BEA BRIEFING

A Primer on BEA's Industry Accounts

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IS THE ECONOMY growing? How fast—or slow? While the Bureau of Economic Analysis' (BEA) featured measure of economic output, gross domestic product (GDP), provides an answer, people are often also interested in the industry dynamics playing out within the economy. Which industries are expanding the fastest? Which are contributing the most to economic growth? How much income is generated from production? How much of an industry's growth is due to growth in real output and how much due to price inflation? Which industries are significant exporters?

BEA's industry accounts—which include the annual and benchmark input-output (I-O) accounts, the GDP by industry accounts, the KLEMS statistics, and satellite accounts—provide answers to such questions. Broadly speaking, the accounts facilitate the study of the internal workings of the U.S. economy. They provide a framework to measure and analyze the production of goods and services by industry. They show the flows of goods and services purchased by each industry, the incomes earned in each industry, and the distribution of sales for each commodity to industries and final users. The industry accounts also detail each industry's contribution to GDP and its counterpart gross domestic income (GDI). These accounts thus offer a valuable complementary tool to the national income and product accounts.

The industry accounts are widely used for a variety of purposes, such as estimating the effects of various policies, regulations, and tax proposals. The U.S. International Trade Commission, for example, uses the annual I-O accounts to measure the impact of various trade policies, and the U.S. Patent and Trade Office used the benchmark I-O accounts to measure the size of the domestic copyright-related industries. Macroeconomic and microeconomic forecasting models, private and public, also use information from the industry accounts.

In addition, academics use the data extensively. As just one example, Nobel Laureate Lawrence Klein and Professors Cynthia Saltzman and Vijaya Duggal used annual and benchmark I-O time series data to examine the strategic importance of intermediate goods and services, particularly the role of information technology on productivity in the financial service industry.[1]

Information from the benchmark I-O accounts is also used by BEA and other statistical agencies in preparing further economic statistics. Within BEA, for example, the benchmark I-O accounts are the building blocks for the national income and product accounts (NIPAs) and the annual I-O accounts.

This article is intended as an introduction to the industry accounts for new users and how they can be used to examine intraindustry and interindustry relationships in the economy. The computer and electronic products industry is used to demonstrate the scope and versatility of the industry accounts.[2]

The first section discusses the annual I-O accounts—the make and use tables and the four main requirements tables. The second section discusses how these accounts might be used for impact analysis. The third section discusses GDP by industry accounts and how they might be used for time series analysis. An appendix looks at the assumptions underlying the accounts. And finally, a list of references is provided for those who want more in-depth information.

Input-Output Account Basics

A basic understanding of an industry's current economic activity and how it relates to the total U.S. economy can be obtained from the two main tables in the I-O accounts: the standard make and use tables. These two tables provide consistent statistics on an industry's production and its relationship with other industries for a given year. They offer a wealth of information about the size of the U.S economy, the relative size of specific industries, what and how much is produced by specific industries, the technology used by specific

1. See Lawrence R. Klein, Cynthia Saltzman, and Vijaya G. Duggal, "Information Technology and Productivity: The Case of the Financial Sector," Survey of Current Business 83 (August 2003): 32–37.

2. The industry accounts classify industries according to the North American Industry Classification System (NAICS). This classification facilitates using the BEA industry accounts with industry statistics from other sources such as the Census Bureau and the Bureau of Labor Statistics.

industries, the incomes generated by production, and the size and scope of an industry's market.

Two sets of I-O tables are available. Annual I-O accounts, which are updated once a year, are available for 1997–2007; they include information on 65 industries. Benchmark I-O accounts include more detail, presenting information on more than 425 industries. The benchmark I-O table, for example, disaggregates the computer and electronic products industry into 25 separate industries. The benchmark I-O accounts are prepared less frequently, roughly once every 5 years, and are based on detailed data from the Economic Census conducted by the Census Bureau. The 2002 benchmark was released in October 2007.

The make table

The standard make table shows the value of each commodity produced by each industry in a given year (table A).[3] Commodities are presented in columns and industries in rows. The entries across a row represent the dollar value of commodities produced by a specific industry. The diagonal cells in the table show the value of production of the commodity for which the industry has been designated the "primary" producer. Entries in the off-diagonal cells in the row show the value of production of "secondary" commodities. For example, a hotel may also provide restaurant services, but these services are not part of the hotel industry's primary product of accommodations. Therefore, the restaurant services are treated as a secondary product of the hotel industry. The sum of all the entries in the row is the total output of that industry.

3. These values are calculated at producers' prices. See the box "The Input-Output Valuation of Transactions."

The entries in a column represent the value of production by each industry of a specific commodity. The off-diagonal cells in each column represent the production of secondary producers of the commodity. The column total is total commodity output. The row totals of the make table equal the column totals of the use table.

The principal measure of output in the I-O accounts is gross output, which includes the value of intermediate products (which are used by others in their production processes) and final products (which count toward GDP). Because gross output reflects double-counting—both intermediate goods and final goods—it is often referred to as "gross duplicated output."

A highly aggregated version of the 2007 annual I-O standard make table is shown in Table A. The row for the computer and electronic products industry shows that in 2007 the industry produced not only $368.6 billion in computers (the industry's primary product in the shaded cell) but also secondary products, including nearly $10 billion in other manufactured goods ($378.3 billion – $368.6 billion) and nearly $9 billion in services. Total gross output for the industry was $388.0 billion.

The computer and electronic products column shows that while the computer and electronic products industry produced 98 percent of all computer and electronic products ($368.6 billion / $374.9 billion), it was not the only producer of these commodities. Nearly $6 billion were produced, as secondary products, by other manufacturing industries ($374.5 billion – $368.6 billion) and by service industries ($339 million). Together, all industries produced $374.9 billion in computer and electronic products commodities.

Table A. The Make of Commodities by Industries, 2007

[Millions of dollars]

Industries/commodities	Agriculture, mining, and construction [1]	Manufacturing		Services [2]	Government [3]	Total industry output [4]
		Total	Computer and electronic products			
Agriculture, mining, and construction [1]	2,059,070	31,113		5,106		**2,092,567**
Manufacturing	1,641	4,952,852	374,513	96,957		**5,033,925**
Computer and electronic products	31	378,281	368,592	8,735		**388,021**
Services [2]	106,376	24,353	339	15,665,480	1	**15,768,450**
Government [3]	24,794	4,051		520,365	2,361,353	**2,913,960**
Total commodity output	**2,191,880**	**5,012,370**	**374,852**	**16,287,909**	**2,362,541**	**25,808,901**

1. Agriculture consists of agriculture, forestry, fishing, and hunting.
2. Consists of utilities; 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; and other services, except government.
3. Consists of federal, state, and local governments.
4. Includes noncomparable imports; inventory valuation adjustment; rest-of-the-world adjustments; and scrap, used and secondhand goods.

