. Examples include advertising and electric utilities in the industry-by-commodity total requirements table.

$$\Delta y = \begin{bmatrix} 180 \\ 0 \end{bmatrix}.$$

$$\begin{aligned} \Delta x &= (I - A)^{-1}\Delta y \\ \begin{bmatrix} \Delta x_1 \\ \Delta x_2 \end{bmatrix} &= \begin{bmatrix} 1.7406 & 0.2002 \\ 0.4402 & 1.3549 \end{bmatrix} * \begin{bmatrix} 180 \\ 0 \end{bmatrix} \\ &= \begin{bmatrix} 1.7406 * 180 + 0.2002 * 0 \\ 0.4402 * 180 + 1.3549 * 0 \end{bmatrix} \\ &= \begin{bmatrix} 313 \\ 79 \end{bmatrix} \end{aligned}$$

The I-O model shows that total goods output increases $313 billion, which consists of the $180 billion of production to satisfy the increase in final demand and $133 billion ($313-$180) of direct and indirect requirements, the output required by the goods industry to support its final production. In addition, total services output increases $79 billion, even though there was no increase in the final demand for services. This indirect output is required as input to the goods industry to support the increase in the production of goods for final use.

Impact analysis scenario 2: Assume final demand for services increases 10 percent, or $443 billion ($4,431 x .10), and final demand for goods is unchanged,

$$\Delta y = \begin{bmatrix} 0 \\ 443 \end{bmatrix}.$$

$$\begin{aligned} \Delta x &= (I - A)^{-1}\Delta y \\ \begin{bmatrix} \Delta x_1 \\ \Delta x_2 \end{bmatrix} &= \begin{bmatrix} 1.7406 & 0.2002 \\ 0.4402 & 1.3549 \end{bmatrix} * \begin{bmatrix} 0 \\ 443 \end{bmatrix} \\ &= \begin{bmatrix} 1.7406 * 0 + 0.2002 * 443 \\ 0.4402 * 0 + 1.3549 * 443 \end{bmatrix} \\ &= \begin{bmatrix} 89 \\ 600 \end{bmatrix} \end{aligned}$$

The model shows that total goods output increases by $89 billion, even though there is no increase in the final demand for goods; all of this output is indirect output that is required to support the increase in the demand for services. Total services output increases $600 billion. The initial change is $443 billion, and the direct and indirect requirements are $157 billion ($600-$443).

Impact analysis scenario 3: Assume final demand for both goods and services increases 10 percent. Goods final demand increases $180 billion ($1,803x.10), and services final demand increases $443 billion ($4,431 x .10),

$$\Delta y = \begin{bmatrix} 180 \\ 443 \end{bmatrix}.$$

$$\Delta x = (I - A)^{-1}\Delta y$$

$$\begin{bmatrix} \Delta x_1 \\ \Delta x_2 \end{bmatrix} = \begin{bmatrix} 1.7406 & 0.2002 \\ 0.4402 & 1.3549 \end{bmatrix} * \begin{bmatrix} 180 \\ 443 \end{bmatrix}$$

$$= \begin{bmatrix} 1.7406 * 180 + 0.2002 * 443 \\ 0.4402 * 180 + 1.3549 * 443 \end{bmatrix}$$

$$= \begin{bmatrix} 313 + 89 \\ 79 + 600 \end{bmatrix} = \begin{bmatrix} 402 \\ 679 \end{bmatrix}$$

The model shows that to satisfy the 10-percent increase in final demand for both goods and services, goods output increases $402 billion, and services output increases $679 billion. As in the previous examples, the increases in total derived output consist of the increases in final demand and in the direct and indirect output required to produce that final demand. Note also that the increases in the output of goods and of services in scenario 3 equal the sum of the increases in scenarios 1 and 2.

Variations of the requirement tables

There are several types of the total requirement tables that can be derived. Among these are domestic output, employment, income, and endogenized household requirements.[18]

Domestic output requirements: These requirements are used when we want to estimate the domestic output of goods and services required to meet final demand. (The total output requirements estimate the total goods and services required from both domestic and foreign sources to meet final demand.) In order to calculate the domestic output requirements, the import matrix (described earlier in the chapter) must be subtracted from the use table before calculating the total requirements matrix.

Employment requirements: These requirements show the direct and indirect impact of changes in final demand on employment. They are derived from the total requirements tables. First, an employee-per-dollar-of-output ratio is calculated. This ratio is then applied to the output requirement for each industry to derive the

[18] For a more complete description of the uses of I-O tables for economic analysis, see Ronald E. Miller and Peter D. Blair, *Input-Output Analysis: Foundations and Extensions*, Prentice-Hall, Englewood Cliffs, New Jersey, 1985.

employment requirement (by multiplying the industry employment ratio times the respective total requirements row). The employment requirements can be calculated from the industry-by-commodity or the industry-by-industry total requirements tables (either the total or domestic requirements tables) depending on the assumptions used for the analysis. Although the employee-per-industry-output ratio is constant, the application to the different types of requirements matrices will yield different employment requirements. Employment requirements are usually calculated in conjunction with the domestic requirements matrix.

Income requirements: These requirements show the direct and indirect impact of changes in final demand on income, which may be measured as either compensation or total value added. They are derived from the total requirements tables. First, an income-per-dollar-of-output ratio is calculated for each industry. This ratio is then applied to the output requirements for each industry to derive an income requirement. As with the employment requirements, the income requirement can be calculated from the industry-by-commodity or the industry-by-industry total requirements tables (either the total or the domestic requirements tables), depending on the assumptions used for the analysis.

Endogenized households: These requirements, sometimes referred to as "type II requirements," attempt to capture the effect of changes in household income on total expenditures. To calculate these requirements, compensation plus proprietors' income and PCE are included in the intermediate portion of the use table. The inclusion of households in intermediate produces requirements that take into account the feedback of changes in household income on household expenditures. Endogenized households can be used with each type of requirement discussed above—domestic or total output, employment, and income requirements.

Other uses of I-O models

The I-O tables are frequently used directly as impact models or as part of larger economic models. Examples include BEA's Regional I-O Modeling System (RIMS II), the Minnesota Implan Group (IMPLAN), employment projections by the Bureau of Labor Statistics (BLS), social accounting matrices (SAM), and computable general equilibrium models (CGE).

BEA's RIMS program prepares estimates of regional I-O multipliers for areas as small as counties. These multipliers are estimated by regionalizing direct domestic coefficients (direct coefficients calculated after subtracting imports) from the U.S. national I-O table to a specified geographic area using labor earnings as a factor.[19] RIMS multipliers—which include output, employment, and earnings multipliers—are prepared either with or without households endogenized.[20]

IMPLAN, another popular application of the I-O accounts, is also an impact model that regionalizes the data from the U.S. national tables using many variables.[21] The IMPLAN modeling system also includes a SAM system. A SAM is a matrix presentation of certain aspects of the national accounts and of other parts of the economy—such as employment by type of worker or income distributions—using the structural linkages provided by the I-O accounts.[22] CGE models are other modeling applications that are closely related to SAMs.[23] Groups prepar-

ing CGE models include the Economic Research Service of the United States Department of Agriculture and the U.S. International Trade Commission.

BLS employment projections are based on the I-O model. BLS maintains a series of I-O tables that are used in combination with occupation-by-industry data and forecasts of gross domestic product to estimate employment by occupation.[24]

[19] This factor is referred to in regional economics as a location quotient. The location quotient is calculated as "earnings in the industry in the region divided by total earnings in the region" divided by "earnings in the industry for the nation divided by total earnings in the nation." A location quotient is calculated for each industry. A quotient of less than one indicates that the region must import the product from outside the region, so the quotient is multiplied by the national direct industry coefficient to derive the regional coefficient. A quotient greater or equal to one indicates that the region is self sufficient for the particular input and the national direct industry coefficient is used.

[20] For a complete description of RIMS, see *Regional Multipliers: A User Handbook for the Regional Input-Output Modeling System (RIMS II), Third Edition* (Washington, DC: U.S. Government Printing Office, 1997). See also BEA's website at www.bea.gov/bea/regional/rims.

