

Integrated BEA/BLS Industry-Level Production Account

Initial Statistics for 2015 and Revised Statistics for 1998–2014

ON JULY 14, 2017, the integrated industry-level production account for the United States was updated to include new statistics for 2015 and revised statistics for 1998–2014. The integrated production account represents an ongoing collaboration between the Industry Economics Directorate of the Bureau of Economic Analysis (BEA) and the Bureau of Labor Statistics (BLS) Productivity Program. The account combines industry-level output and intermediate inputs from BEA’s gross domestic product (GDP) by industry accounts with capital input and labor hours data from the BLS Productivity Program to create an internally consistent production account. It contains detailed data on output and inputs in current and constant prices as well as multifactor productivity (MFP) by industry.¹ The foundations of this account are discussed in detail by Fleck and others.²

With the recent update to the statistics, the underlying data for gross output, intermediate inputs, and value added are now consistent with the results of the 2016 annual update of the industry economic accounts, released on November 3, 2016.³ Data on capital

and labor inputs have been updated in conjunction with the multifactor productivity estimates released by BLS on July 12, 2017.⁴ Updates to the account for 1998–2012 reflect revisions to capital and labor input data from BLS, while updates to the account for 2013–2014 reflect revisions to those series as well as revisions from the annual update of BEA’s industry economic accounts. In addition, recent cooperative efforts between BEA and BLS have resulted in improvements to the account; specifically, the definition of information technology capital used in this account has been amended to be more consistent with the concept of information and communications technology used throughout BEA’s accounts.⁵ This change does not affect total capital input, but it manifests as a shift between the contributions of information technology capital assets and other capital assets.

The detailed results from the industry-level production account are presented in “Table 1. Sources of Industry Output Growth, 1998–2015.” The results reflect

1. The industry-level production account and integrated MFP measures presented in this article reflect output consistent with GDP for the total economy, but differ in concepts and coverage from the official U.S. MFP measures from the Bureau of Labor Statistics, which are available on the [BLS Web site](#).

2. Susan Fleck, Steve Rosenthal, Matthew Russell, Erich H. Strassner, and Lisa Usher, “A Prototype BEA/BLS Industry-Level Production Account for the United States,” in *Measuring Economic Sustainability and Progress*, edited by Dale W. Jorgenson, J. Steven Landefeld, and Paul Schreyer (Chicago: University of Chicago Press, for the National Bureau of Economic Research, 2014).

3. Kevin B. Barefoot, William A. Jolliff, Vanessa M. Vogel, “The 2016 Annual Update of the Industry Economic Accounts: Initial Statistics for the Second Quarter of 2016 and Revised Statistics for 2013–2015 and the First Quarter of 2016.” *SURVEY OF CURRENT BUSINESS* 96 (December 2016).

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4. See the release on the [BLS Web site](#).

5. Information technology capital assets consist of communications equipment, mainframe computers, personal computers, direct access storage devices, printers, terminals, tape drives, storage devices, and integrated systems. Office and accounting machinery, photocopying and related equipment, medical equipment, electromedical instruments, and nonmedical instruments have been redefined to “other” capital assets.

Data Availability

Additional data tables on the integrated BEA/BLS industry-level production account, including industry contributions to the aggregate sources of growth, and details on capital and labor by industry can be found on the [BEA Web site](#) for 1998–2015. The GDP by industry accounts—including gross output, intermediate inputs, and value-added statistics—for 1947–2015 are available on [BEA’s Web site](#). The joint BLS/BEA industry-level production account will be updated annually to be consistent with the annual revisions to the national and industry economic accounts. The official statistics on multifactor productivity can be accessed on the [BLS Web site](#).