The Input-Output Valuation of Transactions

Transactions in commodities are valued at producers' prices in the industry accounts. Producers' prices exclude wholesale and retail trade margins and transportation costs, but they include excise and sales taxes collected and remitted by producers. Transportation costs and trade margins are shown as separate purchases by the users of the commodities. The sum of the producers' value, transportation costs, and trade margins equals the purchasers' value.

In order to show the relationship between the production of commodities and their purchase by intermediate and final users, commodities are shown as if they move directly to users. The flows of commodities for resale to and from wholesale trade and retail trade are not shown. If trade were shown as buying and reselling commodities, industrial and final users would make most of their purchases from a single source—trade.

Wholesale and retail trade margins on commodities are shown as purchases by users and are included in the trade commodity rows of the use table. Transportation costs are the freight charges paid to move the commodity from the producer to the intermediate user or the final user. All transportation costs are shown as purchases by users and are included in the transportation commodity rows of the use table.

Wholesale trade. This sector comprises establishments engaged in wholesaling merchandise, generally without transformation, and rendering services incidental to the sale of merchandise. Wholesalers sell merchandise to other businesses and normally operate from a warehouse or office. Wholesale trade output consists of trade margin output and nonmargin output; both exclude the cost of goods purchased for resale. Both the margin and nonmargin outputs are included in the wholesale trade commodity row of the use table.

The trade margin output occurs when an establishment buys and resells a good. It is included in the purchasers' prices of the goods that are purchased but not in the producers' prices of those goods, and it is measured in two parts. The trade margin is calculated as wholesale sales less the cost of goods sold plus taxes collected by the distributor.

Nonmargin output occurs when a wholesale trade service is purchased separately from the commodity, such as when a wholesaler acts as a broker between buyer and seller. Nonmargin output is assumed to be purchased by the producer of the goods being sold and is thus reflected in the producers' prices of the goods. It is measured as the sum of expenses, excluding the cost of the goods, on goods sold by manufacturers' sales offices, the commissions on goods sold by agents and brokers and by merchant wholesalers acting as commission merchants, the taxes collected, and the customs duties, which are considered as taxes collected by wholesale trade establishments.

Retail trade. This sector has one primary product—distributive services for the sale of goods. Its output consists primarily of retail trade margins, which are measured as retail sales less the cost of goods sold plus the taxes collected by retail trade establishments. All retail trade margin and nonmargin output are included in the retail trade commodity row of the use table.

Retail trade margins apply primarily to purchases by persons, but they are also applied to purchases by business and government, such as some purchases of personal computers by business. Retail trade margins are also applied to some intermediate purchases by business, such as office supplies, gasoline, and construction materials.

Final use components

Imports of goods and services. This component is measured by individual commodity at domestic port values. The domestic port value of an imported commodity, which includes customs duties, is considered equivalent to the producers' price of a domestically produced commodity. The imports of transportation and wholesale trade include adjustments to convert the sum of all commodity imports of goods to foreign port value. Imports of services are valued at producers' prices. No margins or transportation costs are associated with services.

All imports except "noncomparable imports" are assumed either to be consumed within the U.S. boundaries or to have domestic equivalents. Noncomparable imports consist of goods purchased by U.S. residents abroad and of services imports that have no domestic counterparts.[1] These services include travel by U.S. residents abroad—both foreign travel by U. S. residents, which is included in final demand as a part of personal consumption expenditures, and foreign travel by U.S. business people, which is included as intermediate purchases. Noncomparable commodity imports are distributed directly to industries and final users and are shown in a separate row in the use table.

Exports of goods and services. This component is measured by commodity at producers' prices—the same as other domestically produced commodities. Transportation costs and trade margins, which are required to move exports from the producer to the port of exit, are included in the transportation and trade commodity rows of the use table.

Change in private inventories. This component is measured by commodity at the LIFO-reserve-adjusted book value that is reported by industries in the economic censuses. Inventory values are adjusted to remove the effects of price changes while products are held in inventory. This inventory valuation adjustment is made by holding industry, commodity, and inventory type.

1. Most imported goods now have domestic counterparts. Before the 1992 benchmark I-O accounts, noncomparable imports also included domestically consumed imported goods, such as bananas and coffee, that had no significant domestic counterparts.

The use table

The standard use table is a matrix that shows the uses of commodities by industries as intermediate inputs and by final users in a given year (table B). In contrast to the make table, the rows in the use table present the value of commodities (in producers' prices), and the columns display the industries and final users that utilize them. The sum of the entries in a row is the gross output of that commodity. The columns show the products consumed by each industry and the three components of "value added," that is, the income generated by production. The components of value added include returns to labor (compensation of employees), capital (gross operating surplus), and government (taxes on production and imports less subsidies). When aggregated across all industries, value added equals GDP for the nation. Value added is defined as the value of the industry's sales to other industries and final users (gross output) less the value of its purchases from other industries (intermediate inputs). The sum of the entries in a column is that industry's total, or gross, output.

Table B shows the aggregate 2007 annual I-O standard use table corresponding to the make table. The row shows the value of computers and electronic products, as a commodity, used by each industry and final use category—that is, the commodity's market. In 2007, total computer and electronic products commodity output was $374.9 billion, of which nearly 60 percent or $219.5 billion was used by industries as input to their production and $155.3 billion was consumed by final users. Personal consumption expenditures accounted for $74.0 billion in final use; private fixed investment accounted for $186.3 billion, change in private inventories was $2.9 billion, net exports were –$148.5 billion (the negative value indicates imports exceeded exports), and government expenditures and investment accounted for $40.6 billion.

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. The computer industry column of table B shows that the production of the industry's primary and secondary products requires commodity inputs from all areas of the economy, including $66.9 billion in computer and electronic products, $38.5 billion in other manufactured goods, $123.2 billion in services, $944 million in agriculture, mining, and construction goods, and $269 million in government goods and services. In total, $241.7 billion in intermediate inputs were required in 2007.

The computer and electronic products industry generated $146.3 billion in value added: $139.1 billion in compensation to labor, $4.5 billion in taxes on production and imports less subsidies to the government, and nearly $3 billion in gross operating surplus. Note that for each industry the (shaded) total industry output values in the make table column and use table row are the same. Similarly, for each commodity, the (shaded) total commodity output values reported in the two tables are the same.

In addition, the use table shows that the GDP of $13,808 billion can be measured in three ways: as the sum of all final uses (the expenditures approach), the sum of all value added across industries (the sum of incomes generated from production), and as total gross output less total intermediate inputs (the production approach). The GDP value reported in the annual industry accounts is consistent with the GDP reported in the NIPA accounts.