[21] For more information, see the IMPLAN website at www.implan.com.

[22] See the United Nations' description of the System of National Accounts at http://unstats.un.org/unsd/sna1993.

[23] For some further information, see http://wilcoxen.cp.maxwell.syr.edu/pages/389.html.

[24] For more information, see www.bls.gov/emp/home.htm#publications.

APPENDIX TO CHAPTER 12

Mathematical Derivation of the Total Requirements Tables for Input-Output Analysis[25]

From make and use tables, the following are defined:

q: A column vector in which each entry shows the total amount of the output of a commodity. It is a commodity-by-one vector.

g: A column vector in which each entry shows the total amount of each industry's output, including its production of scrap. It is an industry-by-one vector.

U: Intermediate portion of the use matrix in which the column shows for a given industry the amount of each commodity it uses—including noncomparable imports, scrap, and used and secondhand goods. This is a commodity-by-industry matrix.

V: Make matrix, in which the column shows for a given commodity the amount produced in each industry. This is an industry-by-commodity matrix. V has columns showing only zero entries for noncomparable imports and for scrap.

^: A symbol that when placed over a vector indicates a square matrix in which the elements of the vector appear on the main diagonal and zeros elsewhere.

B: Direct input coefficients matrix in which entries in each column show the amount of a commodity used by an industry per dollar of output of that industry. This is a commodity-by-industry matrix.

$$B = U\hat{g}^{-1} \quad (1)$$

[25] The notation and derivation of the tables presented here follow those recommended by the United Nations in the *System of National Accounts*. See *A System of National Accounts Studies in Methods*, Series F No. 2 Rev. 3, United Nations, New York, 1968; see also R. Stone, M. Bacharach, and J. Bates, "Input-Output Relationships, 1951-1966," *Programme for Growth*, Volume 3, London, Chapman and Hall, 1963.

D: A matrix in which entries in each column show, for a given commodity (excluding scrap), the proportion of the total output of that commodity produced in each industry. It is assumed that each commodity (other than scrap) is produced by the various industries in fixed proportions (*industry-technology assumption*). D is an industry-by-commodity matrix. D is also referred to as the market share matrix.

$$D = V\hat{q}^{-1} \quad (2)$$

i: Unit (summation) vector containing only l's.

I: Identity matrix, where I = $\hat{i}$.

e: A column vector in which each entry shows the total final demand purchases for each commodity from the use table.

h: A column vector in which each entry shows the total amount of each industry's production of scrap. Scrap is separated to prevent its use as an input from generating output in the industries in which it originates.

p: A column vector in which each entry shows the ratio of the value of scrap produced in each industry to the industry's total output.

W: An industry-by-commodity matrix in which the entries in each column show, for a given commodity, the proportion of the total output of that commodity produced in each industry adjusted for scrap produced by the industry. W is referred to as the transformation matrix.

From the above definitions, the following identities are derived:

$$q = Ui + e \quad (3)$$

$$g = Vi + h \quad (4)$$

Scrap output in each industry is proportional to total output of the industry, then:

$$h = \hat{p}g \quad (5)$$

The model expressed in equations (1) through (5) thus involves three constants (*B, D, p*) and six variables (*U, V, h, e, q, g*). The model solution is derived as follows:

From (1) and (3), we derive:

$$q = Bg + e \quad (6)$$

From (2) and (4), we derive:

$$g - h = Dq \quad (7)$$

Substituting (5) into (7) and solving for g:

$$g - \hat{p}g = Dq$$
$$(I - \hat{p})g = Dq$$

$$g = (I - \hat{p})^{-1} Dq \quad (8)$$

Let $(I - \hat{p})^{-1} D = W$, then

$$g = Wq \quad (9)$$

Substituting (9) into (6) and solving for *q*:

$$q = BWq + e$$

$$(I - BW)q = e$$

$$q = (I - BW)^{-1} e \quad (10)$$

Substituting (10) into (9) gives:

$$g = W(I - BW)^{-1} e \quad (11)$$

Therefore, three total requirements coefficients matrices are derived.[26]

[26] Tables are prepared at the detailed, summary, and sector levels of aggregation.

Commodity-by-commodity total requirements matrix:

$$(I - BW)^{-1} \quad (12)$$

which shows commodity output required per dollar of each commodity delivered to final users.

Industry-by-commodity total requirements matrix:

$$W(I - BW)^{-1} \quad (13)$$

which shows the industry output required per dollar of each commodity delivered to final users.

And the industry-by-industry total requirements matrix:

$$(I - WB)^{-1} \quad (14)$$

which shows the industry output required per dollar of each industry product delivered to final users.

GLOSSARY OF INPUT-OUTPUT TERMS

TERM	DEFINITION
Administrative data	Data tabulated as a byproduct of administrative programs of Federal and of state and local governments, such as the filing of corporate tax returns, the regulation of public utilities, and the issuance of building permits. Some estimates that are part of the Economic Census, generally those for small establishments (including nonemployers and small employers), are based on administrative data rather than on data collected directly.
Aggregation	The combining of detailed subgroups to form a larger group. For example, detailed I-O items are aggregated to I-O commodities, and detailed industries are aggregated to summary industries and sectors for publication.
Annual I-O accounts	Set of I-O tables—make tables, use tables, and direct and total requirements tables—that update the most recent benchmark I-O accounts. Annual tables incorporate less comprehensive and less reliable source data than those used for the benchmark tables.
Annual Retail Trade Survey (ARTS)	Provides detailed industry measures of retail company activities. Covers retail companies with one or more establishments that sell merchandise and associated services to final consumers (NAICS sectors 44-45). The first year the ARTS was collected on a NAICS basis was 1999. For ARTS, companies provide data on the dollar value of retail sales, sales taxes collected, inventories, method-of-inventory valuation, cost of purchases, and account-receivables balances. This information is used for the annual I-O accounts. In addition, information on sales taxes, inventories, and purchases are used to supplement Economic Census information for the benchmark I-O accounts.

TERM	DEFINITION
Annual Survey of Manufactures (ASM)	Provides sample estimates of statistics for all manufacturing establishments with one or more paid employees. Manufacturing is defined as the mechanical, physical, or chemical transformation of materials or substances into new products. The assembly of components into new products is also considered manufacturing, except when it is appropriately classified as construction. Establishments in the manufacturing sector are often described as plants, factories, or mills and typically use power-driven machines and materials-handling equipment. Also included in the manufacturing sector are some establishments that make products by hand, such as custom tailors and the makers of custom draperies. ASM is the source of product and industry data for the annual I-O and GDP-by-industry accounts. It is also the source of much of the expense data published as part of the Economic Census.
Annual (Wholesale) Trade Survey (ATS)	Provides detailed industry measures of sales and inventories for most wholesale trade activities. Covers companies with employees that are primarily engaged in merchant wholesale trade in the United States. These include merchant wholesalers that take title to the goods they sell, jobbers, industrial distributors, exporters, and importers. Beginning with data for 2003, manufacturers' sales branches and offices are also included. In 2007, the Census Bureau plans to add agents and brokers and wholesale electronic markets to the ATS. For the ATS, companies provide data on the dollar value of annual sales, end-of-year inventories and methods of inventory valuation, and purchases and gross margins. This information is used for the annual I-O accounts and to supplement Economic Census information for the benchmark I-O accounts.
Audit adjustment	(See "Tax-misreporting adjustment.")

