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Integrated BEA/BLS Industry-Level Production Account and the Sources of U.S. Economic Growth

New Statistics for 2017 and Updated Statistics for 1998–2016

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In July 2019, the Bureau of Economic Analysis (BEA), in partnership with the Bureau of Labor Statistics (BLS), published new and updated measures from the integrated industry-level production account. New statistics were released for 2017, and statistics for 1998–2016 were adjusted to reflect changes introduced in the 2018 comprehensive updates of the National Income and Product Accounts (NIPAs) and the Industry Economic Accounts. The major changes introduced in the comprehensive updates include incorporating the value of capital services in measures of investment in own-account research and development (R&D) and in own-account software; improving methods for deflating software, medical equipment, and communications equipment; and harmonizing the treatment of implicit services provided by savings banks and credit unions with the treatment of implicit services provided by commercial depository institutions. The changes to the NIPAs were described in Kelly and others (2018). The impact on the GDP by industry accounts was covered in Howells and others (2018).

The previous release of the integrated industry-level production account in July 2018 covered 1987–2016, and work is underway to extend the current vintage of the account backward to 1987. Data for the 1987–1997 period will be released after updated historical GDP by industry account data for 1987–1998 are released later this year.

The major application of the industry-level production account is growth accounting to present the sources of GDP growth across industries from the bottom up.[2] Details of the account are presented in Fleck and others (2014). At the industry level, growth accounting gives the sources of industry output growth, including contributions to growth from intermediate inputs, capital, labor, and (integrated) multifactor productivity (MFP). Table 1 presents the sources of industry growth from 1998–2017 for 63 industries that span the GDP by industry accounts. Over this

period, the fastest growing industries were data processing, internet publishing, and other information services; warehousing and storage; computer systems design and related services; and support activities for mining. The production account estimates reveal that while each of these industries had relatively strong output growth, the underlying sources of growth differed among the group. The largest contributor to the data processing, internet publishing, and other information services industry was the accumulation of capital input, while the largest contributor to the warehousing and storage industry was purchases of intermediate inputs. MFP growth was the largest driver of growth in the computer systems design and related services industry over this period, and intermediate inputs accounted for the largest share of growth in support activities for mining.

At the other end of the spectrum, apparel and leather and allied products, textile mills and textile product mills, printing and related support activities, and paper products were the industries with the largest contractions over the period. Each of these industries had positive MFP growth over the period; the declines in output were driven by declines in labor and intermediate input.

Table 1. Sources of Industry Output Growth, 1998–2017

	Output growth	Capital contribution	Labor contribution	Intermediate contribution	MFP growth
Farms	1.23	0.07	−0.06	0.19	1.03
Forestry, fishing, and related activities	−0.11	0.45	0.61	−1.07	−0.11
Oil and gas extraction	3.06	−0.09	−0.14	1.00	2.28
Mining, except oil and gas	−1.13	0.63	−0.18	−0.30	−1.27
Support activities for mining	5.54	0.35	0.89	2.40	1.91
Utilities	0.48	0.74	0.00	−0.28	0.02
Construction	0.10	0.26	0.34	0.52	−1.01
Wood products	−0.35	0.04	−0.51	−0.59	0.70
Nonmetallic mineral products	−0.64	0.20	−0.22	−0.56	−0.05
Primary metals	−0.62	−0.05	−0.48	−0.79	0.71
Fabricated metal products	−0.12	0.16	−0.18	−0.05	−0.05
Machinery	−0.13	0.16	−0.38	−0.05	0.14
Computer and electronic products	3.77	0.44	−0.72	−1.93	5.97
Electrical equipment, appliances, and components	−1.12	0.10	−0.38	−1.47	0.64
Motor vehicles, bodies and trailers, and parts	1.96	−0.01	−0.19	1.45	0.70
Other transportation equipment	0.95	0.30	−0.11	0.22	0.54
Furniture and related products	−1.22	0.12	−0.67	−0.71	0.04
Miscellaneous manufacturing	0.69	0.37	−0.11	−0.28	0.71
Food and beverage and tobacco products	0.51	0.19	0.09	0.45	−0.22
Textile mills and textile product mills	−3.83	−0.17	−1.20	−3.02	0.56
Apparel and leather and allied products	−6.95	−0.04	−2.15	−5.11	0.35
Paper products	−1.29	−0.14	−0.53	−0.68	0.05
Printing and related support activities	−2.07	−0.05	−1.08	−2.06	1.12
Petroleum and coal products	0.99	0.31	−0.04	1.02	−0.30
Chemical products	0.32	1.00	−0.11	0.02	−0.58
Plastics and rubber products	−0.34	0.16	−0.23	−0.67	0.40
Wholesale trade	3.12	0.94	0.19	1.72	0.27
Retail trade	2.33	0.89	0.18	1.19	0.07
Air transportation	−0.50	0.29	−0.53	−1.26	1.00
Rail transportation	0.79	0.08	−0.57	0.84	0.44
Water transportation	1.29	0.13	0.33	0.43	0.40
Truck transportation	1.26	0.40	0.19	0.99	−0.32
Transit and ground passenger transportation	2.25	0.40	0.95	0.97	−0.08