Table 1. Sources of Industry Output Growth 1998–2015

[Average annual growth rates]

	Growth		Contributions		
	Output	Capital contribution	Labor contribution	Intermediate contribution	Integrated MFP growth
Farms	1.02	0.13	0.18	-0.15	0.87
Forestry, fishing, and related activities.....	0.01	0.57	0.74	-1.52	0.22
Oil and gas extraction.....	2.55	0.07	0.12	0.01	2.35
Mining, except oil and gas.....	-0.42	0.67	-0.17	0.18	-1.10
Support activities for mining.....	4.86	0.48	1.86	0.77	1.75
Utilities.....	-0.23	0.69	0.01	-0.52	-0.42
Construction.....	-0.26	0.19	0.23	0.16	-0.84
Wood products.....	-0.94	0.04	-0.66	-0.84	0.52
Nonmetallic mineral products.....	-1.07	0.20	-0.34	-0.66	-0.27
Primary metals.....	-0.46	-0.09	-0.49	-0.69	0.81
Fabricated metal products.....	0.20	0.10	-0.17	0.36	-0.09
Machinery.....	0.15	0.15	-0.42	0.17	0.25
Computer and electronic products.....	3.41	0.48	-0.89	-1.90	5.72
Electrical equipment, appliances, and components.....	-1.46	-0.04	-0.50	-1.64	0.72
Motor vehicles, bodies and trailers, and parts.....	1.80	0.14	-0.25	1.07	0.84
Other transportation equipment.....	1.54	0.21	-0.17	1.07	0.43
Furniture and related products.....	-1.35	0.10	-0.81	-0.55	-0.09
Miscellaneous manufacturing.....	1.25	0.40	-0.16	0.49	0.52
Food and beverage and tobacco products.....	0.52	0.21	0.05	0.39	-0.14
Textile mills and textile product mills.....	-4.17	-0.19	-1.28	-3.03	0.34
Apparel and leather and allied products.....	-5.75	-0.07	-2.23	-3.92	0.47
Paper products.....	-1.28	-0.16	-0.54	-0.55	-0.03
Printing and related support activities.....	-1.75	-0.05	-1.13	-1.71	1.15
Petroleum and coal products.....	0.88	0.19	-0.04	0.41	0.31
Chemical products.....	0.89	1.07	-0.12	0.39	-0.45
Plastics and rubber products.....	-0.43	0.14	-0.28	-0.20	-0.10
Wholesale trade.....	2.43	1.00	0.17	0.90	0.37
Retail trade.....	2.14	0.85	0.17	1.03	0.10
Air transportation.....	-0.65	0.12	-0.73	-0.41	0.37
Rail transportation.....	1.01	0.13	-0.43	0.74	0.57
Water transportation.....	2.73	-0.06	0.36	0.76	1.66
Truck transportation.....	1.27	0.44	0.20	0.88	-0.24
Transit and ground passenger transportation.....	1.36	0.38	0.71	0.95	-0.68
Pipeline transportation.....	-1.37	1.50	0.13	-3.99	0.99
Other transportation and support activities.....	1.92	-0.06	0.32	1.77	-0.11
Warehousing and storage.....	6.09	0.41	1.80	3.15	0.73
Publishing industries, except Internet (includes software).....	1.45	0.90	-0.30	-0.11	0.95
Motion picture and sound recording industries.....	1.29	1.08	0.18	-1.00	1.02
Broadcasting and telecommunications.....	4.32	1.56	-0.27	1.81	1.22
Data processing, Internet publishing, and other information services.....	8.23	2.71	0.56	4.66	0.30
Federal Reserve banks, credit intermediation, and related activities.....	1.00	1.27	0.27	-0.24	-0.30
Securities, commodity contracts, and investments.....	3.08	0.13	0.55	1.91	0.48
Insurance carriers and related activities.....	3.43	1.00	0.36	1.88	0.19
Funds, trusts, and other financial vehicles.....	2.19	0.09	0.03	-0.19	2.26
Real estate.....	2.67	1.26	0.07	0.85	0.48
Rental and leasing services and lessors of intangible assets.....	2.53	2.54	0.01	1.44	-1.46
Legal services.....	-0.10	0.82	0.09	0.17	-1.18
Computer systems design and related services.....	4.53	0.17	2.39	0.27	1.71
Miscellaneous professional, scientific, and technical services.....	2.64	0.66	0.92	1.09	-0.03
Management of companies and enterprises.....	3.24	0.25	1.19	2.22	-0.42
Administrative and support services.....	3.19	0.78	0.76	0.81	0.83
Waste management and remediation services.....	1.51	0.17	0.59	0.86	-0.11
Educational services.....	2.62	0.22	1.47	1.34	-0.40
Ambulatory health care services.....	3.29	0.18	1.68	1.19	0.23
Hospitals and nursing and residential care.....	2.96	0.26	1.08	1.88	-0.26
Social assistance.....	3.04	0.09	1.77	1.41	-0.24
Performing arts, spectator sports, museums, and related activities.....	2.69	0.08	0.57	1.42	0.62
Amusements, gambling, and recreation industries.....	2.49	0.59	0.48	1.32	0.10
Accommodation.....	1.50	0.75	0.11	0.64	-0.01
Food services and drinking places.....	2.00	0.04	0.70	1.12	0.14
Other services, except government.....	0.38	0.42	0.18	0.90	-1.13
Federal government.....	1.55	0.55	0.01	0.92	0.07
State and local government.....	1.35	0.44	0.50	0.38	0.04