TERM	DEFINITION
Auxiliaries	Auxiliaries are establishments whose employees are primarily engaged in providing various management or support services to one or more establishments of the same enterprise. Thus, within an enterprise, the auxiliary establishments are distinct from those establishments that are primarily engaged in producing goods and from those that are primarily engaged in providing services for personal or household use or for other enterprises. For example, an automotive repair shop or storage garage operated by an enterprise primarily for repair or storage of its own vehicles qualifies as an auxiliary. In addition to its primary activity of supporting the operations of the enterprise, an auxiliary may also provide services to the general public or to other business firms as a secondary activity. One major change introduced by NAICS is that auxiliaries are now treated as establishments classified by their production processes. Central Administrative Offices (CAOs) are included in NAICS 55, Management of Companies and Enterprises. Certain other auxiliaries are now treated as part of the industry that has a similar production function. For example, an accounting department that is a separate establishment would now be included in the accounting services industry. The services provided by auxiliaries are now included in output, measured by expenses to provide those services. Under the SIC, the services provided by auxiliary establishments were not included in output, and their expenses were included with the expenses of the industry served by the auxiliary.
Backward linkage	The interconnection of an industry to other industries from which it purchases its inputs in order to produce its output. It is measured as the proportion of intermediate consumption to the total output of the sector (direct backward linkage) or to the total output requirement (total backward linkage). An industry has significant backward linkages when its production of output requires substantial intermediate inputs from many other industries.
Basic price or basic value	The price received by the producer for goods or services that are sold. It excludes taxes collected by the producer from purchasers, such as taxes that liquor manufacturers collect on behalf of government and sales taxes collected by retailers. In the I-O tables prepared by BEA, basic prices have excluded subsidies and included duties on imports. The 1993 System of National Accounts expands this definition to include subsidies. (See “Basic value tables.”)

TERM	DEFINITION
Basic value tables	An alternative presentation of the I-O accounts recommended by the 1993 System of National Accounts. The basic value tables consist of a supply table and a use table. Industry and commodity output are measured in "basic value," which excludes commodity taxes and duties but includes subsidies. The supply table is a variation of the make table; it is transposed from the make table and includes imports, thus enabling the calculation of supply. The use table shows transactions in purchasers' value, and value added includes subsidies and excludes sales and excise taxes collected by the industry on behalf of government.
Benchmark I-O accounts	One of the major elements of the U.S. national and industry economic accounts. They provide detailed statistics on economic processes and relationships, and they provide essential information for other economic accounts. They are used to set the level of GDP in the NIPAs, and they provide commodity detail on the composition of the final-use categories. In addition, they provide information on what industries use to produce their output and on what commodities are produced by each industry. The benchmark I-O accounts consist of make tables, use tables, and direct and total requirements tables. They are prepared at about 5-year intervals, primarily from Economic Census data.
Best change	Best change is the most accurate measure of period-to-period movement in an economic statistic using the best available source data. Because the levels of economic time series are revised according to schedules, newly available source data are frequently incorporated on a best-change basis, rather than waiting until a benchmark or annual revision. Best-change is the method used in the NIPAs and annual industry accounts to prepare time series estimates. The best-change procedures are necessary because of the differences in the revision schedules for the statistical programs upon which the accounts are based.

TERM	DEFINITION
Best level	The most accurate value for an economic statistic at a specified point in time using the best available source data. This value may differ from the published value, which because of revision schedules, may not yet have incorporated those data. The benchmark I-O accounts provide best-level estimates for the NIPAs and other accounts. Best-level estimates produced for the NIPAs are used by the industry staff for comparison as part of preparing the estimates of final uses for the benchmark I-O accounts.
Bridge tables	Two tables, one for personal consumption expenditures and one for private equipment and software, that show the relationships between categories of expenditures in the I-O accounts and those in the NIPAs. The bridge tables enable analysts to use the commodity-composition relationships shown in the benchmark I-O tables to prepare estimates for nonbenchmark years.
Business Expenses Survey (BES) (previously Business Expenditures Survey)	Census Bureau survey that provides periodic estimates of operating expenses for retail, merchant wholesale, and most service firms. Operating expenses for 1997 include payroll and fringe benefits, contract labor costs, taxes and license fees, depreciation and amortization charges, software and other computer expenses, office supplies, repair and maintenance expenses, lease and rental payments, utilities, advertising, accounting, and legal services. Unpublished data on capital expenditures were included in the past. Coverage was expanded for 2002 to include more industries and to collect more categories of expenses. For 2007, the BES will collect information for only wholesale and retail trade; information on services will be collected as part of the Service Annual Survey.
Capital consumption adjustment (CCAdj)	Private capital consumption allowances less private consumption of fixed capital (defined below). This adjustment is used to convert income and depreciation measures from the historical-cost accounting used by firms when filing their income tax returns to the current-replacement cost basis with consistent service lives and empirically based depreciation schedules.

TERM	DEFINITION
Capital consumption allowances (CCA)	Consists largely of tax-return-based depreciation charges for corporations and nonfarm proprietorships and of historical-cost depreciation (calculated by BEA, using consistent service lives and empirically based depreciation schedules) for farm proprietorships and partnerships and other private business.
Capital flow table	Table that expands the gross private fixed investment component of the I-O use table to show the types of new equipment and structures purchased for use by each industry. Because the capital flow table shows the industry using the capital rather than owning the capital, leased equipment generally appears in the industry leasing the equipment rather than in the industry that owns the equipment. Rental equipment (generally short term) is recorded as being used by the equipment rental industry.
Central Administrative Offices (CAOs)	(See "Auxiliaries.")
Class of client/ customer	Census data series for selected industries that provides information on the category of customers—that is, individuals, businesses, government (Federal and state and local), and other clients. Data are not collected for all industries, and the categories differ by industry. This information is used to develop commodity-flow estimates.
Commodity	A commodity is a product or service. It may be produced by one or by many industries. Commodity output represents the total output of the product or service, regardless of the industry that produced it. If an industry and the commodity produced by the industry have the same name, the commodity is considered to be the primary product of that industry. Any other commodity produced by that industry is a secondary product of that industry.
Commodity-flow method	A technique used to estimate purchases of an item by intermediate or final users when primary data are not available. The method generally begins with an estimate of the total supply of an item available for domestic uses; it then either attributes a fixed percentage of supply to an intermediate or final user, or it adjusts for other purchases and attributes the residual to intermediate or final users. Commodity-flow estimates are always calculated in basic prices.

TERM	DEFINITION
Commodity line (CL)	Census Bureau term used to describe the breakdown of wholesale-trade sales by type of goods being sold. Beginning with the 2002 Economic Census, "product line" has replaced "commodity line" as the term used for wholesale sales by type of product.
Commodity taxes	Taxes that are collected directly from purchasers by industries on behalf of government. They include most sales and excise taxes. Commodity taxes are part of commodity output and are included in the producers' value of transactions. Most commodity taxes are collected by wholesalers and retailers.
Commodity-technology assumption	By this assumption, the production of each commodity requires a unique set of inputs no matter which industry produces that commodity. This assumption provides the basis for the redefinition of secondary products in the I-O accounts, whereby the secondary product and its associated inputs are redefined from the industry that produced it to the industry in which it is the primary product. See also *Handbook of Input-Output Table Compilation and Analysis, Studies in Methods, Handbook of National Accounting,* Series F, No. 74, (New York: United Nations, 1999): 91.
Concordance	A table that relates data based on two different classifications systems. For example, foreign trade harmonized codes for merchandise are matched to I-O commodity or item codes.
Consistency principle	One of the three fundamental principles underlying the I-O accounts. Under this principle, the data compiled from one source are comparable with the data compiled from another source. For example, in accordance with this principle, the estimates shown in the I-O accounts should be consistent with the underlying source data and with the estimates shown in the national accounts. In the United States, NAICS provides a consistent basis for classification that enables comparisons across the broad range of economic statistics. The other two principles are homogeneity and proportionality.

