N E W S   R E L E A S E

B U R E A U   O F   L A B O R   S T A T I S T I C S
U . S .   D E P A R T M E N T   O F   L A B O R

BLS

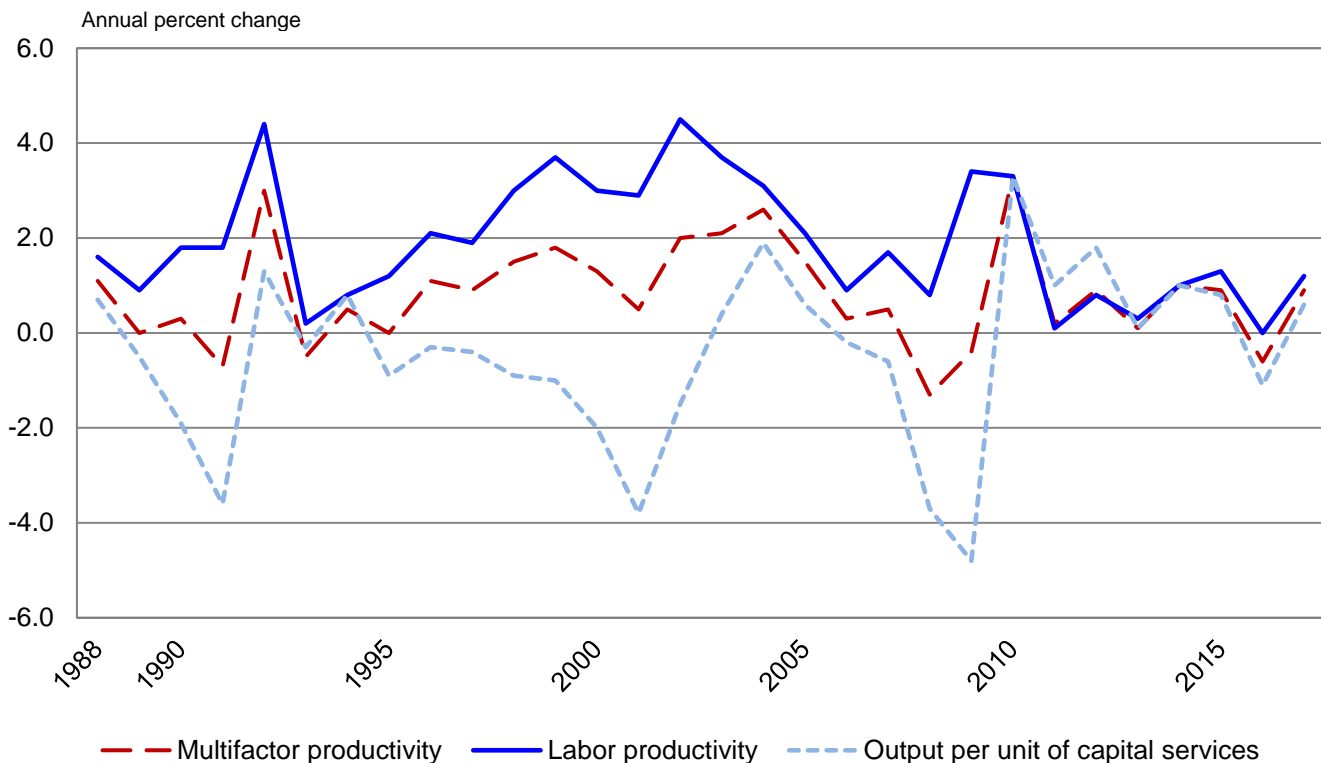## MULTIFACTOR PRODUCTIVITY TRENDS – 2017

Private nonfarm business sector multifactor productivity increased 0.9 percent in 2017, the U.S. Bureau of Labor Statistics reported today. (See chart 1, table A.) This 2017 increase reflects a 2.9-percent increase in output and a 2.0-percent increase in the combined inputs of capital and labor. Capital services grew by 2.2 percent and labor input–which is the combined effect of hours worked and labor composition–grew by 1.9 percent. The increase in multifactor productivity followed a 0.6-percent decrease in 2016. (See table 1.)