Table B. The Use of Commodities by Industries, 2007

[Millions of dollars]

Commodities/industries	Agriculture, mining, and construction [1]	Manufacturing		Services [2]	Government [3]	**Total intermediate use**	Personal consumption expenditures	Private fixed investment	Change in private inventories [4]	Net trade	Government consumption expenditures and gross investment [3]	Total final uses (GDP)	**Total commodity output**
		Total	Computer and electronic products										
Agriculture, mining, and construction [1]	154,402	595,776	944	248,419	89,143	**1,087,739**	59,605	1,011,206	11,099	–271,109	293,340	1,104,141	**2,191,880**
Manufacturing	415,614	1,609,532	105,397	929,547	317,079	**3,271,773**	1,681,597	689,338	34,532	–779,107	114,238	1,740,597	**5,012,370**
Computer and electronic products	4,401	108,822	66,881	79,778	26,520	**219,521**	73,990	186,349	2,938	–148,523	40,576	155,331	**374,852**
Services [2]	464,515	1,135,150	123,225	5,030,294	720,891	**7,350,850**	7,904,854	527,305	10,205	441,528	53,167	8,937,059	**16,287,909**
Government [3]	1,579	3,170	269	69,801	9,904	**84,454**	63,599			314	2,214,174	2,278,087	**2,362,541**
Total intermediate inputs [5]	**1,038,805**	**3,417,099**	**241,727**	**6,374,425**	**1,171,034**	**12,001,363**							
Compensation of employees	549,340	969,412	139,114	4,823,282	1,477,338	**7,819,371**							
Taxes on production and imports less subsidies	28,529	57,178	4,483	893,320	–15,874	**963,153**							
Gross operating surplus	475,893	590,236	2,697	3,677,424	281,462	**5,025,015**							
Total value added	**1,053,761**	**1,616,826**	**146,294**	**9,394,025**	**1,742,926**							**13,807,538**	
Total industry output	**2,092,567**	**5,033,925**	**388,021**	**15,768,450**	**2,913,960**		**9,710,168**	**2,133,993**	**–3,642**	**–707,810**	**2,674,830**		**25,808,901**

1. Agriculture consists of agriculture, forestry, fishing, and hunting.
2. Consists of utilities; 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; and other services, except government.
3. Consists of federal, state, and local governments.
4. Includes inventory valuation adjustment.
5. Includes noncomparable imports; inventory valuation adjustment; rest-of-the-world adjustments; and scrap, used and secondhand goods.

Impact Analysis

While the make and use tables from the I-O accounts provide basic facts about an industry for a given year, researchers often want a more in-depth analysis. The main contribution of the I-O accounts to economic analysis is that they permit users to measure the full, economywide repercussions that changes in final uses (household, business, and governments spending) have on industry and commodity output, employment, and income. A number of industry tables are derived from the standard make and use tables; these tables can be used for additional analysis, such as an "event study" or "impact analysis."

Redefinitions

The derivation of tables for this additional analysis starts with the standard make and use tables, in which all products produced by an industry—primary and secondary—are assigned to that industry. For the supplementary make and use tables, however, some secondary products and their associated inputs are redefined; that is, they are reassigned to the industry in which they are the primary products. Redefinitions are made when the input structure of the industry's secondary product differs significantly from the input structure of its primary product. For example, the restaurant services in hotels are redefined from the accommodations industry to the food services industry. These supplementary tables are referred to as "after redefinition."

Redefinitions affect numerous industries in the I-O accounts, notably wholesale trade, retail trade, construction, publishing industries, and accommodations and food services. As a result of redefinitions, the total value of secondary products is decreased, and the total value of primary products is increased by the same amount.[4] For the 2007 annual I-O accounts the amount of the redefined secondary output was $702 billion, or 2.7 percent of total output and 40 percent of total secondary output. For most industries, the output shown in the standard make and use tables will differ from that shown in the supplementary make and use tables; however, commodity outputs are not affected.

Requirements tables

Four requirements tables are derived from the "after redefinitions" make and use table. These tables are the most useful for impact or event analysis, because they can be used to show the impact of a specified change in final demand throughout the economy.[5] The values in these requirements tables are expressed as portions of industry output rather than in dollars. The coefficients in the requirements tables represent interindustry linkages that, in turn, link output and final demand.

The commodity-by-industry direct requirements table. This table is sometimes referred to as "the direct coefficients table" (table C). The direct coefficients calculate only the direct effects, which are the amount of commodity inputs required by an industry to produce a dollar of the industry's output, valued in producers' prices. This table thus ignores the indirect effects, which are the production requirements of all other industries to meet the industry's initial demand for a dollar of its output. For example, consider an increase in the final demand for motor vehicles. The direct requirements table shows the input production requirements—such as paint, steel, and plastic—of the motor vehicles, bodies and trailers, and parts industry to provide additional motor vehicle output. It does not include the "trickle down" effects, that is, the production requirements of all other industries necessary to support the additional demand for intermediate inputs

4. See chapters 4 and 9 in *Concepts and Methods of the U.S. Input-Output Accounts* for details on the redefinition and reclassification process and underlying assumptions (www.bea.gov/papers/pdf/IOmanual_092906.pdf).

5. BEA produces three additional supplementary tables that serve as bridges between the I-O statistics and statistics in the NIPAs. The bridge table for personal consumption expenditures (PCE) covers the I-O commodity composition of NIPA PCE. The bridge table for private fixed investment in equipment and software (PES) covers the I-O commodity composition of NIPA PES expenditures. The third bridge table reconciles the I-O statistics of exports and imports with those in the NIPAs. The commodity composition tables are necessary because the I-O accounts value the final use categories in producers' prices while the NIPA final demand categories are expressed in purchasers' prices. In benchmark years, the I-O accounts also include a *Concordance Between Input-Output Commodity Codes and Foreign Trade Harmonized Codes*. This table links Census Bureau merchandise trade data by harmonized foreign trade codes to I-O commodity codes by weight. The weight indicates what portion of the harmonized code value was allocated to the I-O commodity.