TERM	DEFINITION
Consumption of fixed capital (CFC)	The economic charge for the using up of private and government fixed capital located in the United States. In the NIPAs and in the industry accounts, the CFC is defined as the decline in the value of the stock of assets due to wear and tear, obsolescence, accidental damage, and aging. See also "Capital consumption adjustment" and "Capital consumption allowances."
Cost, insurance, and freight (c.i.f.)	The market value of merchandise imports at the customs frontier of a country. All charges for transporting and insuring the goods from the country of export to the given country are included, but the costs of unloading from ship, aircraft, etc. are excluded unless borne by the carrier. Import customs duties are also excluded.
Cost of goods sold	When calculating margin output, it is necessary to remove the cost of the goods being sold from the value of the sales. For the wholesale and retail trade industries, data are collected on purchases of merchandise for resale rather than on the cost of goods sold. Cost of goods sold is calculated as purchases less the change in inventories of merchandise for resale.
Coverage adjustment	Estimates that are made to account for information that is missing from the source data, either because the data were not collected or because the data were not complete or correct. For example, in the output estimates for the I-O tables, coverage adjustments are made for tax misreporting, imputations of own-account software, taxes, and tips.
Current-dollar estimates	The current-dollar, or nominal, estimates provide measures that are valued in the prices of the period when the transactions occurred.
Current Industrial Report (CIR)	Census data source for selected manufacturing industries that provides monthly, quarterly, and annual measures of industrial activity. The primary objective of the CIR program is to produce timely data on production and shipments of selected products. These surveys measure manufacturing activity in important commodity areas such as textiles and apparel, chemicals, primary metals, computer and electronic components, industrial equipment, aerospace equipment, and consumer goods. In some cases where CIR data are available, the Economic Census may not collect data for the detailed products.

TERM	DEFINITION
Direct requirements table	The commodity-by-industry direct requirements table is derived from the use table by relating commodity inputs used by an industry to the industry's output. The values in this table, referred to as "direct requirements coefficients," are in ratio format and show the dollar amount of a commodity required directly by an industry to produce a dollar of the industry’s output.
Disclosure symbol (D)	The disclosure symbol (D) is used by the Census Bureau, BEA, and other organizations in their tables to denote that data have been suppressed to avoid disclosure of proprietary data for a company. The suppressed data are included in the totals that are shown for higher level aggregates.
Domestic port value	The Customs value of imports as appraised by U.S. Customs and Border Protection when entering the United States. It is the price actually paid or payable for merchandise when it is sold for exportation to the United States (that is, the foreign port value) plus insurance costs, freight costs of transporting the commodity to the United States, and any applicable duties. The domestic port value is roughly equivalent to the basic value that is used to value domestic production.
Domestic supply	Domestic supply is both a NIPA and an industry accounts term. In the NIPAs and in the pre-1997 benchmark I-O accounts, it represents the value of the commodity produced by domestic firms (valued at producers' prices) plus imports, transportation costs, and wholesale margin, minus exports and inventory change. Beginning with the 1997 benchmark I-O accounts and in the annual I-O accounts, it represents the value of the commodity produced by domestic firms (valued at basic prices) plus imports and sales from final uses, minus exports and inventory change. It *does not* include commodity taxes, transportation costs, and wholesale margin.

TERM	DEFINITION
Dummy industries	Dummy industries are used to simplify the process of estimating transactions (that is, inputs of commodities used by industries and final users) by grouping related items that are generally assumed to be purchased in the same proportion by many different industries. Purchases of these related items are consolidated under one dummy industry, rather than being treated as purchases of individual items. Then, before the I-O table is balanced, weights can be calculated for every item in the dummy industry, and these weights applied to every purchase of the dummy commodity in order to break out these purchases into their component items. For example, office supplies are used by all industries, and some data exist for the value of office supplies purchased by industries. The purchases of office supply items—paper, pens, staples, etc.—are consolidated, and shown as purchased by the dummy industry "office supplies" and other industries are shown buying the dummy commodity "office supplies" rather than the individual office supply items.
Earnings requirements	I-O ratios that measure earnings paid to households by employment throughout the economy, directly and indirectly, in connection with delivery of $1 million of final demand for a specific commodity.
Economic Census	Provides a detailed portrait of the nation's economy once every 5 years, from the national to the local level. The basic statistics collected cover nearly all of the U.S. economy except agriculture and government, which are covered by concurrent economic censuses. Several related programs collect additional statistics, including those on minority- and women-owned businesses. The Economic Census is conducted largely by the Census Bureau; the Census of Agriculture is conducted by the U.S. Department of Agriculture. The Economic Census for 1997 compiled and published data primarily on a NAICS basis for the first time.
Employment and employee compensation tables	Additional I-O tables that expand the use table by breaking down the compensation component of value added. For each industry, employee compensation is separated into wages and salaries and supplements to wages and salaries. The tables also provide data on employment. The last employment table was published for the 1977 I-O accounts.

TERM	DEFINITION
Employment requirements	I-O requirements used to estimate the total number of jobs (both full-time and part-time) throughout the economy that are needed, directly and indirectly, to deliver $1 million of final demand for a specific commodity.
Enterprise	A business or membership organization consisting of one or more establishments under common, direct or indirect, ownership or control. An enterprise may vary in composition, ranging from a single-establishment company (for example, corporation, partnership, etc.) to a complex family of parent and subsidiary companies (or firms) under common ownership or control.
Establishment	An economic unit—business or industrial—at a single physical location where business is conducted or where services or industrial operations are performed. Examples include a factory, mill, store, hotel, movie theater, mine, farm, ranch, bank, railroad depot, airline terminal, sales office, warehouse, or central administrative office. One or more establishments make up an enterprise or a company. However, a single establishment may be comprised of subunits, departments, or divisions. In the industry classification systems—SIC and NAICS—the establishment is the basic unit for collecting many types of economic information.
Excise taxes	Taxes that are levied by the Federal Government on the manufacture, sale, or consumption of specific items, usually on a per-unit basis rather than a percentage basis. For example, cigarettes are taxed by the pack or carton, alcoholic beverages are taxed by the bottle, and gasoline is taxed by the gallon. Excise taxes are a type of commodity tax.
Exports	A component of final uses that measures goods and services that are produced in the United States and sold to the foreign sector. They are valued at f.a.s. (free alongside ship), which is equivalent to purchasers' value at the U.S. port of export. The definition of exports in the U.S. international transactions accounts differs slightly from that in the NIPAs and I-O accounts, primarily in the treatment of trade in nonmonetary gold and of trade involving U.S. territories.

TERM	DEFINITION
Final uses	The consumption of the goods and services that are produced and distributed in the economy. In the I-O accounts, final-use transactions consist of the transactions that make up the final-expenditure components of GDP: Personal consumption expenditures; private fixed investment; change in private inventories; exports of goods and services; imports of goods and services; and Federal, state, and local government consumption expenditures and gross investment (including investment by government enterprises).
Firm value	The valuation in the I-O transaction record that is considered the most statistically reliable—that is, the value most closely based on hard data, such as the Economic Census, and least dependent on adjustments and judgmental estimation. The firm value may be the basic value, the purchasers' value through wholesale, or the total purchasers' value.
First in, first out (FIFO)	Method of valuing inventories that assumes that the oldest stock in inventories is sold first.
Foreign port value	The value of an imported product before transportation costs, insurance, or customs duties associated with delivering the product to the United States. When these costs are added, the value of the product is measured at domestic port value. The sum of imports in final uses (shown at domestic port value) is equal to the foreign port value of the imports, with adjustments for domestically produced transportation costs, insurance, and duties.
Forward linkage	The interconnection of an industry to other industries to which it sells its outputs. It is measured as the row sum of the direct requirements table (direct forward linkage) or as the row sum of the total requirements table (total forward linkage). An industry has significant forward linkages when a substantial amount of its output is used by other industries as intermediate inputs to their production.
Free alongside ship (f.a.s.)	The market value of merchandise at the U.S. port of export, based on transaction price including inland freight, insurance, and other charges incurred in placing the merchandise alongside the carrier at the U.S. port of exportation. The costs of loading the merchandise aboard the exporting carrier and of freight, insurance, and any charges or transportation costs beyond the port of exportation are excluded.