Multifactor productivity is calculated by dividing an index of real output by an index of combined units of labor input and capital services. Multifactor productivity annual measures differ from BLS quarterly labor productivity (output per hour worked) measures because the former also includes the influences of capital services and shifts in the composition of the workforce. Measures for the most recent year of this release are preliminary estimates. See the Technical Notes for additional information.

Private business sector multifactor productivity increased at a 0.8-percent annual rate in 2017. A 2.7-percent increase in output outpaced a 2.0-percent increase in the combined inputs of capital and labor in 2017. (See table A, table 2.)

Chart 1. Multifactor productivity, labor productivity, and output per unit of capital services in the private nonfarm business sector, 1987-2017
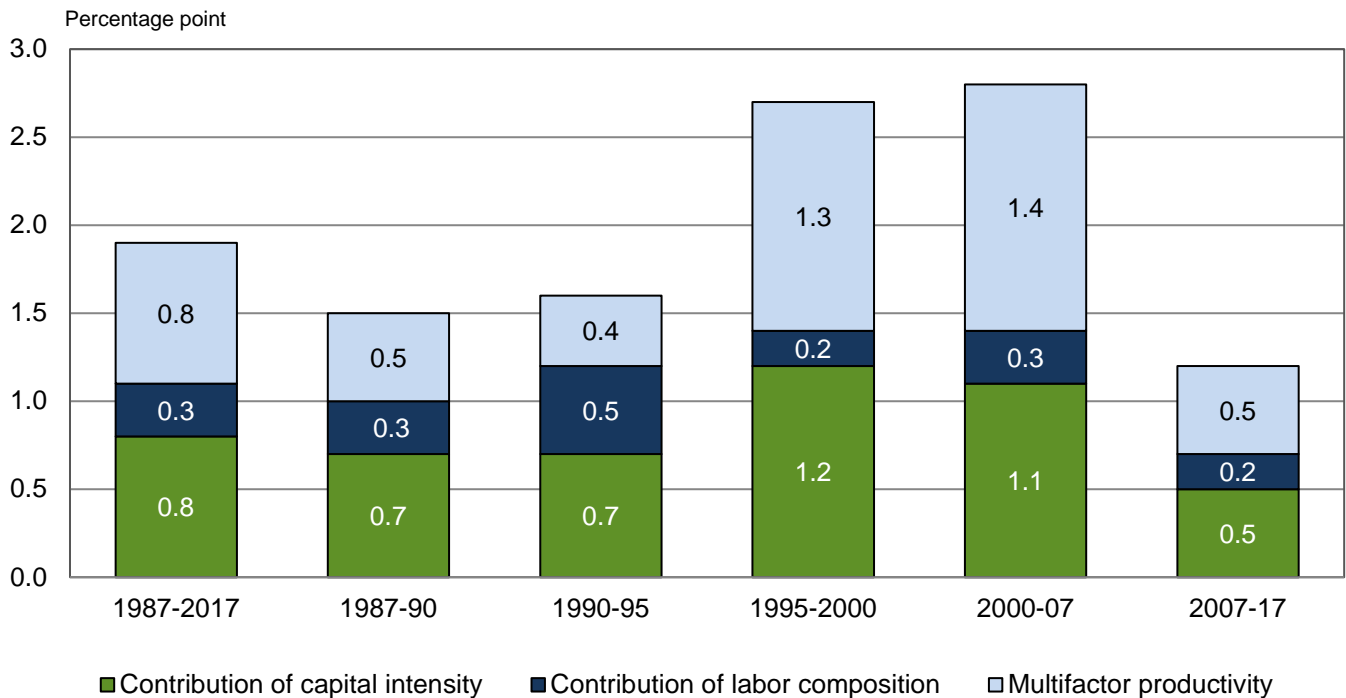
2017 Multifactor Productivity Trends