	Output growth	Capital contribution	Labor contribution	Intermediate contribution	MFP growth
Pipeline transportation	0.29	1.79	0.05	−2.36	0.82
Other transportation and support activities	1.64	−0.01	0.44	1.77	−0.56
Warehousing and storage	7.13	0.41	1.89	4.59	0.25
Publishing industries, except internet (includes software)	1.87	1.56	−0.29	−0.56	1.15
Motion picture and sound recording industries	2.17	0.74	0.33	−0.14	1.25
Broadcasting and telecommunications	4.28	2.14	−0.25	1.64	0.75
Data processing, internet publishing, and other information services	10.10	4.29	0.53	3.43	1.85
Federal Reserve banks, credit intermediation, and related activities	1.41	1.42	0.34	0.33	−0.69
Securities, commodity contracts, and investments	2.82	0.17	0.56	1.82	0.29
Insurance carriers and related activities	4.38	1.09	0.34	2.79	0.16
Funds, trusts, and other financial vehicles	2.17	0.06	0.06	2.40	−0.34
Real estate	2.74	1.21	0.07	0.95	0.51
Rental and leasing services and lessors of intangible assets	1.77	2.73	0.02	0.58	−1.57
Legal services	0.24	0.94	0.15	0.50	−1.36
Computer systems design and related services	6.10	0.24	2.32	0.63	2.90
Miscellaneous professional, scientific, and technical services	2.80	0.70	1.02	1.19	−0.11
Management of companies and enterprises	2.23	0.19	1.46	1.05	−0.47
Administrative and support services	3.20	0.85	0.90	1.14	0.31
Waste management and remediation services	1.43	0.19	0.67	0.25	0.32
Educational services	2.69	0.54	1.34	1.23	−0.42
Ambulatory health care services	3.24	0.27	1.56	0.90	0.52
Hospitals and nursing and residential care	2.95	0.32	0.96	1.69	−0.02
Social assistance	3.35	0.10	1.65	1.93	−0.32
Performing arts, spectator sports, museums, and related activities	2.69	0.16	0.50	1.01	1.02
Amusements, gambling, and recreation industries	1.94	0.72	0.49	1.03	−0.30
Accommodation	1.73	0.84	0.13	0.99	−0.22
Food services and drinking places	1.94	0.02	0.66	1.11	0.14
Other services, except government	0.38	0.45	0.15	0.90	−1.12
Federal	1.46	0.61	0.04	0.75	0.05
State and local	1.56	0.52	0.46	0.54	0.05

MFP Multifactor productivity

Notes. Average annual percentange growth. A contribution is a share-weighted growth rate.

Table 2 provides industry contributions to aggregate GDP growth and industry shares of aggregate nominal GDP. This information is taken from the previously published GDP by industry accounts but is provided here for context. Comparing the 2009–2017 period to the 1998–2007 period shows the industry sources of the slow recovery from the Great Recession that occurred during 2008 and 2009. Slowdowns in the growth of value added in manufacturing; finance, insurance, real estate, and rental and leasing; and government accounted for almost all the slow recovery. The data on nominal shares demonstrate the ongoing shift away from manufacturing toward services. This table provides information on summary level sectors; complete data for the 63 industries is available on the BEA website.