TERM	DEFINITION
Free on board (f.o.b.)	The market value at the customs frontier of a country's exports of merchandise, including all costs of transporting the goods to the customs frontier, export duties, and the cost of loading the goods onto the carrier unless the latter cost is borne by the carrier.
General government	Government agencies that provide goods and services financed largely by taxes and not through normal price transactions. Excludes government enterprises.
Government as producer	As part of the 2003 comprehensive NIPA revision, the treatment of government was changed to recognize government as a producer. General government is now treated as an intermediate industry and recognized as producing services (valued as the expense of providing those services). Services that are directly purchased (for example, college tuition) are now treated as secondary products of the government industry, and the remaining services are treated as consumption expenditures in government final uses.
Government consumption expenditures and gross investment	The final-demand component for government in the NIPAs. It includes consumption expenditures, which is shown as a purchase of services of general government, and gross investment, which is shown as purchases of structures and equipment. It excludes some categories of expenditures—such as transfer payments, interest paid by government, and government subsidy payments.
Government enterprises	A set of institutional units that have many of the characteristics of private businesses, but are owned by government. They sell their goods and services directly to the public for a price and thereby recover a significant part or all of their operating costs. Revenue from such sales are considered enterprise revenue if the good or service is similar to those sold by private business and if the provision of that good or service is the primary function of the government unit. Examples of government enterprises include electric utilities, local transit, and the United States Postal Service.

TERM	DEFINITION
Government functional tables	Tables that show Federal Government and state and local government expenditures by the principal purpose that each program is intended to serve. NIPA tables 3.15-3.17 present government consumption expenditures classified by BEA's own functional categories. For Federal, these include defense and multiple nondefense categories. For state and local, these include education, health, public order and safety, and several other functions.
Gross domestic product (GDP)	The market value of the goods and services produced by labor and property located within the borders of the United States. In 1991, GDP replaced gross national product (GNP) as the featured measure of U.S. production.
GDP by industry (Previously gross product originating by industry)	GDP by industry is the contribution of each private industry and of government to the nation’s output, or GDP. An industry's GDP, or its "value added," is equal to its gross output (which consists of sales or receipts and other operating income, commodity taxes, and inventory change) minus its intermediate inputs (which consist of energy, raw materials, semifinished goods, and services that are purchased from domestic industries or from foreign sources). It can also be measured as the sum of incomes related to production, such as wages and salary accruals and gross operating surplus.
Gross national product (GNP)	The market value of the goods and services produced by labor and property supplied by U.S. residents.
Gross operating surplus (GOS)	As part of the 2003 comprehensive NIPA revision, replaced “other value added” as one of the three components of value added. It is a profits-like measure that includes proprietors’ income, corporate profits, net interest, business transfer payments, etc. GOS can be calculated as gross output less (1) intermediate inputs, (2) employee compensation, and (3) “taxes on production and imports less subsidies.”
Harmonized code	A 10-digit commodity classification system for foreign trade. It was introduced in the United States in January 1989 in order to ensure international comparability in the classification of exports and imports by commodity. There are approximately 19,000 codes for imports and 9,000 codes for exports.

TERM	DEFINITION
Homogeneity principle	One of the three fundamental principles underlying the I-O accounts. Under this principle, each industry's output is produced with a unique set of inputs or a unique production function. The other two principles are consistency and proportionality.
Import matrix	A table that shows the estimated use of imports by industries and final uses. The format of the import matrix is similar to that of the use table, but only imported commodities are distributed across the rows of the table. Because source data are not available on who purchases imports, the estimates are based on the assumption that each industry's use of imports for a specific commodity is proportional to its total use of that commodity. To calculate the import matrix, a ratio of imports by product to supply (domestic production plus imports less exports and change in inventories) is used. Two import matrixes are prepared, one to match with the standard use table (before reallocation of inputs) and one to match with the supplementary use table (after the reallocation of inputs).
Imports	A component of final uses that measures goods and services that are produced by the foreign sector and are purchased as intermediate inputs or for final use in the United States. The definition of imports in the U.S. international transactions accounts differs slightly from that in the NIPAs and I-O accounts, primarily in the treatment of trade in nonmonetary gold and of trade involving U.S. territories. Imports of goods by commodity are valued at U.S. domestic port values, including duties. Imports of services are valued at producers' values. The entries for transportation services and for trade include adjustments that convert the value of total imports of goods and services to foreign port value.
Imputation	Estimation of the dollar value of a nonmonetary or nonmarket transaction. In the calculation of the I-O accounts, a number of items are assigned imputed values. These imputations recognize specific nonmarket transactions, which if ignored, would result in erroneous accounting of the nation's economic activities. The largest imputations are for the rental value of owner-occupied housing and for services provided without charge by financial intermediaries.

TERM	DEFINITION
Indirect business taxes (IBT)	Prior to the 2003 comprehensive NIPA revision, IBT was the name of one of the three components of value added. It consists of tax and nontax liabilities that are chargeable to business expenses when calculating profit-type incomes and of certain other business liabilities to government agencies that are treated like taxes. Thus, IBT includes taxes on sales, property, and production, but it excludes employer contributions for social insurance and taxes on income. As part of the NIPA revision, this component was modified and termed "taxes on production and imports less subsidies." The major differences between the two are attributable to the treatments of subsidies and nontaxes.
Indirect requirements coefficients	Ratios that show the production required of an industry and of all other industries to meet that industry's initial demand for production. The coefficient can be calculated as the total requirements matrix less the identity matrix less the direct requirements matrix.
Industry	A group of establishments engaged in the same or similar types of economic activity.
Industry-technology assumption	By this assumption, each industry's production requires a unique set of inputs, no matter which product it is producing. This assumption provides the basis for the mechanical calculation of the total requirements tables in the I-O accounts. See also *Handbook of Input-Output Table Compilation and Analysis*, *Studies in Methods, Handbook of National Accounting*, Series F, No. 74, (New York: United Nations, 1999): 88.
Information Returns Program factor (IRP factor)	Internal Revenue Service adjustment for revenue shortfalls resulting from errors by IRS auditors; the IRP factor is a part of the tax-misreporting adjustment.
Input category	A broad expense category for an industry or final-use category. Examples include office supplies and purchased fuels.
Input category code (ICC)	A 1-5 character alphanumeric code representing an input (expense) category, used to facilitate data processing. If the code begins with a number, it relates to an industry (for example, 00M5 is the code for cost of purchased electricity). If the code begins with a letter, it relates to a final-use category (for example, FDA5F is the code for Federal defense other electronics equipment investment).

TERM	DEFINITION
Input category control	An estimate of total expenses for one input category for an industry or final-use category.
Input coefficient	The dollar value of a commodity required directly by an industry to produce a dollar of output. It is also referred to as the direct requirement coefficient.
Input control component	A record in the data files used to calculate input category controls. Each input control component contains an ICCType, input category code, value, source, and other supporting documentation.
Input control component type (ICCType)	A code on each input control component estimate. Each code indicates a set of estimates related to a type of establishment or a kind of adjustment necessary to build input category controls. (For example, PUBEXP is the code for published expenses, usually for employer establishments; MISREPORT is the code for adjustments to expenses for tax misreporting.)
I-O analysis	A type of applied economic analysis that tracks the interdependence among various producing and consuming sectors of an economy. More particularly, it measures the relationship between a given set of demands for final goods and services and the inputs required to satisfy those demands.
I-O industry classification system	System for defining and aggregating industries for the I-O accounts. Up through the 1992 I-O benchmark, the I-O system was based on the SIC. Beginning with the 1997 I-O benchmark, it is based on NAICS. (A concordance between the I-O industry classification codes and the NAICS codes for the 1997 benchmark is published in Appendix A of the article on the benchmark I-O accounts in the December 2002 issue of the *Survey of Current Business*.)
Interim supply	Domestic production (output) plus imports. Interim supply is used to distribute transportation costs and wholesale margins to commodities.