Multifactor productivity in the private nonfarm business sector grew at an average annual rate of 0.8 percent from 1987 to 2017. For the 2007-17 period, multifactor productivity grew at an average annual rate of 0.5 percent as combined inputs increased 1.1 percent and output increased 1.6 percent. The increase in combined inputs reflected a 1.7-percent average annual percent increase in capital services along with an 0.8-increase in labor input. (See table A.)

In the 2007-17 period, labor productivity decelerated to an average annual rate of 1.2 percent, as compared to the average annual rate of 2.7 percent in the 2000-07 period. Labor productivity growth can be viewed as the sum of three components: multifactor productivity growth, the contribution of capital intensity, and the contribution of shifts in labor composition.

Between the 2000-07 and 2007-17 periods, labor productivity growth declined 1.5 percentage points, reflecting a 1.2-percent slowdown in the growth of output. Additionally, the 2007-2017 period experienced decelerations in multifactor productivity growth, the contribution of capital intensity, and the contribution of labor composition. The contribution of capital intensity grew 0.5 percentage points in the 2007-2017 period, the slowest growth, as viewed over the 1987-2017 sub periods. (See chart 2.) Multifactor productivity increased 0.5 percentage points in the 2007-17 period compared to a growth rate of 1.4 percent in the 2000-07 period, a 0.9-percentage point decline. (See chart 2, table B.) The contributions of labor composition slightly decelerated by 0.1 percentage points between the 2000-07 period and the 2007-17 period, to 0.2 percent. (See chart 2, table B.)

Chart 2. Contributions to labor productivity growth in the private nonfarm business sector, 1987-2017

Note: Multifactor productivity plus the contributions of capital intensity and labor composition may not sum to labor productivity due to independent rounding.

2015-16 Revisions

In 2016, the multifactor productivity growth rate in the private nonfarm business sector was revised downward from an average annual rate of -0.2 percent to an average annual rate of -0.6 percent due to a downward revision to output of -0.2 percent and an upward revision to combined inputs of 0.2 percent. In 2015, the multifactor productivity growth rate in the private nonfarm business sector was revised upward from an average annual rate of 0.6 percent to an average annual rate of 0.9 percent due to revisions in output. (See table D.)

2016 Capital Services

The deceleration of capital services since 2000 is largely due to a deceleration in the growth of equipment and intellectual property products. The average annual rate of growth of equipment decelerated from the peak in the 1995-2000 period, from 9.1 percent to 2.2 percent in the more recent 2007-16 period. The average annual rate of growth of intellectual property products decelerated from a peak of 8.4 percent in 1995-2000 to 3.2 percent in 2007-16. (See chart 3, table C.)
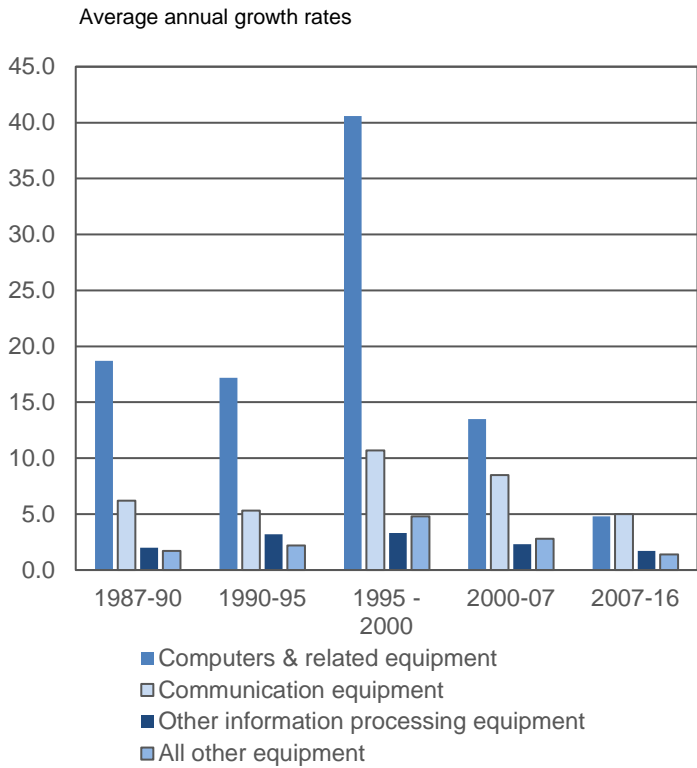
Within equipment, growth in computers decelerated from a 13.5-percent average annual rate in 2000-07 to 4.8 percent in 2007-16. (See chart 4, table C.) Within intellectual property products, software decelerated from a 7.7-percent average annual rate of growth in 2000-07 period to 3.8 percent in 2007-16. (See chart 5, table C.)