Table 2. Sector Sources of Value-Added Growth

	1998–2017	1998–2007	2007–2017	2007–2009	2009–2017
Contributions					
Value added	2.04	2.87	1.29	−1.40	1.96
Agriculture, forestry, fishing, hunting, and mining	0.08	0.07	0.10	0.17	0.08
Transportation, warehousing, and utilities	0.05	0.05	0.06	−0.10	0.10
Construction	−0.04	0.01	−0.08	−0.53	0.03
Manufacturing	0.22	0.48	−0.02	−0.69	0.15
Computer and electronic products	0.18	0.29	0.09	0.13	0.07
Trade	0.23	0.36	0.11	−0.59	0.28
Information	0.27	0.30	0.23	0.09	0.27
Finance, insurance, real estate, and rental and leasing	0.45	0.65	0.27	0.07	0.32
Other services	0.56	0.63	0.51	0.01	0.63
Government	0.21	0.32	0.11	0.16	0.10
Shares					
Shares in nominal value added	100.0	100.0	100.0	100.0	100.0
Agriculture, forestry, fishing, hunting, and mining	2.6	2.3	2.9	3.1	2.8
Transportation, warehousing, and utilities	4.4	4.4	4.5	4.4	4.5
Construction	4.0	4.5	3.6	4.0	3.5
Manufacturing	12.1	13.2	11.2	11.5	11.1
Computer and electronic products	1.5	1.7	1.4	1.5	1.4
Trade	11.5	11.9	11.2	11.1	11.2
Information	4.7	4.7	4.8	4.8	4.8
Finance, insurance, real estate, and rental and leasing	19.1	19.0	19.1	18.5	19.3
Other services	24.6	23.6	25.5	25.1	25.6
Government	16.9	16.4	17.3	17.6	17.3

Notes. Average annual percentages. Aggregate value-added growth is the aggregate of share-weighed industry value-added growth. Shares are nominal industry shares of aggregate value added.

Table 3 shows the sources of aggregate value-added growth across factors of production and growth in MFP by sector. From 1998 to 2017, aggregate value added grew by just over 2 percent per year on average. Growth in capital input accounted for the majority of this (1.20 percentage points out of 2.04 percentage points), with the largest contributions to aggregate capital input growth originating in finance, insurance, real estate, and rental and leasing; information; and other services. Labor input accounted for the next largest share of growth (0.50 percentage point). Growth in labor in other services and government accounted for almost all of this contribution. MFP growth accounted for the remainder of aggregate value-added growth (0.35 percentage point). MFP growth in manufacturing (mostly computers and electronic products) and information made up most aggregate MFP growth.

Table 3. Sources of Aggregate Value-Added Growth

	1998–2017	1998–2007	2007–2017	2007–2009	2009–2017
Capital input					
Aggregate	1.20	1.59	0.84	0.81	0.84
Agriculture, forestry, fishing, hunting, and mining	0.01	0.00	0.02	0.01	0.02
Transportation, warehousing, and utilities	0.04	0.04	0.04	0.04	0.04
Construction	0.02	0.05	0.00	−0.02	0.00
Manufacturing	0.11	0.11	0.10	0.13	0.09
Trade	0.16	0.24	0.09	−0.01	0.12
Information	0.19	0.18	0.19	0.15	0.20
Finance, insurance, real estate, and rental and leasing	0.36	0.58	0.16	0.15	0.16
Other services	0.18	0.22	0.14	0.20	0.12
Government	0.13	0.17	0.09	0.16	0.07
Labor input					
Aggregate	0.50	0.59	0.41	−1.35	0.85
Agriculture, forestry, fishing, hunting, and mining	0.01	0.01	0.00	−0.03	0.01
Transportation, warehousing, and utilities	0.01	0.00	0.03	−0.08	0.05
Construction	0.03	0.09	−0.03	−0.41	0.07
Manufacturing	−0.10	−0.18	−0.03	−0.41	0.06
Trade	0.03	0.05	0.02	−0.21	0.08
Information	−0.01	−0.01	−0.01	−0.09	0.01
Finance, insurance, real estate, and rental and leasing	0.06	0.10	0.03	−0.15	0.07
Other services	0.39	0.40	0.37	−0.08	0.49
Government	0.07	0.12	0.03	0.12	0.01
MFP					
Aggregate	0.35	0.69	0.05	−0.85	0.27
Agriculture, forestry, fishing, hunting, and mining	0.06	0.05	0.07	0.19	0.04
Transportation, warehousing, and utilities	0.00	0.01	−0.01	−0.06	0.00
Construction	−0.09	−0.13	−0.05	−0.10	−0.04
Manufacturing	0.22	0.55	−0.08	−0.39	0.00
Trade	0.03	0.07	0.00	−0.37	0.09
Information	0.09	0.13	0.05	0.02	0.05
Finance, insurance, real estate, and rental and leasing	0.03	−0.03	0.08	0.08	0.08
Other services	0.00	0.00	−0.01	−0.11	0.02
Government	0.01	0.03	−0.01	−0.12	0.02
Aggregate value-added growth	2.04	2.87	1.30	−1.38	1.97