MFP Multifactor productivity

NOTE: Integrated MFP estimates differ from official estimates produced by the Bureau of Labor Statistics (BLS), which are available on the [BLS Web site](#).

a diversity of outcomes and sources of growth over the period. For example, the data processing, Internet publishing, and other information services industry was the fastest growing industry; output increased 8.23 percent per year on average, primarily as a result of the growth in capital investments and purchases of intermediate inputs. Together, this output growth is consistent with the ongoing shift to domestic cloud computing and the input data indicates that this shift is relatively intensive in capital and intermediate inputs. In contrast, output for the textile mills and textile product mills industry decreased 4.17 percent per year on average over the period, which is in line with increased demand for imported textiles. The largest growth in industry MFP occurred in computer and electronic products, reflecting the fast pace of innovation in the production of information technology.

In this account, GDP growth and its sources across factors of production are measured using the direct industry aggregation approach used by Jorgenson, Ho, Samuels, and Stiroh.⁶ In this approach, aggregate value added is the share-weighted growth of industry value-added growth. The contribution of industry capital and labor input growth towards aggregate value-added growth is the Domar-weighted input contribution.⁷ For 1998–2015, aggregate value added increased 1.96 percent per year on average (table 2).⁸ Increases in capital input accounted for 1.08 percentage points (about 55 percent), growth in labor input accounted for 0.47 percentage point (about 24 percent), and increases in MFP accounted for 0.41 percentage point (about 21 percent) of aggregate growth. The integrated account tables, which are available on [BEA's Web site](#), allow for more detailed decompositions of industry output and aggregate value-added growth by type of labor or capital asset.

The industry-level production account can be used to analyze how the ongoing recovery compares with the period before the 2007–2009 Great Recession. Comparing the sources of growth from the 2009–2015 period to the 1998–2007 period indicates that the majority of the difference in aggregate growth before and after the Great Recession can be attributed to a decline in the contribution of capital input, with a small deceleration in MFP growth also contributing. More than

6. Dale W. Jorgenson, Mun S. Ho, Jon D. Samuels, and Kevin J. Stiroh, "The Industry Origins of the American Productivity Resurgence," *Economic Systems Research* 19, no. 3 (October 2007): 229–252.

7. Each industry's Domar weight is the ratio of the industry's current-dollar gross output to aggregate current-dollar value added. The industry's contribution to aggregate MFP growth is the industry's MFP growth multiplied by its Domar weight. The contribution of industry intermediate input use drops out in the calculation of aggregate value added and its decomposition.

8. Contributions are calculated using a Tornqvist index calculation. The growth rates presented in this account are natural log growth rates rather than percent changes.

half of the decrease in capital input was due to a decrease in the contribution of “other” capital (–0.51 percentage point), and another third was due to a decrease in information technology (–0.31 percentage point).⁹ At the industry level, a large portion of the ag-

9. Other capital includes about 90 types of other capital equipment and structures, inventories, and land.

gregate difference in the contribution of capital input over the two periods was driven by lower capital input contributions from real estate and rental and leasing, finance and insurance, retail trade, and professional, scientific, and technical services (table 3).