In 2016, the annual growth of computers decreased for the first time in the series, to -0.1 percent. Computers steadily accelerated from 1992 to 1999. From 2008 forward, the annual growth in computers steadily slowed until the 2016 decline of -0.1 percent. Communications equipment is defined as telecommunication parts and equipment that send and receive information. From 1994 to 2000, communications equipment annual growth steadily accelerated. After reaching a peak of 14.7-percent annual growth in 2000, growth has slowed but remains positive in communication equipment. Starting in 2012, the annual growth in communication equipment began to outpace the annual growth in computers for the first time in the series. (See chart 6.)

Chart 3. Real capital services by asset type in the private nonfarm business sector, 1987- 2016
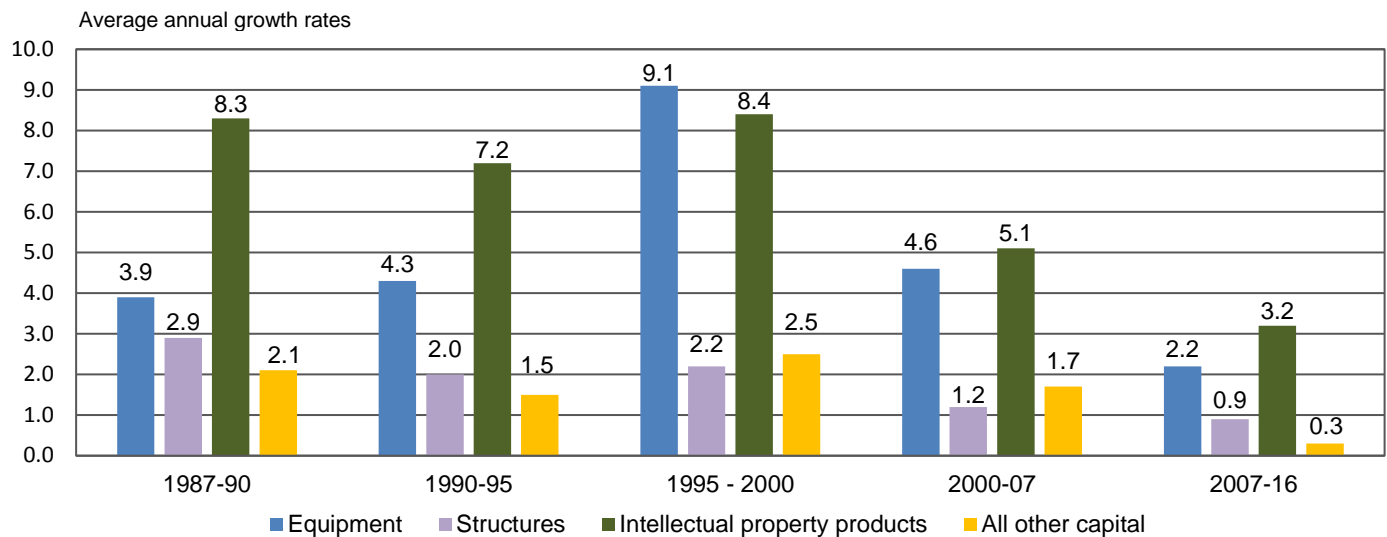
Chart 4. Types of capital equipment in the private nonfarm business sector, 1987- 2016