MFP Multifactor productivity

Notes. Average annual percentages. Aggregate value-added growth is the aggregate of share-weighed industry value-added growth. Sector contributions are aggregates of industry share-weighted contributions.

Comparing the sector growth accounting in the 2009–2017 and 1998–2007 periods reveals the sources of the relatively slow recovery from the Great Recession. Capital input contributed significantly less during the latter period compared with the former period, with the largest difference in the finance, insurance, real estate, and rental and leasing sector. The slowdown in aggregate MFP growth was due almost entirely to a slowdown in manufacturing MFP growth (again, mostly due to computer and electronic products), although MFP growth from 2009 to

2017 in the information sector slowed as well compared with the 1998–2007 period. Labor input growth contributed more in the 2009–2017 period than in the 1998–2007 period. The largest sector contributors to the acceleration in the contribution of labor input were manufacturing and other services.

Updates to Previous Results

With this release of the integrated industry-level production account, statistics for 1998–2016 were updated to reflect the results of the most recent comprehensive updates of the NIPAs and the GDP by industry accounts. The following two tables present information on the impact of these changes on estimates of the sources of economic growth. Details on the methodological and statistical changes are covered in Kelly and others (2018), Howells and others (2018), and in the March 20, 2019, BLS news release on MFP trends.[3]

Table 4 shows aggregate value-added growth was revised upward for the 1998–2016 period as a whole and for the 1998–2007 and 2007–2016 subperiods. From 1998 to 2016, the largest revisions raised growth estimates in the information and other services sectors. Between 1998 and 2007, the largest revisions were in the manufacturing and other services sectors, while in the 2007–2016 period, the largest revisions were to estimates of value-added growth in the information and other services sectors. There were only marginal changes to the nominal shares of aggregate value added by sector because of the comprehensive updates.

Table 4. Revisions to Sector Sources of Value-Added Growth

	1998–2016	1998–2007	2007–2016	2007–2009	2009–2016
Contributions					
Value added	0.11	0.12	0.09	0.16	0.07
Agriculture, forestry, fishing, hunting, and mining	−0.01	0.02	−0.03	−0.08	−0.02
Transportation, warehousing, and utilities	0.01	−0.01	0.03	0.07	0.02
Construction	−0.01	0.01	−0.03	−0.05	−0.03
Manufacturing	0.00	0.05	−0.04	−0.04	−0.04
Computer and electronic products	0.02	0.02	0.02	0.04	0.01
Trade	−0.01	−0.01	−0.01	0.02	−0.02
Information	0.05	0.03	0.08	0.06	0.08
Finance, insurance, real estate, and rental and leasing	0.00	−0.04	0.03	0.05	0.02
Other services	0.05	0.05	0.05	0.13	0.02
Government	0.03	0.04	0.01	−0.01	0.02
Shares					
Shares in nominal value added	0.0	0.0	0.0	0.0	0.0
Agriculture, forestry, fishing, hunting, and mining	−0.2	0.0	−0.3	−0.1	−0.4
Transportation, warehousing, and utilities	0.1	0.0	0.1	0.1	0.1
Construction	−0.1	0.0	−0.2	−0.1	−0.2
Manufacturing	−0.2	0.0	−0.3	−0.1	−0.4
Computer and electronic products	0.0	0.0	−0.1	0.0	−0.1
Trade	0.0	0.0	0.0	0.0	0.0
Information	0.1	0.0	0.2	0.1	0.2
Finance, insurance, real estate, and rental and leasing	−0.1	−0.2	0.0	−0.2	0.1
Other services	0.4	0.2	0.7	0.5	0.7
Government	−0.1	−0.1	−0.2	−0.2	−0.2