Table C. The Direct Requirements by Industries, 2007

[Output requirements per dollar of delivery to final demand, at producers' prices]

Commodities/industries	Agriculture, mining, and construction [1]	Manufacturing		Services [2]	Government [3]
		Total	Computer and electronic products		
Agriculture, mining, and construction [1]	0.07036	0.11940	0.00247	0.01550	0.03080
Manufacturing	0.21191	0.32282	0.27725	0.05542	0.10757
Computer and electronic products	0.00225	0.02164	0.17555	0.00506	0.00911
Services [2]	0.22148	0.22644	0.32229	0.31833	0.24612
Government [3]	0.00075	0.00063	0.00068	0.00443	0.00341
Total intermediate inputs [4]	**0.50571**	**0.68395**	**0.63410**	**0.39981**	**0.39967**
Compensation of employees	0.26313	0.18434	0.34947	0.30752	0.50849
Taxes on production and imports less subsidies	0.01287	0.01141	0.01184	0.05672	–0.00550
Gross operating surplus	0.21829	0.12030	0.00460	0.23596	0.09734
Total value added	**0.49429**	**0.31605**	**0.36590**	**0.60019**	**0.60033**
Total industry output	**1.00000**	**1.00000**	**1.00000**	**1.00000**	**1.00000**

1. Agriculture consists of agriculture, forestry, fishing, and hunting.
2. Consists of utilities; 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; and other services, except government.
3. Consists of federal, state, and local governments.
4. Includes noncomparable imports; rest-of-the-world adjustments; and scrap, used and secondhand goods.

from the motor vehicles industry, such as the additional requirement for tire cord and synthetic rubber by the plastics and rubber industry to provide the additional tires required by the motor vehicles industry.

The direct requirements table is calculated by dividing each row element (commodity value) of the use table after redefinitions by the column sum for each industry in the table. Table C shows that for the computer and electronic products industry to produce $1 billion of computer and electronic products output in 2007, it directly required $634 million of intermediate inputs ($1 billion x 0.634). That included $176 million in computer and electronic products ($1 billion x 0.176) and $102 million in other manufactured goods (0.278 – 0.176 = 0.102 x $1 billion), which included such manufactured goods as $31 million in fabricated metals, $20 million in primary metals, and $12 million in chemical products. The industry also required $322 million in services inputs, including $82 million in wholesale trade services, $61 million in miscellaneous professional, scientific and technical services, and $7 million in legal services. The industry generated $366 million in value added for every $1 billion in industry output, 96 percent of which was for compensation to labor.

In many cases, researchers and policymakers are interested in the total impact—including the direct and indirect effects—of the specified change in final demand.[6] BEA offers three total requirements tables, as shown in the following table.

Total Requirements Table

Table	Use
Commodity-by-commodity	Final demand is shown for commodities; the objective is to derive the commodity output that is required.
Industry-by-commodity	Final demand is shown for commodities; the objective is to derive the industry output that is required.
Industry-by-industry	Final demand is shown for industries; the objective is to derive the industry output that is required.

The commodity-by-commodity total requirements table. This 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.[7] Providing $1 billion of computer and electronic products to final users required, among other inputs, $1.2 billion of computer and electronic products, $61 million in primary metals goods, $50 million in fabricated meal products, and $36 million in chemical products.[8] The total commodity requirements coefficient is 2.223, which is the sum of all the entries in the column. This means that the total value of all commodities required for an additional $1 billion of computer and electronic products delivered to final users is $2.2 billion.

The industry-by-commodity total requirements table. This 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. This table may be the most useful because most information on final uses is in terms of commodities and most other statistical data—for example, employment—is in terms of industries. In order to provide final users with $1 billion of computer and electronic products goods, the computer and electronic products industry is required to produce $1.2 billion of industry output.[9] Recall that some of the industry's production will be used by other industries as intermediate inputs; not all reaches final users. Other industries must produce $975 million of industry output. The total industry output requirement coefficient is 2.174, indicating the additional output of all industries that is required to deliver $1 billion of computer and electronic products to final users is $2.2 billion.

The industry-by-industry total requirements table. This 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. For example, in 2007, providing final users with $1 billion of computer and electronic products industry output required the computer and electronic products industry to produce $1.2 billion of output, the primary metals industry to produce $57 million of output, and the fabricated metal products industry to produce $50 million of output, and so on.[10] The total industry output requirements coefficient is 2.172, indicating that

6. The final use requirements coefficients presented in the total requirements tables identify the cumulative effects on total industry and commodity outputs that result from a change in final use. In contrast to conventional macroeconomic multipliers that measure the cumulative impact on final output of a policy change, such as the decline in GDP that results from a reduction in government spending, these final use coefficients measure the impact of a change in final demand (uses) on gross output (final and intermediate output). Indeed, shifts in the composition of final uses can have a "multiple" impact on industry and commodity output but can have no effect on the level of total GDP.

7. A coefficient greater than one (on the diagonal) indicates that for a specific commodity, the coefficient includes the increase in demand for that commodity plus other direct and indirect inputs of that commodity required to produce the commodity for final use.

8. Statistics are from the 2007 annual I-O Commodity-by-Commodity Total Requirements Table.

9. Statistics are from the 2007 annual I-O Industry-by-Commodity Total Requirements Table.

10. Statistics are from the 2007 annual I-O Industry-by-Industry Total Requirements Table.

the additional output of all industries to deliver $1 billion of output to final users from the computer and electronic products industry is $2.2 billion.

Other tables

Other tables, such as a domestic output requirements tables and an employment requirements table, can easily be constructed by users.

Domestic output requirements table. When using the total requirements tables, it is important to note that the amount of output required to deliver a dollar of commodity to final users includes both imported commodities and domestically produced commodities. However, both the total commodity output requirements coefficient and the total industry output requirements coefficient represent the output required as if all of the commodity were domestically supplied. Therefore, if a portion of the commodity is imported, the impact on domestic output will be lower than that implied by the requirements coefficient.

The coefficients in a domestic output requirements table are used to estimate the domestic output of goods and services required to meet final demand. Users can derive this table by subtracting the import matrix from the use table after redefinitions before calculating a total requirements matrix.[11] So a domestic output industry-by-commodity requirements table for 2007 is generated by subtracting the import matrix from the use table after redefinitions and then calculating the industry-by-commodity total requirements table.[12]

This table shows that in order to provide final users with $1 billion of computer and electronic products goods, after taking into account imported computer and electronic products, the domestic computer and electronic products industry is required to produce $1.1 billion of industry output. Other industries contribute $757 million of industry output. The total industry output requirement coefficient is 1.831, indicating that the total additional output of all domestic industries required to deliver $1 billion of computer and electronic products to final users is $1.8 billion. This compares with the total (domestic and foreign output) requirements of 2.174 from the standard industry-by-commodity total requirements table described previously.

Employment requirements table. This table shows the direct and indirect impact of a change in final demand on industry employment. These tables are derived from one of the total requirements tables. The employment requirement coefficient 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. From the domestic industry-by-commodity employment requirements table, the direct and indirect impact of a $1 billion change in final demand for computer and electronic products (commodity) on employment can be calculated.

As one would expect, the greatest impact occurs in the computer and electronics products industry, where in 2007, a $1 billion dollar increase in final demand required an increase in the industry's employment of nearly 3,500 workers. Higher employment in other industries would also be required: wholesale trade (513 workers), miscellaneous professional, scientific and technical services (419 workers), administrative and support services (350 workers), and management of companies and enterprises (210 workers). Across all industries, roughly 6,785 additional workers would have been required to meet a $1 billion increase in final demand.