During the 2009–2015 period, labor input contributed 0.87 percentage point to the 1.94 average annual

Table 2. Growth in Aggregate Value-Added and the Sources of Growth

[Average annual growth rates]

	1998–2015	1998–2007	2007–2015	2007–2009	2009–2015	2009–2015 less 1998–2007
Value added ¹	1.96	2.76	1.06	–1.56	1.94	–0.82
Capital input ²	1.08	1.53	0.58	0.66	0.56	–0.97
Information technology capital ³	0.24	0.37	0.09	0.16	0.06	–0.31
R&D capital.....	0.08	0.08	0.08	0.10	0.07	–0.01
Software capital.....	0.17	0.23	0.09	0.10	0.09	–0.14
Entertainment originals capital.....	0.03	0.03	0.02	0.02	0.02	–0.01
Other capital.....	0.57	0.81	0.30	0.27	0.31	–0.51
Labor input.....	0.47	0.59	0.33	–1.28	0.87	0.29
College labor.....	0.56	0.61	0.50	–0.06	0.69	0.08
Noncollege labor.....	–0.09	–0.02	–0.17	–1.21	0.18	0.21
Integrated multifactor productivity ²	0.41	0.65	0.14	–0.94	0.51	–0.14

R&D Research and development

1. Aggregate value-added growth is the sum of the share-weighted value-added growth by industry.
2. The contributions of labor, capital, and integrated multifactor productivity are the Domar-weighted sums of each industry's labor, capital, or multifactor productivity contribution to industry output growth.

3. Information technology (IT) capital consists of computer capital, communications capital, and other IT capital.

NOTE: Integrated MFP estimates differ from official estimates produced by the Bureau of Labor Statistics (BLS), which are available on the [BLS Web site](#).

Table 3. Contributions to Aggregate Real Value-Added Growth

[Percentage points]