Average annual growth rates

- Computers & related equipment
- Communication equipment
- Other information processing equipment
- All other equipment

Chart 5. Types of intellectual property products in the private nonfarm business sector, 1987- 2016

Average annual growth rates

- Research & Development
- Software
- Artistic Originals
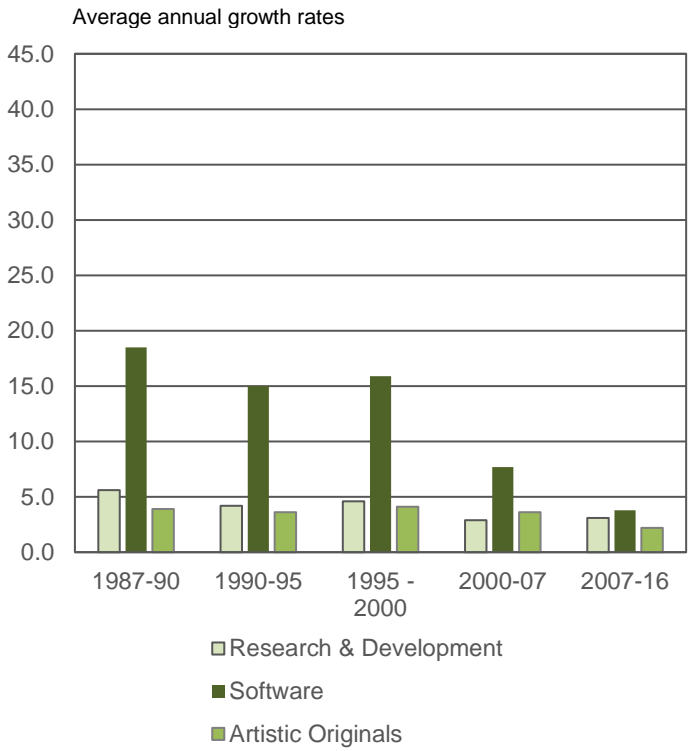
Chart 6. Real capital input growth for computers and communication equipment, private nonfarm business sector, 1987- 2016