GDP by Industry Accounts

While the input-output accounts offer a wealth of information in current dollars, the GDP by industry accounts allow for easier time series analysis of industry output in current dollars and in inflation-adjusted dollars.[13] These accounts provide an industry-by-industry breakout of GDP. They are ideally suited for studying industry shares of GDP, the composition of an industry's value added, an industry's returns to labor and capital, and its contribution to U.S. economic growth and inflation.

Value added

One key feature of the GDP by industry accounts is the value-added estimates for all industries. Value added is a measure of the incomes earned in production in each industry. As such, it is also a measure of an industry's contribution to GDP. The main components of value include the returns to labor (as measured by compensation of employees) and returns to capital (as measured by gross operating surplus) and the returns to

11. The import matrix is a supplemental table that shows for each commodity, the value of import of that same commodity used by each industry. The import matrix is derived from the use table. The imputed import values are based on the assumption that each industry uses imports of a commodity in the same proportion as imports-to-domestic supply of the same commodity. Therefore, all variability of import usage across industries reflects the assumption and is not based on industry-specific information. BEA prepares two import matrixes, corresponding to the standard use table and the use table after redefinitions.

12. BEA does not prepare domestic output requirements tables as part of the I-O accounts, but it does provide the import matrix so that users can construct domestic output requirements tables.

13. The GDP by industry accounts are an extension of the annual I-O accounts and therefore the current dollar value added and its components in the two sets of accounts are consistent.

government (as measured by taxes on productions and imports less subsidies).

Current-dollar value added for the computer and electronic products industry declined at an average annual rate of –0.5 percent in 1998–2007. By contrast, value added for all industries rose at an 5.2 percent rate (table D).

Returns to capital. The gross operating surplus includes corporate profits and proprietors' income as well as depreciation, net interest, and business transfer payments. As a share of current-dollar value added, gross operating surplus was consistently lower in the computer and electronic products industry than for the economy as a whole. For the industry, gross operating surplus, as a share of value added, fell from 26.7 percent in 1998 to a trough of –2.5 percent in 2001 before recovering to 1.8 percent in 2007 (table E). The industry was hit hard in the recession of 2001. The ratio across all industries held up much better; the ratio fell from 35.7 percent in 1998 to 34.6 percent in 2001 before rising to 36.4 percent in 2007.

Returns to labor. In contrast to the capital share, the compensation of employees share of current-dollar value added in the computer and electronic products industry was 71.7 percent in 1998, while the national level share was just 57.4 percent. However, while the share across all industries declined to 56.6 percent in 2007, the computer and electronic products industry share increased to 95.1 percent.

Real growth rates. A look at an industry's "real," or inflation-adjusted, value-added growth rates in comparison to real GDP growth can suggest if the industry is adding to (or reducing) the national economy's growth.

Real GDP increased at an average annual rate of 2.8 percent in 1998–2007 (table D). Real value added also increased for most industries during this period; however, the growth rates varied considerably. The computer and electronic products industry grew at an average annual rate of 21.3 percent over this period, the highest growth rate of the 65 industries included in the GDP by industry accounts.

Contributions to economic growth. Differences in growth rates alone do not indicate the extent to which industries contribute to economic growth. An industry's contribution also depends on the industry's size. For example, real value added for the computer and electronic products industry increased by 45.1 percent in 1998. Even though the computer and electronic products industry is relatively small (1.9 percent of current-dollar GDP in 1998), it contributed a larger share to growth: 0.75 percentage points of the 4.2 percent growth in real GDP. By 2007, the computer and electronic products industry accounted for 1.1 percent of current-dollar GDP; industry real value added increased 19.9 percent during 2007 and contributed 0.20 percentage points to the 2.0 percent growth in real GDP.

Intermediate inputs

For an industry to produce output, it needs capital and labor, its value-added inputs, and secondary inputs, which are also known as intermediate inputs to production. For example, a baker produces bread by mixing flour, water, eggs, and other material inputs before placing the dough into an oven. In addition to the material inputs, the baker also needs electricity, a kind of energy input, to power the operating equipment. Finally, the baker may have a fleet of vans to transport the bread to the local grocery store, or the baker may contract the delivery (purchased-service input) to a local trucking service.

The KLEMS statistics provide detail on the types of intermediate inputs described above that are consumed by industries to produce goods and services. These statistics break out total intermediate inputs by industry into three cost categories: energy, materials, and purchased services. They also provide information on the contribution of price and quantity changes for the different types of intermediate inputs on the U.S.

Table D. Industry Value Added as a Percentage of GDP, Percent Change in Value Added, and Contributions to Percent Change in Real Gross Domestic Product, 1998–2007

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	Average 1998–2007
All industries											
Percentage of current-dollar GDP	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Percentage of real GDP growth	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Percent change in current-dollar GDP	5.3	6.0	5.9	3.2	3.4	4.7	6.6	6.3	6.1	4.8	5.2
Percent change in real GDP	4.2	4.5	3.7	0.8	1.6	2.5	3.6	2.9	2.8	2.0	2.8
Percentage point contribution to percent change in real GDP	4.2	4.5	3.7	0.8	1.6	2.5	3.6	2.9	2.8	2.0	2.8
Computer and electronic products											
Percentage of current-dollar GDP	1.9	1.8	1.9	1.4	1.2	1.1	1.1	1.1	1.1	1.1	1.4
Percentage of real GDP growth	0.2	0.1	0.2	0.0	0.0	0.1	0.0	0.1	0.1	0.1	0.1
Percent change in current-dollar value added	7.3	–1.7	14.0	–26.2	–9.3	–0.1	1.2	6.6	8.0	1.3	–0.5
Percent change in real value added	45.1	30.3	48.0	–2.0	2.1	15.5	16.0	22.3	25.0	19.9	21.3
Percentage point contribution to percent change in real GDP	0.75	0.53	0.75	–0.02	0.03	0.17	0.17	0.22	0.25	0.20	0.31

NOTE. Industry percentage of real GDP growth is calculated as the ratio of the industry percentage point contribution to all industries percent change in real GDP to percent change in real GDP.

economy; for example, the impact of price changes for energy inputs on overall prices for the nation's output.

A look at the composition of total intermediate inputs for the U.S. economy shows the broad move toward an increasingly services-oriented economy. In each year over 1998–2007, every dollar of gross output represented a progressively higher percentage of purchased services and a lower percentage of materials. In 2007, purchased services accounted for 26.2 percent of the nation's output (table F). That means that every dollar of output in 2007 reflected 26 cents worth of purchased services. Materials accounted for about 18 cents of every dollar of output.