	1998–2015				1998–2007				2009–2015				2009–2015 less 1998–2007			
	Value added	Capital	Labor	Inte-grated MFP	Value added	Capital	Labor	Inte-grated MFP	Value added	Capital	Labor	Inte-grated MFP	Value added	Capital	Labor	Inte-grated MFP
Total economy	1.96	1.08	0.47	0.41	2.76	1.53	0.59	0.65	1.94	0.56	0.87	0.51	–0.82	–0.97	0.29	–0.14
Agriculture, forestry, fishing, and hunting.....	0.03	0.00	0.01	0.02	0.03	0.00	0.01	0.02	0.01	0.01	0.02	–0.02	–0.02	0.01	0.01	–0.04
Mining.....	0.07	0.01	0.01	0.05	0.02	0.00	0.01	0.02	0.13	0.03	0.02	0.07	0.11	0.04	0.01	0.06
Utilities.....	0.01	0.02	0.00	–0.01	0.01	0.02	0.00	0.00	0.02	0.02	0.00	–0.01	0.00	0.00	0.00	0.00
Construction.....	–0.04	0.02	0.02	–0.08	0.00	0.05	0.09	–0.14	0.05	–0.01	0.05	0.01	0.04	–0.06	–0.04	0.14
Durable goods.....	0.21	0.04	–0.08	0.25	0.36	0.05	–0.11	0.43	0.24	0.02	0.05	0.17	–0.12	–0.03	0.16	–0.26
Nondurable goods.....	0.01	0.07	–0.04	–0.02	0.07	0.05	–0.06	0.08	–0.04	0.08	0.01	–0.14	–0.12	0.03	0.07	–0.22
Wholesale trade.....	0.13	0.08	0.01	0.03	0.22	0.12	0.03	0.07	0.17	0.06	0.04	0.07	–0.05	–0.06	0.01	–0.01
Retail trade.....	0.10	0.08	0.02	0.01	0.15	0.12	0.02	0.00	0.13	0.03	0.04	0.06	–0.02	–0.09	0.01	0.06
Transportation and warehousing.....	0.03	0.01	0.01	0.01	0.05	0.02	0.00	0.03	0.05	0.01	0.05	–0.01	0.00	–0.01	0.05	–0.04
Information.....	0.20	0.13	–0.01	0.08	0.28	0.17	–0.01	0.12	0.14	0.08	0.01	0.05	–0.14	–0.08	0.02	–0.07
Finance and insurance.....	0.19	0.11	0.05	0.03	0.31	0.19	0.08	0.05	0.06	0.03	0.06	–0.02	–0.25	–0.16	–0.02	–0.07
Real estate and rental and leasing.....	0.30	0.24	0.01	0.05	0.38	0.39	0.02	–0.04	0.26	0.05	0.01	0.20	–0.11	–0.34	–0.01	0.23
Professional, scientific, and technical services.....	0.17	0.06	0.10	0.01	0.20	0.10	0.12	–0.02	0.18	0.01	0.13	0.05	–0.02	–0.09	0.01	0.06
Management of companies and enterprises.....	0.03	0.01	0.03	–0.01	0.01	0.01	0.02	–0.02	0.10	0.00	0.04	0.05	0.09	0.00	0.02	0.07
Administrative and waste management services.....	0.09	0.03	0.03	0.03	0.13	0.04	0.04	0.04	0.11	0.02	0.07	0.02	–0.02	–0.03	0.03	–0.02
Educational services.....	0.02	0.00	0.02	–0.01	0.02	0.00	0.02	0.00	0.01	0.00	0.02	–0.02	–0.02	0.00	0.00	–0.02
Health care and social assistance.....	0.17	0.02	0.15	–0.01	0.17	0.02	0.15	0.00	0.14	0.02	0.17	–0.05	–0.03	0.00	0.02	–0.04
Arts, entertainment, and recreation.....	0.02	0.00	0.01	0.01	0.02	0.01	0.01	0.00	0.03	0.00	0.02	0.01	0.01	0.00	0.01	0.01
Accommodation and food services.....	0.04	0.01	0.03	0.00	0.06	0.01	0.02	0.02	0.07	0.00	0.05	0.02	0.01	–0.01	0.02	0.00
Other services, except government.....	–0.02	0.02	0.01	–0.04	–0.02	0.02	0.01	–0.06	0.01	0.00	0.01	–0.01	0.03	–0.02	0.00	0.05
Federal government.....	0.05	0.04	0.00	0.00	0.06	0.05	0.00	0.02	0.02	0.02	0.00	0.00	–0.04	–0.02	0.00	–0.02
State and local government.....	0.15	0.07	0.08	0.00	0.23	0.08	0.12	0.02	0.06	0.05	0.01	0.00	–0.17	–0.04	–0.11	–0.02
Addenda:																
Private economy components:																
Information technology-producing industries.....	0.29	0.04	0.02	0.23	0.37	0.05	–0.01	0.33	0.20	0.03	0.06	0.11	–0.17	–0.02	0.07	–0.22
Information technology-using industries.....	1.01	0.58	0.34	0.08	1.45	0.87	0.41	0.17	0.98	0.27	0.55	0.16	–0.46	–0.59	0.14	–0.01
Noninformation technology industries.....	0.47	0.34	0.03	0.09	0.65	0.48	0.07	0.10	0.68	0.18	0.26	0.24	0.03	–0.30	0.19	0.14

MFP Multifactor productivity

NOTE: Aggregate value added growth for the total economy appears in the top left corner of each panel with all

other values representing contributions to that total. Integrated estimates of multifactor productivity differ from the official estimates produced by the Bureau of Labor Statistics (BLS), which are available on the [BLS Web site](#).

percent change in real value added (45 percent of growth). This contribution was larger than the 0.59 percentage point contribution (21 percent of growth) that it made during the prerecession period when real value added grew 2.76 percent per year on average. The contribution of labor input for the durable-goods industry turned up, contributing 0.05 percentage point in the postrecession period after subtracting 0.11 percentage point from real value-added growth before 2007. The contribution of noncollege labor to real value-added growth during the postrecession period turned up after decreasing during the 1998–2007 pe-

riod.¹⁰ The contribution of college labor also showed a small increase compared with its contribution in the preceding period.

The contribution of MFP to aggregate value-added growth for the 2009–2015 period was –0.14 percentage point lower than the 1998–2007 contribution, reflecting smaller contributions to growth by the durable- and nondurable-goods manufacturing sectors during the postrecession period. These results are consistent with the previously published statistics.

10. College labor includes workers with a bachelor's degree and above; noncollege labor includes the remainder of workers