Annual percent change

Computers — Communication equipment
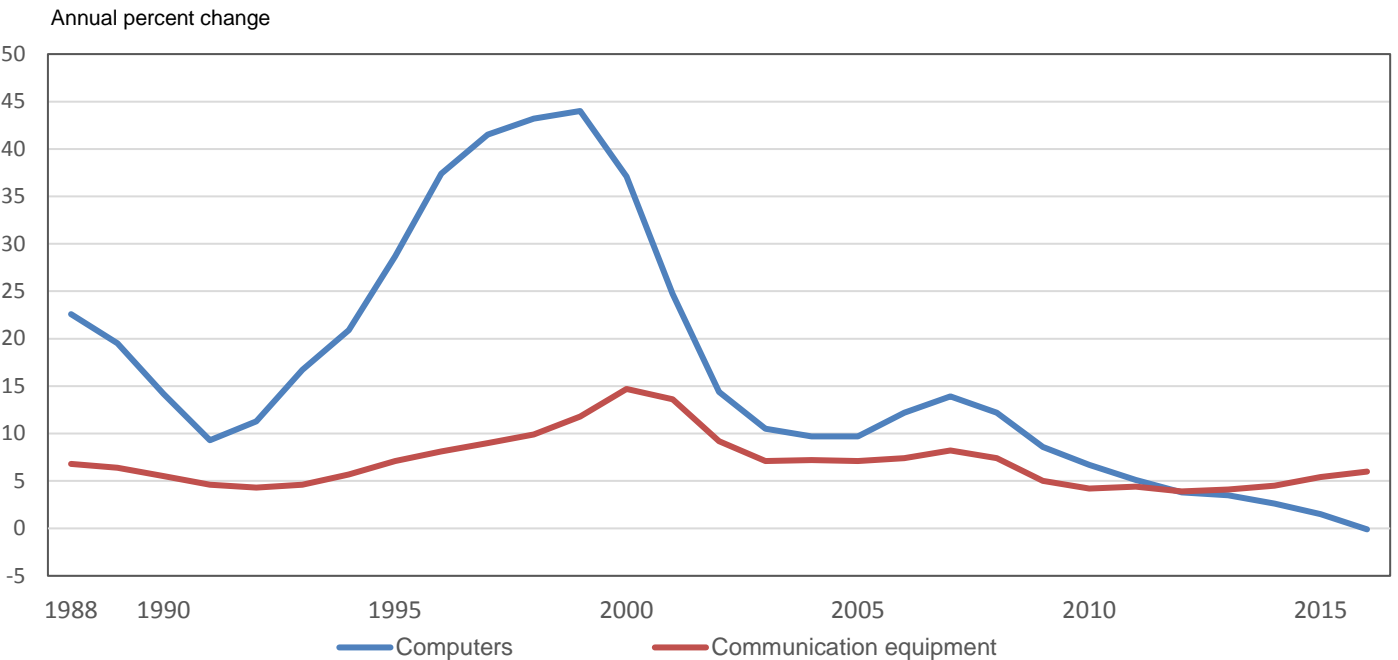
Table A. Productivity, output, and inputs in the private nonfarm business and private business sectors for selected periods, 1987-2017

Average annual growth rates

	1987-2017	1987-1990	1990-1995	1995-2000	2000-2007	2007-2017	2015-2016	2016-2017
Private nonfarm business[1]								
Productivity								
Multifactor Productivity[2]	0.8	0.5	0.4	1.3	1.4	0.5	-0.6	0.9
Labor productivity[3]	1.9	1.4	1.7	2.7	2.7	1.2	0.0	1.2
Output per unit of capital	-0.5	-0.6	-0.6	-0.9	-0.5	-0.1	-1.1	0.6
Output	2.8	3.2	3.0	5.0	2.8	1.6	1.5	2.9
Combined inputs[4]	2.0	2.8	2.5	3.7	1.4	1.1	2.1	2.0
Labor Input[5]	1.4	2.2	2.0	2.5	0.5	0.8	1.8	1.9
Hours	0.9	1.8	1.3	2.2	0.1	0.4	1.5	1.6
Labor composition[6]	0.4	0.4	0.7	0.3	0.4	0.4	0.3	0.3
Capital services	3.3	3.9	3.5	6.0	3.3	1.7	2.5	2.2
Analytic ratio								
Capital intensity[7]	2.4	2.0	2.2	3.7	3.2	1.3	1.1	0.6
Private business[1]								
Productivity								
Multifactor Productivity[2]	0.9	0.6	0.4	1.5	1.4	0.5	-0.5	0.8
Labor productivity[3]	2.0	1.6	1.6	2.9	2.7	1.2	0.1	1.2
Output per unit of capital	-0.4	-0.5	-0.4	-0.7	-0.4	-0.1	-0.9	0.5
Output	2.8	3.2	2.9	5.1	2.8	1.6	1.6	2.7
Combined inputs[4]	2.0	2.7	2.5	3.5	1.4	1.1	2.0	2.0
Labor Input[5]	1.3	2.1	2.1	2.4	0.5	0.8	1.8	1.8
Hours	0.9	1.6	1.3	2.1	0.1	0.4	1.5	1.5
Labor composition[6]	0.4	0.4	0.7	0.3	0.4	0.4	0.3	0.3
Capital services	3.2	3.8	3.4	5.8	3.2	1.7	2.5	2.2
Analytic ratio								
Capital intensity[7]	2.3	2.1	2.0	3.7	3.2	1.3	1.0	0.7