The computer and electronic products industry requires 32 cents worth of materials and 30 cents worth of purchased services to produce a dollar of output. These shares are much more evenly distributed than they were before the economic slowdown in 2001; for example, in 2000, at the height of the information technology (IT) boom, materials accounted for 38 cents and purchased services accounted for 25 cents of every dollar.

The use of materials inputs, adjusted for inflation, for the computer and electronic products industry varied considerably, reflecting the IT boom, the 2001 slowdown, and the subsequent recovery through 2007. In 1999 and 2000, growth in the use of materials neared 20 percent each year (table G), and accounted for 0.81 percentage point, or about 20 percent, of the 4.1 percent growth in the use of materials in 1999 and 0.88 percentage point, or about 38 percent of the 2.3 percent growth in 2000 (table H). This growth was followed by steep declines, 11 percent in 2001 and 21 percent in 2002. The use of materials was relatively flat during the post 2001 recovery.

Table E. Shares of Value Added, 1998–2007

[Percent]

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
All industries										
Gross domestic product	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Compensation of employees	57.4	57.9	59.0	58.7	58.2	57.8	57.0	56.7	56.5	56.6
Taxes on production and imports less subsidies	6.9	6.8	6.8	6.6	6.9	6.9	7.0	7.0	7.0	7.0
Gross operating surplus	35.7	35.3	34.3	34.6	34.8	35.3	36.0	36.4	36.5	36.4
Computer and electronic products										
Value added	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Compensation of employees	71.7	79.3	83.8	100.3	98.6	96.5	95.6	95.0	94.9	95.1
Taxes on production and imports less subsidies	1.6	1.7	1.6	2.2	2.6	2.8	3.0	3.0	2.9	3.1
Gross operating surplus	26.7	19.0	14.6	–2.5	–1.2	0.7	1.4	2.1	2.1	1.8

Table F. Shares of Gross Output, 1998–2007

[Percent]

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
All industries										
Gross output	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Gross domestic product	55.0	54.8	54.0	55.0	55.7	55.5	54.8	53.8	53.5	53.5
Intermediate inputs	45.0	45.2	46.0	45.0	44.3	44.5	45.2	46.2	46.5	46.5
Energy inputs	1.7	1.7	2.0	2.0	1.9	1.9	2.1	2.5	2.5	2.5
Materials inputs	19.8	19.4	19.2	18.2	17.5	17.6	17.9	18.3	18.2	17.8
Purchased-services inputs	23.5	24.1	24.8	24.8	24.9	25.0	25.2	25.4	25.8	26.2
Computer and electronic products										
Gross output	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Value added	38.7	35.8	37.1	32.7	35.3	35.3	34.4	35.6	37.5	37.7
Intermediate inputs	61.3	64.2	62.9	67.3	64.7	64.7	65.6	64.4	62.5	62.3
Energy inputs	0.6	0.7	0.6	0.7	0.7	0.7	0.7	0.7	0.6	0.6
Materials inputs	36.9	37.6	37.7	37.5	34.1	33.2	34.0	34.0	32.5	31.9
Purchased-services inputs	23.7	25.9	24.6	29.1	29.9	30.8	30.9	29.6	29.4	29.7

Price growth

The price indexes for gross output, value added, and intermediate inputs represent the prices received by an industry for its output and the prices paid for its inputs. Growth rates for these indexes indicate whether prices for these inputs are growing faster or slower than output prices. Price growth for the nation's output averaged 2.3 percent in 1998-2007 and was evenly distributed between value added (2.3 percent) and intermediate inputs (2.4 percent) (table I). Within intermediate inputs, energy prices increased significantly more than prices for materials and purchased services: 6.7 percent, 2.5 percent, and 1.9 percent, respectively. Indeed, energy prices saw double-digit price increases in 2000 and 2003–2005.

The pattern of changes in the price indexes for the computer and electronic products industry was quite different from the national pattern. Most striking is the large and continual decline in prices for gross output

Table G. Percent Change in Chain-Type Quantity Indexes, 1998–2007

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	Average annual rate of change 1998–2007
All industries											
Gross output	5.3	5.1	4.6	–0.1	1.0	2.3	3.9	4.0	2.9	1.8	3.1
Gross domestic product	4.2	4.5	3.7	0.8	1.6	2.5	3.6	2.9	2.8	2.0	2.8
Intermediate inputs	6.5	6.0	5.7	–1.2	0.4	2.1	4.4	5.1	3.1	1.5	3.3
Energy inputs	0.0	2.8	4.2	–1.4	3.5	–5.9	7.6	4.1	–2.6	0.9	1.2
Materials inputs	5.1	4.1	2.3	–3.1	–0.6	1.6	2.3	3.8	0.9	–1.9	1.4
Purchased-services inputs	8.2	7.8	8.5	0.3	1.0	3.0	5.8	6.4	5.3	4.1	5.0
Computer and electronic products											
Gross output	16.6	21.9	24.1	–5.1	–11.6	5.6	8.4	6.9	7.5	7.1	7.6
Value added	45.1	30.3	48.0	–2.0	2.1	15.5	16.0	22.3	25.0	19.9	21.3
Intermediate inputs	1.8	16.7	11.8	–7.1	–17.9	0.6	4.6	–0.5	–1.5	0.1	0.4
Energy inputs	–13.6	11.3	–3.1	–12.3	–12.2	–3.8	–0.1	–9.9	–16.7	–5.1	–6.8
Materials inputs	3.6	16.8	17.6	–10.6	–21.3	–0.4	6.9	2.4	–2.2	0.0	0.7
Purchased-services inputs	–0.9	16.5	3.7	–1.9	–13.8	1.7	2.2	–3.6	–0.3	0.3	0.2

and value added in the industry: averaging –8.1 percent and –18.0 percent, respectively. Over 1998–2007, value-added prices for the computer and electronic products industry subtracted just over 3 tenths of a percentage point from the 2.3 percent average annual growth in the GDP price index (table J). Within intermediate inputs, the growth in prices for material inputs was negative 8 of the 10 years. Overall, materials prices paid by the industry declined by 3.8 percent annually, subtracting 0.19 percentage point from the 2.5 percent average annual growth in economywide materials prices. The decline in these price indexes at a time when real output was growing, reflects the significant productivity gains in the industry. The growth in the

Table H. Contributions of the Computer and Electronic Products Industry to Percent Change in Chain-Type Quantity Indexes for GDP, Energy, Materials, and Purchased-Services, 1998–2007