TERM	DEFINITION
Intermediate inputs	Purchases of goods and services—such as energy, materials, and purchased services—that are used for the production of other goods and services rather than for final consumption. These inputs are sometimes referred to as current-account expenditures. They do not include any capital-account purchases nor do they include the inputs from the primary factors of production (capital and labor) that are components of value added.
Inventory	Stocks of goods held by the firm over a period of time. In the I-O accounts, inventory includes (1) products purchased for resale, generally held by wholesalers and retailers, (2) materials and supplies for use in the production of goods for sale or in the provision of a service, (3) products that are partly processed and that require further processing prior to sale (work in process), and (4) finished goods held for sale.
International transactions accounts (ITAs)	Prepared by BEA, the ITAs summarize the transactions between U.S. and foreign residents, such as exports and imports of goods and services and direct investment activities.
Inventory valuation adjustment (IVA)	The difference between the cost of inventory withdrawals as valued at acquisition cost and the cost of withdrawals as valued at replacement cost. The IVA adjusts inventories from the change in book value reported by most businesses to the definition of inventories used in the NIPAs and industry accounts—that is, the change in physical volume valued at the average prices for the time period. The IVA is subtracted from corporate profits and nonfarm proprietors' income to remove inventory profits or losses from the income reported by businesses. (Up through the 1997 benchmark, the IVA in the I-O accounts has differed from the IVA in the NIPAs by the amount of the LIFO-reserve adjustment.)
Item	The most detailed level at which output controls and inputs are estimated in the I-O database. Items are aggregated to commodities.
Item master list	A file that identifies all items included in the I-O database. It includes the item code, description of the item, and information on whether the item receives wholesale margin and transportation costs. The 1997 benchmark master list consists of approximately 8,200 items.

TERM	DEFINITION
Kind of business (KB)	A term used to describe the classification of wholesale and retail establishments into the detailed wholesale and retail industries, using the SIC or NAICS.
Last in, first out (LIFO)	Method of valuing inventories that assumes that the most recent addition to inventories is sold first.
Leontief matrix	The Leontief "A" matrix is a direct requirements table calculated from an industry-by-industry transactions table. The "I - A" matrix (where I is an identity matrix with ones in the diagonal cells and zeroes in other cells) can be inverted to calculate the inverse ($(I - A)^{-1}$) or total requirements table. The elements of the inverse enable one to estimate both the direct and indirect impacts of a change in final uses.
Leontief, Wassily	Wassily Leontief is referred to as the "father" of I-O analysis, for which he received the Nobel Prize in 1973. Beginning in the 1930s, he constructed the first I-O tables for the United States, and he also served as a consultant to the Bureau of Labor Statistics when they published the first official U.S. I-O table in 1944.
Make table	Matrix that shows the value in producers' prices of each commodity produced by each industry. The entries in a row represent the dollar value of commodities produced by the industry at the beginning of the row. The entries in a column represent the dollar value of production by each industry of the commodity at the top of the column. It is one of the two primary tables in the I-O accounts. The make table, together with the use table, is used to derive the I-O total requirements tables.
Manufacturers' sales branches (MSBs)	One of the several types of wholesalers, MSBs hold inventories and primarily sell products manufactured or mined in the United States by their parent companies.
Manufacturers' sales offices (MSOs)	One of the several types of wholesalers, MSOs do not hold inventories and primarily act as agents to sell products manufactured or mined in the United States by their parent companies.
Margin or margin costs	The value of the wholesale and retail trade services provided in delivering commodities from producers' establishments to purchasers. Margin is calculated as sales receipts less the cost of the goods sold. It consists of the trade margin plus sales taxes and excise taxes that are collected by the trade establishment.

TERM	DEFINITION
Materials consumed	The major products used by the manufacturing and mining industries. The Census Bureau collects information only on the most important materials consumed by a particular industry and for which cost information is available from its records. Materials consumed are sometimes referred to as "table 7" inputs because they have been shown in table 7 of the publications.
Merchandise line (ML)	Census Bureau term used to describe the breakdown of retail-trade sales into the types of goods being sold. Beginning with the 2002 Economic Census, "product line" has replaced "merchandise line" as the term used for retail sales by type of product.
Merchandise returned	(See "Reimports.")
Merchant wholesaler	Merchant wholesalers are wholesalers that sell goods on their own account—that is, they buy the goods, usually maintain them in warehouses, and then resell them. Beginning with the 2002 NAICS, merchant wholesalers now include sales offices and sales branches that are maintained by manufacturing, refining, or mining enterprises apart from their plants or mines for the purpose of marketing their products.
Misreporting adjustment	(See "Tax-misreporting adjustment.")
Most appropriate kind of business (MAKB)	An assumption made when estimating margins that the best estimate of the margin rate is the rate from the primary seller of the good. For example, the margin rate for shoe stores is used to make the first estimate of the margin on shoes sold at department stores and sporting goods stores. This technique can also be used when estimating taxes.
National income and product accounts (NIPAs)	A principal U.S. economic account prepared by BEA, the NIPAs display the value and composition of U.S. production and the distribution of incomes generated in producing it.

TERM	DEFINITION
Noncomparable imports	Consist of three types of services: (1) Services that are produced and consumed abroad, such as airport expenditures by U.S. airlines in foreign countries; (2) services imports that are unique, such as payments for the rights to patents, copyrights, or industrial processes; and (3) services imports that cannot be identified by type, such as payments by U.S. companies to their foreign affiliates for an undefined "basket" of services. In preparing the I-O accounts, these imports are distributed directly to industries and to final users.
North American Industry Classification System (NAICS)	A system of industrial classification—developed and used by the United States, Canada, and Mexico—for grouping establishments by similarity of production process. Beginning with the 1997 Economic Census, NAICS has replaced the 1987 SIC as the primary industry classification system used for U.S. economic statistics. NAICS features more detailed classifications for the services industries and improved classifications for the high-tech industries. (See also "Economic Census".)
North American Product Classification System (NAPCS)	A comprehensive demand-oriented product classification system that is being developed by the United States, Canada, and Mexico. NAPCS is designed to complement NAICS, the supply-oriented industry classification system introduced for 1997. In particular, NAPCS will focus on improving the identification, definition, and classification of the products produced by the services industries.
NEC	Not elsewhere classified.
NSK	Not specified by kind.
Other labor income (OLI)	A component of personal income that includes employer payments to private pension and profit-sharing plans, publicly administered government employee retirement plans, private group health and life insurance plans, privately administered workers' compensation plans, supplemental unemployment benefit plans, and several minor categories of employee compensation. The NIPAs now refer to OLI as employer contributions for employee pension and insurance funds. It is part of the value-added component "compensation."

TERM	DEFINITION
Other secondary products	Secondary products that are neither "redefined" nor "reclassified." For these products, which generally have inputs similar to those of the primary products of the industry where they are produced, BEA follows the Census classification. Thus, no adjustments are made that affect either industry or commodity output.
Other value added (OVA)	A term used prior to the 2003 comprehensive NIPA revision for the residual component of value added, sometimes referred to as profit-type income. For most industries, OVA was derived by subtracting total intermediate inputs, compensation of employees, and indirect business tax and nontax liability from total industry output. It included consumption of fixed capital, proprietors' income, corporate profits, and business transfer payments. OVA has now been replaced by gross operating surplus (GOS).
Output control	The total value of domestic production for an industry, commodity, or item.
Output control component (OCC)	A record of data that is used to compute the output control for an industry, commodity, or item. Each control is made up of one or more components identified by the OCCType code. Components are based on source data and type of output.
Output control component type (OCCType)	A code of up to 10 characters used in the database to identify the source data and types of estimates included in the output control estimate. Examples include COMTAX, Expenses, Receipts, RedefIO, ReSaleCost, Second, Tip.
Output requirements	Derived from the I-O total requirements tables, the output requirements show the amount of output required to satisfy a given level of final-use expenditures. For the commodity-by-commodity total requirements table, it is the production required both directly and indirectly of the commodity at the beginning of each row per dollar of delivery to final use of the commodity at the top of the column. For the industry-by-commodity total requirements table, it is the industry output required to deliver a dollar of a commodity to final users. For the industry-by-industry total requirements table, it is the industry output required to deliver a dollar of industry output to final users.