1 Excludes government enterprises.
2 Output per combined units of labor input and capital services.
3 Output per hour worked.
4 The growth rate of each input is weighted by its share of current dollar costs.
5 Hours worked by age, education, and gender group are weighted by each group's share of total wages.
6 Ratio of labor input to hours.
7 Capital services per hour.

Table B. Labor productivity and the contributions of capital intensity, labor composition, and multifactor productivity to labor productivity in the private nonfarm business and private business sectors for selected periods, 1987-2017

Average annual growth rates

	1987-2016	1987-2017*	1987-1990	1990-1995	1995-2000	2000-2007	2007-2016	2007-2017*	2015-2016	2016-2017*
Private nonfarm business[1]										
Labor productivity[2]	1.9	1.9	1.4	1.7	2.7	2.7	1.2	1.2	0.0	1.2
Contribution of capital intensity[3]	0.8	0.8	0.7	0.7	1.2	1.1	0.5	0.5	0.4	0.2
Contribution of information processing equipment (IPE)[4]	0.3	NA	0.3	0.3	0.6	0.3	0.1	NA	0.1	NA
Contribution of research and development (R&D)[5]	0.1	NA	0.1	0.1	0.1	0.1	0.1	NA	0.1	NA
Contribution of intellectual property products (IPP) excluding R&D[6]	0.2	NA	0.2	0.2	0.3	0.3	0.1	NA	0.2	NA
Contribution of capital services excluding IPP & IPE	0.2	NA	0.1	0.2	0.2	0.4	0.2	NA	0.1	NA
Contribution of labor composition[7]	0.3	0.3	0.3	0.5	0.2	0.3	0.2	0.2	0.2	0.2
Multifactor productivity[8]	0.8	0.8	0.5	0.4	1.3	1.4	0.4	0.5	-0.6	0.9
Contribution of R&D to multifactor productivity	0.2	NA	0.2	0.2	0.2	0.2	0.1	NA	0.1	NA
Private business[1]										
Labor productivity[2]	2.0	2.0	1.6	1.6	2.9	2.7	1.2	1.2	0.1	1.2
Contribution of capital intensity[3]	0.8	0.8	0.7	0.7	1.2	1.1	0.5	0.5	0.4	0.3
Contribution of information processing equipment (IPE)[4]	0.3	NA	0.3	0.3	0.6	0.3	0.1	NA	0.1	NA
Contribution of research and development (R&D)[5]	0.1	NA	0.1	0.1	0.1	0.1	0.1	NA	0.1	NA
Contribution of intellectual property products (IPP) excluding R&D[6]	0.2	NA	0.2	0.2	0.3	0.3	0.1	NA	0.2	NA
Contribution of capital services excluding IPE & IPP	0.2	NA	0.2	0.1	0.2	0.4	0.2	NA	0.1	NA
Contribution of labor composition[7]	0.3	0.3	0.3	0.5	0.2	0.3	0.2	0.2	0.2	0.2
Multifactor productivity[8]	0.9	0.9	0.6	0.4	1.5	1.4	0.5	0.5	-0.5	0.8

1 Excludes government enterprises.
2 Output per hour worked.
3 Capital services per hour multiplied by capital's share of current dollar costs.
4 Information processing equipment per hour multiplied by its share of current dollar costs.
5 Research and development per hour multiplied by its share of current dollar costs.
6 Software and artistic originals per hour multiplied by their share of current dollar costs.
7 Labor composition multiplied by labor's share of current dollar costs.
8 Output per combined units of labor input and capital services.
* NA identifies where data for the most recent year are not available.