	GDP		Energy inputs		Materials inputs		Purchased-services inputs	
	All industries	Computer and electronic products	All industries	Computer and electronic products	All industries	Computer and electronic products	All industries	Computer and electronic products
	Percent change	Percentage point contribution	Percent change	Percentage point contribution	Percent change	Percentage point contribution	Percent change	Percentage point contribution
1998	4.2	0.75	0.0	–0.15	5.1	0.19	8.2	–0.03
1999	4.5	0.53	2.8	0.11	4.1	0.81	7.8	0.44
2000	3.7	0.75	4.2	–0.03	2.3	0.88	8.5	0.10
2001	0.8	–0.02	–1.4	–0.11	–3.1	–0.56	0.3	–0.05
2002	1.6	0.03	3.5	–0.10	–0.6	–0.99	1.0	–0.37
2003	2.5	0.17	–5.9	–0.03	1.6	–0.01	3.0	0.04
2004	3.6	0.17	7.6	0.00	2.3	0.22	5.8	0.05
2005	2.9	0.22	4.1	–0.06	3.8	0.08	6.4	–0.07
2006	2.8	0.25	–2.6	–0.08	0.9	–0.06	5.3	–0.01
2007	2.0	0.20	0.9	–0.02	–1.9	0.00	4.1	0.01
Average, 1998–2007	2.8	0.31	1.2	–0.05	1.4	0.06	5.0	0.01

Table I. Percent Change in Chain-Type Price Indexes, 1998–2007

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	Average annual rate of change 1998–2007
All industries											
Gross output	–0.3	1.1	2.8	1.2	1.1	2.8	3.8	4.2	3.5	3.0	2.3
Gross domestic product	1.1	1.4	2.2	2.4	1.7	2.1	2.9	3.3	3.2	2.7	2.3
Intermediate inputs	–1.6	0.7	3.7	0.1	0.1	3.6	4.8	5.6	3.9	3.4	2.4
Energy inputs	–7.8	3.1	18.1	2.5	–5.6	14.2	10.8	22.7	7.9	5.5	6.7
Materials inputs	–4.0	–0.2	4.3	–1.3	–1.1	4.3	7.0	7.2	4.9	4.7	2.5
Purchased-services inputs	1.0	1.3	2.2	0.8	1.3	2.4	2.6	2.9	2.7	2.1	1.9
Computer and electronic products											
Gross output	–15.1	–12.9	–11.2	–11.8	–4.9	–5.5	–4.1	–3.8	–4.5	–6.0	–8.1
Value added	–26.0	–24.6	–23.0	–24.7	–11.2	–13.5	–12.8	–12.8	–13.6	–15.5	–18.0
Intermediate inputs	–7.3	–4.7	–3.3	–3.7	–1.5	–0.9	0.9	1.4	1.2	0.3	–1.8
Energy inputs	–2.1	–0.4	6.7	8.1	–5.2	8.3	5.3	13.1	5.9	3.1	4.1
Materials inputs	–11.1	–7.4	–6.1	–6.9	–2.9	–2.6	–0.3	0.4	0.4	–1.1	–3.8
Purchased-services inputs	–0.9	–0.4	1.1	0.7	0.2	0.9	2.2	2.2	2.0	1.7	1.0

Table J. Contributions of the Computer and Electronic Products Industry to Percent Change in Chain-Type Price Indexes for GDP, Energy, Materials, and Purchased-Services, 1998–2007

	GDP		Energy inputs		Materials inputs		Purchased-services inputs	
	All industries	Computer and electronic products	All industries	Computer and electronic products	All industries	Computer and electronic products	All industries	Computer and electronic products
	Percent change	Percentage point contribution	Percent change	Percentage point contribution	Percent change	Percentage point contribution	Percent change	Percentage point contribution
1998	1.1	–0.60	–7.8	–0.02	–4.0	–0.60	1.0	–0.03
1999	1.4	–0.55	3.1	0.00	–0.2	–0.40	1.3	–0.01
2000	2.2	–0.50	18.1	0.07	4.3	–0.35	2.2	0.03
2001	2.4	–0.47	2.5	0.07	–1.3	–0.36	0.8	0.02
2002	1.7	–0.15	–5.6	–0.04	–1.1	–0.12	1.3	0.00
2003	2.1	–0.17	14.2	0.06	4.3	–0.09	2.4	0.02
2004	2.9	–0.15	10.8	0.03	7.0	–0.01	2.6	0.05
2005	3.3	–0.15	22.7	0.07	7.2	0.01	2.9	0.04
2006	3.2	–0.16	7.9	0.03	4.9	0.01	2.7	0.04
2007	2.7	–0.18	5.5	0.01	4.7	–0.03	2.1	0.03
Average, 1998–2007	2.3	–0.31	6.7	0.03	2.5	–0.19	1.9	0.02

energy and purchased services price indexes were dominated by the drop in materials and value added prices.

Appendix: A Note on Assumptions

When using the industry accounts, the underlying assumptions are worth keeping in mind. The assumptions follow directly from the fundamental economic principles that provide structure to I-O accounts.

First, inspection of the I-O use and the requirements tables shows that each industry is defined so that it has a unique production function, that is, a unique set of inputs.

Second, there are no economies of scale in production; the ratio of each input to one unit of output remains constant over a wide range of output levels. This means if the demand for a given product increases 50 percent, all of the inputs required for the product will also increase by 50 percent. This principle is necessary to calculate the effect of a change in final uses on the output of all industries.

Third, the production relationships embodied in the I-O represent aggregate relationships at a given level of production in a given year. Thus, it is important to use the requirements tables to estimate impacts for a year close to the reference year of the accounts. This is particularly important in using the detailed benchmark I-O accounts, which are produced once

Data Availability

The industry accounts are available to the public without charge on BEA's Web site at www.bea.gov. Users have two options for downloading the industry data: downloading complete tables or creating user specified extracts via an interactive data retrieval tool. Users who want to directly download published I-O data will find all the data files accessible in the Industry Economic Accounts portion of BEA's Web site. Data downloading is recommended for users who want to retrieve the complete tables at the most detailed industry level. All data are in MS Excel format except for the very large detail level benchmark tables, which are in TXT format.

The benchmark I-O tables for 1997 and 2002 are available on a NAICS basis. Tables for 1947, 1958, 1963, 1967, 1972, 1977, 1982, 1987, and 1992 are available on the Standard Industrial Classification (SIC) basis. The import matrix and the concordance between the I-O commodity codes and the foreign trade harmonized codes are available only for 1997 and 2002. The bridge tables are available for 1987 forward.

The benchmark I-O accounts are available at three levels of industry and commodity aggregation:

- The sector level—15 industries, 16 commodities, and 6 final use categories—that corresponds approximately to the two-digit level NAICS
- The summary level—133 industries, 136 commodities, and 13 final use categories – that corresponds approximately to the three- and four-digit level NAICS
- The detailed level—over 425 industries and commodities and 13 final use categories

The NAICS-based annual I-O tables are available for 1997–2007. These tables are consistent with the 2008 annual revision of the integrated annual industry accounts and the 2004 comprehensive revision of the annual industry accounts.[1] The import matrix and the bridge tables are available only for 2002–2007. Historic SIC-based tables are available for 1996–99.