TERM	DEFINITION
Own-account construction (Previously force-account construction)	Own-account new construction refers to construction activities performed by businesses, governments, or persons for themselves rather than by purchasing from construction businesses. Beginning with the 1997 benchmark I-O accounts, own-account new construction is treated as being produced by the industries in which the construction occurs and then "purchased" in final uses as investment. In the 1997 standard make and use tables, own-account new construction, including output and all inputs, is shown as a secondary product of the industry in which the activity occurs. Previously, own-account construction was reassigned to the new-construction industry and included as part of its primary production. In cases where the general contractor for a new housing unit intends to be an owner-occupant, the resulting new construction is now shown in the owner-occupied dwellings industry. For government, it is now shown in the general government industry. Beginning with the 1997 standard and supplementary make and use tables, own-account maintenance and repair construction is no longer treated as output. Previously, own-account maintenance and repair activities were included in the maintenance and repair construction industry and then purchased by the industry producing those services. This change is intended to facilitate comparisons of data from the I-O accounts with other statistical data on industries.
Own-account software	Own-account software refers to software production activities performed by businesses or governmen for themselves rather than by purchasing from software-producing businesses. Beginning with the 1997 benchmark I-O accounts, it is treated as being produced by the industries in which the own-account software originates and then "purchased" in final uses as investment. In the 1997 standard make and use tables, own-account software, including output and all inputs, is shown as a secondary product of the industry in which the activity occurs, and it is shown as part of the primary production of the software industry in the supplementary make and use tables.
Personal consumption expenditures (PCE)	NIPA final-demand component for purchases by the household sector. In addition to showing what households spend, it also includes the current operating expenses of nonprofits that primarily serve households. For the 1997 and earlier benchmarks, PCE is split into durable goods, nondurable goods, and services.

TERM	DEFINITION
PCE bridge table	Table that identifies the I-O commodity composition of each PCE category in the NIPAs. It shows the value of the transactions in producers' and purchasers' prices and the associated transportation costs and margins.
Primary inputs	Capital and labor inputs to production. Value added consists of the costs—such as compensation, profits, and depreciation—that are related to these inputs. When the total requirements tables are calculated, there are no further impacts associated with the primary inputs.
Primary product	The principal good or service of an industry. In the SIC or NAICS systems and the I-O industry classification system, an establishment is assigned to a specific industry based on its primary product.
Primary suppression	An analysis by the Census Bureau or other statistical agencies to ensure that a published estimate does not represent so few companies that the activities of individual companies in the cell may be deduced.
Private equipment and software expenditures (PES)	NIPA final-demand component for investment in equipment and software by businesses and by nonprofit institutions. This component was previously referred to as producers' durable equipment (PDE). The estimates of PES are generally made using the commodity-flow method.
PES bridge table	Table that identifies the I-O commodity composition of each category of private equipment and software in the NIPAs. It shows the value of the transactions in producers' and purchasers' prices and the associated transportation costs and margins.
Product lines	Census Bureau term used to describe the products produced or sold in the Economic Census. Beginning with the 2002 Economic Census, this term has replaced "merchandise line" for retail sales, "commodity line" for wholesale sales, and "revenue line" for services.
Proportionality principle	One of the three fundamental principles underlying the I-O accounts. Under this principle, all inputs consumed by an I-O industry are a linear function of the level of output—that is, the inputs consumed vary in direct proportion to output and there are no economies of scale. The other two principles are consistency and homogeneity.

TERM	DEFINITION
Prorate	A statistical technique for allocating a product to consuming industries and/or final uses that may be used in the absence of specific consumption information. It distributes the product to a specific set of consumers in proportion to some variable with a known distribution that is closely related to the use of that product by those consumers. For example, in previous I-O benchmarks, prorates were used to allocate gasoline and tire purchases to particular industries based on miles driven.
Producers' value or price (Proval)	Price received by the producer for goods and services that are sold. Proval is equal to basic value plus commodity taxes.
Purchasers' value or price (Purval)	Price paid by industries and final users for the goods and services they use. Purval is equal to producers' value plus trade (wholesale and retail) margins and transportation costs.
RAS technique	Method used in the preparation of updated I-O accounts that are based on partial survey information. The technique applies row and column balancing factors iteratively until the adjusted matrix (the transactions table) satisfies the row and column totals (commodity and industry output). The technique converges to a solution resulting in a balanced I-O matrix.
Reallocation	The inputs that are reassigned along with the redefined output of secondary products. Both intermediate inputs and value-added components are reallocated in moving from the use table before redefinitions to the use table after redefinitions. They are subtracted from the industry that produced the secondary product and added to the industry for which the product is primary. The sum of the reallocations must be equal to the value of the redefined output.
Receipts/revenue line (RL)	Census Bureau term used for services sales. Receipts lines show the various services performed in a services industry. Beginning with the 2002 Economic Census, they are referred to as product lines.

TERM	DEFINITION
Reclassification	Reclassifications, one of the three I-O methods for handling secondary products, are made as part of the preparation of the standard I-O make and use tables. Reclassifications are made when BEA decides that a product that the Census Bureau has designated as a primary product should instead be treated for I-O purposes as a secondary product. For example, in the Census Bureau classification system, the primary product of the newspaper industry is defined as newspaper sales and newspaper advertising. In the I-O system, the primary product of the newspaper industry is newspapers, and the advertising is treated as a secondary product of the newspaper industry and is reclassified to the advertising commodity. Reclassifications are also made when a product is primary to more than one industry—that is, the final product is the same but it is made using different production processes. In these cases, BEA groups the output in the commodity where the largest amount of it is produced. For example, sheets can be made in knitting or weaving mills or from purchased fabric. For the I-O accounts, all sheets are treated as a single commodity and are shown as the product of curtain and linen mills. Reclassifications do not affect the definition of the industry or the measurement of industry output, which consists of the output of both the primary and the secondary products of that industry. However, reclassifications do affect the definition of the commodity and the measurement of commodity output.
Reconciliation	The process of comparing two sets of estimates, explaining the differences, and selecting the better estimate. For the benchmark I-O accounts, the initial I-O estimates of final uses are reconciled with the NIPA estimates of final expenditures.

TERM	DEFINITION
Redefinition	Redefinitions, one of the three methods for handling secondary products, are made as part of the preparation of the supplementary I-O make and use tables. Redefinitions are made when an industry's production of a secondary product has very different inputs ("recipe") than those for the production of its primary product. In such a case, the secondary product (output and inputs) is moved ("redefined") from the industry in which the output occurs to the industry in which the product is primary. For example, the output and associated inputs for restaurants located in hotels are moved from the hotels and lodging places industry to the eating and drinking places industry. Redefinitions do not affect the definition of the commodity or the measurement of commodity output, which consists of all of the output of that commodity wherever it's produced. However, redefinitions do affect industry output.
Reexports	Goods of foreign origin that were previously imported into the United States and subsequently exported to a foreign country in substantially the same condition as when imported.
Regulatory data	Data collected by government agencies for the purpose of regulating an industry. For example, the U.S. Department of the Treasury collects information from banking institutions for regulatory purposes.
Reimports	Domestically produced goods that were previously exported for processing or assembly, or both, and then returned to the United States. They are also referred to as merchandise returned.
Requirements tables	There are four I-O requirements tables: Commodity-by-industry direct requirements, commodity-by-commodity total requirements, industry-by-commodity total requirements, and industry-by-industry total requirements.
Resales	Merchandise bought and sold without being processed further; for example, hair care products sold at barber shops and beauty shops. Reselling is the primary activity of wholesale and retail establishments, and it also occurs in most other industries.

TERM	DEFINITION
Retail category code (RCC)	Codes assigned to I-O transactions receiving retail margins. They group similar transactions together for the purpose of allocating retail margins.
Retail margin	The markup to the price of a product when a product is sold through a retail trade activity. It is calculated as sales receipts less the cost of goods sold. Sales and excise taxes collected by the retailer are generally shown as a part of the retail margin.
Royalty	Payment for the use of patented or copyrighted materials and for similar rights. These payments are treated as income from property.
Sales taxes	Taxes that are generally levied by state and local governments as a percentage of the commodity's price. *General sales taxes* are typically shown separately on sales receipts and are typically levied as a standard percentage of the commodity's price. They include sales taxes collected by retail establishments, by wholesalers, and by service establishments. *Selective sales taxes* are levied on a specific commodity at a percentage that differs from that of the general sales tax. They include taxes on motor fuels, tobacco products, alcoholic beverages, public utilities, meals, hotel occupancy, and amusements.
Satellite accounts	Supplemental accounts that expand the analytical capacity of the NIPAs and the I-O accounts by focusing on a particular aspect of economic activity. Satellite accounts are designed to provide more detailed information within a framework that is conceptually and statistically consistent with BEA's principal economic accounts. Examples include the travel and tourism satellite accounts and the transportation satellite accounts.
Secondary product	A good or service that is produced by an industry in addition to its primary product. Secondary products are the primary product of another industry. Secondary products in the I-O accounts are termed redefinitions, reclassifications, and other secondary products.