Notes. Average annual percentages. Aggregate value-added growth is the aggregate of share-weighed industry value-added growth. Shares are nominal industry shares of aggregate value added.

Table 5 shows the revisions to the sources of growth had the most impact on estimates of the contribution of capital input and MFP growth. The largest revisions to capital input occurred in the information sector. Importantly, upward revisions to capital input in the later part of the sample were larger than upward revisions to capital input earlier in the sample. As a result, the

slowdown in MFP growth (that is, the difference between MFP growth in the 2009–2016 and 1998–2007 periods) is more pronounced than the integrated MFP estimates published before the comprehensive updates.

Table 5. Revisions to Sources of Aggregate Value-Added Growth

	1998–2016	1998–2007	2007–2016	2007–2009	2009–2016
Capital input					
Aggregate	0.14	0.08	0.20	0.17	0.21
Agriculture, forestry, fishing, hunting, and mining	0.00	0.00	0.00	0.00	−0.01
Transportation, warehousing, and utilities	0.00	0.00	0.00	0.01	0.00
Construction	0.00	0.00	0.01	0.00	0.01
Manufacturing	0.00	0.01	0.00	0.01	−0.01
Trade	0.00	−0.01	0.01	0.01	0.02
Information	0.06	0.02	0.10	0.06	0.11
Finance, insurance, real estate, and rental and leasing	0.01	0.00	0.03	0.03	0.03
Other services	0.03	0.00	0.06	0.04	0.06
Government	0.03	0.05	0.00	0.01	0.00
Labor input					
Aggregate	0.00	−0.01	0.01	−0.05	0.02
Agriculture, forestry, fishing, hunting, and mining	0.00	0.00	0.00	0.00	0.00
Transportation, warehousing, and utilities	0.00	0.00	0.00	−0.01	0.00
Construction	0.00	0.00	0.00	−0.01	0.00
Manufacturing	0.00	0.00	0.00	0.00	0.00
Trade	0.00	0.00	0.00	−0.01	0.00
Information	0.00	0.00	0.00	0.00	0.00
Finance, insurance, real estate, and rental and leasing	0.00	0.00	0.00	0.00	0.00
Other services	0.00	0.00	0.00	−0.02	0.01
Government	0.00	0.00	0.01	0.01	0.01
MFP					
Aggregate	−0.02	0.06	−0.11	0.05	−0.15
Agriculture, forestry, fishing, hunting, and mining	0.00	0.02	−0.03	−0.08	−0.01
Transportation, warehousing, and utilities	0.01	−0.01	0.03	0.07	0.02
Construction	−0.01	0.01	−0.04	−0.04	−0.04
Manufacturing	0.01	0.04	−0.03	−0.03	−0.03
Trade	−0.01	−0.01	−0.02	0.02	−0.03
Information	0.00	0.01	−0.02	0.01	−0.02
Finance, insurance, real estate, and rental and leasing	−0.02	−0.03	0.00	0.03	−0.01
Other services	0.02	0.05	−0.01	0.11	−0.04
Government	0.00	−0.01	0.00	−0.02	0.01
Aggregate value-added growth	0.11	0.12	0.10	0.18	0.08

MFP Multifactor productivity

Notes. Average annual percentages. Aggregate value-added growth is the aggregate of share-weighed industry value-added growth. Sector contributions are aggregates of industry share-weighted contributions.

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2. The industry-level production account and integrated multifactor productivity (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 BLS, which are available on the BLS website.
3. See the release on the BLS website.