1. The annual I-O accounts consistent with the 2010 comprehensive revision will be available in May 2010.

The annual I-O accounts are available at two levels of industry and commodity aggregation:

- The sector level—15 industries, 16 commodities, and 6 final use categories— that corresponds approximately to the two-digit level NAICS
- The summary level—65 industries, 68 commodities, and 13 final use categories—that corresponds approximately to the three-digit level NAICS

The NAICS-based GDP by industry statistics for gross output, intermediate inputs, and value added and KLEMS statistics are available for 1997–2007. These accounts are integrated with the annual I-O accounts. Historical NAICS-based GDP by industry statistics for value added (1947–97) and for gross output and intermediate inputs (1987–97), and SIC-based GDP by industry statistics for gross output (1977–97) and value-added and its components (1947–97) are also available.

The annual accounts, both annual I-O and GDP by industry, are available approximately 11 months after the end of the reference year. The "advance" GDP by industry statistics are aggregated to 20 broad industry groups and government—roughly corresponding to the two-digit NAICS—rather than to the 65 industries in the revised accounts. The advance statistics are published approximately four months after the end of the reference year.

The core tables for the benchmark I-O accounts for 1997 forward and the annual accounts for 1997 forward also are available on an interactive basis on BEA's Web site. The interactive access area allows users to customize a selection of data from the U.S. I-O account tables. Data can be extracted in Excel of CSV format. In addition, users are able to graph selected information from the GDP by industry accounts and the KLEMS statistics to view trends over time. Select tables allow for four different types of graphs: actual values, normalized values, changes from one period to the next, and percentage changes from one period to the next.

Published articles on the I-O accounts can be found on BEA's Web site. See www.bea.gov/industry/an2.htm for a list of articles.

every 5 years. Interindustry relationships change over time because of changes in market conditions, technology, and productivity. The farther the event year is from the reference year, the less reliable the results.

Fourth, the I-O accounts implicitly assume that all adjustments to a change in final demand are achieved instantly and without price changes. For analyses that require different assumptions, other economic tools may be more appropriate.

Fifth, BEA's industry accounts, following BEA conventions, use Fisher indexes to create price and quantity indexes. For more information, see J. Steven Landefeld, Brent R. Moulton, and Cindy M. Vojtech, "Chained-Dollar Indexes: Issues, Tips on Their Use, and Upcoming Changes," SURVEY 83 (November 2003): 8–16.

References

This article provides a first step in understanding BEA's industry accounts. For readers interested in continuing their education, this section offers references, organized by subject area and industry account.

Satellite Accounts

Satellite accounts are supplemental accounts that expand the analytical capacity of the BEA's accounts by focusing on a particular aspect of economic activity. BEA currently produces two sets of satellite accounts—the travel and tourism satellite accounts and the research and development satellite account—and is developing satellite accounts for health, innovation, and energy.

Travel and tourism satellite accounts. Tourism is not treated as a separate industry in NAICS; rather, data for tourism are scattered among several industries—such as transportation services, accommodations, food and beverage services, and retail trade. As a result, comprehensive data on tourism is not identified specifically in the U.S. national accounts. The U.S. travel and tourism satellite accounts present a rearrangement of information from the NIPAs and the industry I-O accounts, augmented with information from other U.S. government agencies and from a private sector vendor of tourism information. In the these accounts, the flows of commodities that are related to travel and tourism activities link tourism expenditures to the industries that produce tourism goods and services in the U.S. The tourism industries in the satellite accounts include industries whose output is purchased directly and indirectly by travelers.

These accounts present statistics on expenditures by tourists, or visitors, for 24 types of goods and services. The accounts also present statistics on the income generated by travel and tourism and statistics on output and employment generated by travel and tourism-related industries. Current-dollar and real dollar tourism output by commodity are reported along with the commodity chain-type price indexes. Both annual and quarterly these satellite accounts are produced.

The travel and tourism satellite accounts can be used by government officials and policymakers and by researchers to determine the size and components of travel and tourism, to assess the contributions of the tourism industry to the U.S. economy, to assess the relationship among the travel and tourism industries, to determine the expenditures of tourists, and to compare travel and tourism industries to other manufacturing and services industries. Because the accounts are a time series, they can be used to analyze how travel and tourism expenditures have change in recent years and examine who is traveling and how the mix of travelers is changing.

Research and development satellite account. The research and development (R&D) satellite account adjusts the accounting conventions of BEA's core accounts to test the impact of treating R&D as a capital investment rather than as a current-period expense. It provides statistics on R&D investment, capital stock, and depreciation in the economy on a funder basis. In addition, it reports R&D-adjusted measures of GDP, gross domestic income, and national savings. Currently, the BEA accounts do not treat R&D and many other intangibles as investment and thus cannot separately identify their contribution to U.S. economic growth. This satellite account is part of a long-term effort to better account for intangible assets. BEA plans to incorporate R&D spending as investment into its core accounts in 2013.

The most recent R&D satellite account, released in September 2008, provides data for 1959–2004 at the national level and R&D statistics for 13 R&D intensive industries. The impact of R&D investment on GDP by state is available for 1998–2002. The R&D satellite account also includes an international component that shows the impact of treating R&D as investment on several dimensions of international transactions, including international transactions balances, the international investment position, and value added for multinational corporations for 1995–2004.

The R&D satellite account is a joint project by BEA and the National Science Foundation that aims to provide detailed statistics to facilitate research into the effects of R&D on the economy. The R&D satellite account can be used to determine the funding distribution of R&D investment and to assess the effects of R&D on the U.S. economy. Many state policymakers view R&D investment as an important part of their state's economic development strategy. For example, enhancing and encouraging R&D and knowledge-based industries within states and developing state-private partnerships with R&D industries are among the highest priorities among state governors.

Potential future satellite account. BEA is exploring the feasibility of creating additional satellite accounts—for innovation, including research and development and other intangible investments; health care; and energy.

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Future Directions for the Industry Accounts

In order to provide more relevant statistics on industry activity, BEA is proposing a number of improvements to the industry accounts. Proposals being considered include preparing quarterly GDP by industry statistics that would be released shortly after the quarterly GDP estimates from the NIPAs; integrating the benchmark I-O accounts with the already integrated annual I-O and annual GDP by industry accounts; preparing an I-O based energy satellite account; and improving the measurement of intangibles and innovation in BEA's core and satellite accounts.

In addition, longer run research on the source data and methodologies used to prepare major portions of the annual I-O accounts and the NIPAs is being considered in order to improve the consistency and quality of both sets of accounts. For more information, see "BEA Briefing: Future Directions for the Industry Accounts" by Brian C. Moyer in the March 2009 Survey of Current Business.