TERM	DEFINITION
Sector	In the national economic accounts, the institutional units that make up the total economy: Business, households and institutions, and general government. In NAICS, one of the 20 major areas of economic activity. The sectors are generally the two-digit NAICS level—though manufacturing, retail, and transportation and warehousing span several two-digit codes.
Service Annual Survey (SAS)	Provides estimates of revenue and other measures for most service industries. Beginning with the 2003 survey year, expenses and products are being collected for some industries. Census is planning to expand the coverage of expenses and products to all industries. The SAS covers companies that primarily provide services to individuals, businesses, and governments. Beginning with the 1999 survey year, data were published on a NAICS basis for 1999 and 1998. The SAS now includes data for industries that were formerly collected as part of the Annual Survey of Communications Services and the Transportation Annual Survey.
Special I-O industries/ commodities	Industries/commodities that are provided for in the I-O industry classification system but are not included in the SIC or NAICS. In the 1997 benchmark accounts, they consisted of both industries and commodities for the inventory valuation adjustment and owner-occupied housing and of commodities for noncomparable imports, for scrap, used and secondhand goods, and for the rest-of-the-world adjustment to final uses. I-O special industries/commodities are incorporated to maintain consistency with economic concepts underlying the NIPAs.
Standard Industrial Classification (SIC)	System for grouping economic activities using the operating establishment as the basic production unit. The SIC system assigns each establishment an industry code on the basis of its primary activity, which is the establishment's principal product or group of products produced or distributed or services rendered. Beginning with the 1997 benchmark, the SIC was replaced by NAICS as the basis for I-O industry and commodity classification.

TERM	DEFINITION
Standard make and use tables	The featured tables in the 1997 benchmark I-O, these tables are based on NAICS. They are constructed *before* the redefinitions of selected secondary products. (In the 1992 I-O accounts, these make and use tables were referred to as "alternative" tables.)
Supplementary make and use tables	A second set of tables in the 1997 benchmark I-O, these tables are derived from the standard make and use tables. The estimates in the supplementary make and use tables are *after* the redefinitions of selected secondary products. (In the 1992 I-O accounts, these make and use tables and the requirements tables were referred to as "traditional" tables, and the NIPA bridge tables were referred to as "supplementary" tables.)
Supplements to wages and salaries	Employer contributions for social insurance funds and for other labor income. Supplements are a part of the value-added component "compensation."
Survey of Current Business (SCB)	BEA's monthly journal.
System of National Accounts (SNA)	An international set of guidelines for a system of economic accounts. The SNA organizes information about the flows and stocks that represent an economy within a comprehensive, integrated framework. The 1993 SNA was published by the Inter-Secretariat Working Group for the National Accounts (Commission for the European Communities, International Monetary Fund, Organisation for Economic Co-operation and Development, United Nations, and World Bank). The next update of the SNA is scheduled for 2008.
Tariff Schedule of the U.S. Annotated (TSUSA)	A very detailed classification system in which U.S. import data were originally recorded. This schedule was the legal basis for import-duty calculations by U.S. Customs. It was replaced by the harmonized system in 1989.
Taxes on production and imports, less subsidies	As part of the 2003 comprehensive NIPA revision, replaced indirect business taxes and nontax payments as one of the three components of value added. This component includes sales and excise taxes, customs duties, property taxes, motor vehicle licenses, severance taxes, other taxes, and special assessments. It excludes most nontax payments, and as the name indicates, subsidies are netted out.

TERM	DEFINITION
Tax-misreporting adjustment	An adjustment that is made to tax-return data from the Internal Revenue Service (IRS) in order to account for underreported income and for illegal nonfiling or late filing of tax returns. The adjustment is applied to the IRS data that are used in the Economic Census as the basic source for receipts.
Taxpayer Compliance Measurement Program (TCMP)	An Internal Revenue Service program consisting of detailed audits of a random, stratified sample of individual tax returns. TCMP ratios are incorporated into the tax-misreporting (audit) adjustments used in the I-O accounts and the NIPAs. The last TCMP was conducted in 1988, and it has since been replaced by the NRP (National Research Program).
Total requirements coefficients	I-O coefficients that estimate overall production required to produce a dollar of output. These coefficients (expressed as per dollar of output delivered to final demand) reflect (a) the initial final demand for the output of a given industry or commodity, and (b) both direct and indirect requirements resulting from the initial demand.
Total requirements tables	Three I-O tables showing the output required to meet a given level of final use. The three tables are the commodity-by-commodity total requirements table, the industry-by-commodity total requirements table, and the industry-by-industry total requirements table. All three tables are calculated from the supplementary make and use tables. (See also “Output requirements.”)
Trade margin	The combined wholesale and retail trade margins, including taxes collected by wholesalers and retailers. For further explanation, see “wholesale margin” and “retail margin.”
Transportation cost	The value of for-hire transport services required in delivering commodities from producers' establishments to purchasers. It is treated as a “margin” in transiting from producers’ value (Proval) to purchasers’ value (Purval).
Travel and tourism satellite accounts (TTSAs)	A satellite account prepared by BEA that shows a detailed picture of the travel and tourism industries and their role in the U.S. economy.

TERM	DEFINITION
Use table	Matrix that shows the consumption of commodities by each industry or final user. The entries in a row represent the dollar value of the commodity consumed by each industry or final user. The total output of each commodity is the sum of all intermediate uses of the commodity by industries and all sales to final users, or the sum of the row entries. The entries in a column represent the dollar value of each commodity and value-added component used by the industry. The total output of each industry is the sum of all intermediate uses of all commodities and value added, or the sum of the column entries. For the economy as a whole, the total of all final uses of commodities equals the sum of all value added by all industries, or GDP. Use tables are produced for industries both before redefinitions and after redefinitions. It is one of the two primary tables in the I-O accounts. The use table, together with the make table, is used to derive the I-O total requirements tables.
Value added	The difference between an industry's or an establishment's total output and the cost of it's intermediate inputs. It equals gross output (sales or receipts and other operating income, plus inventory change) minus intermediate inputs (consumption of goods and services purchased from other industries or imported). Value added consists of compensation of employees, taxes on production and imports less subsidies (formerly indirect business taxes and nontax payments), and gross operating surplus (formerly "other value added").
Wedging	A statistical convention or technique used to narrow the difference between a "best level" and a published level by the gradual incorporation of the "best-change" data over several time periods. The technique is used in preparing the NIPA estimates for nonbenchmark years after incorporating the estimates from the latest benchmark I-O table. (See also "Best change" and "Best level.")
Wholesale margin	Measures output in the wholesale industry as the addition to the price of a product when the product is sold through wholesale trade. Wholesale margin includes sales and excise taxes collected by the wholesaler. Wholesale margin is calculated when the wholesaler buys and then resells the product. It is calculated as sales less the cost of the goods sold. There are also nonmargin types of wholesale output—for example, commissions or expenses of manufacturers' sales offices.

TERM	DEFINITION
Workfile	The database for the benchmark I-O accounts showing all the detailed transactions that are used to produce the use table. For the 1997 benchmark, the working level of the database consisted of about 8,200 items and 1,100 consuming industries and final uses.
WPurval (Wholesale purchasers' value)	Price paid by the purchasers of commodities at the wholesale trade level; wholesale purchasers' prices are obtained by adding wholesale trade margin plus transportation costs to producers' prices.

Acronyms

BEA	Bureau of Economic Analysis
GDP	Gross domestic product
I-O	Input-output
NAICS	North American Industry Classification System
NIPAs	National income and product accounts
SIC	Standard Industrial Classification

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1441 L Street NW ■ Washington, DC 20230
U.S. Department of Commerce
Economics and Statistics Administration
202.606.9900 ■ www.bea.gov

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