Note: Multifactor productivity plus contribution of capital intensity and labor composition may not sum to labor productivity due to independent rounding. Contributions of the components of capital intensity may not sum to the total contribution of capital intensity due to independent rounding.

Table C. Real capital services by asset type in the private nonfarm business and private business sectors for selected periods, 1987-2016

Average annual growth rates

	1987-2016	1987-1990	1990-1995	1995-2000	2000-2007	2007-2016	2015-2016
<u>Private nonfarm business[1]</u>							
All assets	3.3	3.9	3.5	6.0	3.3	1.7	2.5
Equipment	4.5	3.9	4.3	9.1	4.6	2.2	3.4
Information processing equipment (IPE)	8.8	8.8	8.5	18.6	8.6	4.0	3.3
Computers & related equipment	16.1	18.7	17.2	40.6	13.5	4.8	-0.1
Communication equipment	7.0	6.2	5.3	10.7	8.5	5.0	6.0
Other IPE	2.4	2.0	3.2	3.3	2.3	1.7	2.7
All other equipment	2.5	1.7	2.2	4.8	2.8	1.4	3.4
Structures	1.6	2.9	2.0	2.2	1.2	0.9	1.1
Intellectual property products (IPP)	5.8	8.3	7.2	8.4	5.1	3.2	4.4
Research and development	3.8	5.6	4.2	4.6	2.9	3.1	3.3
Software	10.1	18.5	15.0	15.9	7.7	3.8	6.2
Artistic originals	3.3	3.9	3.6	4.1	3.6	2.2	2.0
Rental residential capital	1.2	1.9	0.9	1.8	2.2	-0.1	0.4
Inventories	2.6	3.4	2.3	4.4	2.3	1.9	3.2
Land	0.6	1.5	1.3	1.3	0.7	-0.5	0.8
<u>Private business[1]</u>							
All assets	3.3	3.8	3.4	5.8	3.2	1.6	2.5
Equipment	4.4	3.6	4.1	9.0	4.6	2.2	3.4
Information processing equipment (IPE)	8.8	8.8	8.5	18.6	8.6	4.0	3.4
Computers & related equipment	16.1	18.7	17.2	40.6	13.5	4.8	-0.1
Communication equipment	7.0	6.2	5.3	10.7	8.5	5.0	6.0
Other IPE	2.6	2.0	3.2	3.4	2.5	2.0	2.9
All other equipment	2.4	1.4	2.0	4.7	2.8	1.5	3.4
Structures	1.6	2.8	1.9	2.1	1.2	0.9	1.1
Intellectual property products (IPP)	5.8	8.3	7.2	8.4	5.1	3.2	4.4
Research and development	3.8	5.6	4.2	4.6	2.9	3.1	3.3
Software	10.1	18.5	15.0	15.9	7.7	3.8	6.2
Artistic originals	3.3	3.9	3.6	4.1	3.6	2.2	2.0
Rental residential capital	1.2	1.9	0.9	1.8	2.2	-0.1	0.4
Inventories	2.5	3.0	2.3	4.2	2.2	1.8	3.1
Land	0.6	3.0	1.1	0.9	0.7	-0.7	0.4

1 Excludes government enterprises.

Note: Real capital services by asset type are not available for the most recent reference year. For a brief discussion of methods used in preparing these data see the Technical Notes in this release.

Table D. Previous and revised multifactor productivity and related measures for the 2015 - 2016 and 2014 - 2015 period

Annual percent change from previous year

Sector	Multifactor productivity[1]	Real value-added output	Inputs		
			Combined inputs[2]	Labor[3]	Capital services
Annual percent change, 2015-2016					
Private nonfarm business					
Previous	-0.2	1.7	1.9	1.6	2.4
Revised	-0.6	1.5	2.1	1.8	2.5
Private business					
Previous	-0.1	1.8	1.9	1.6	2.3
Revised	-0.5	1.6	2.0	1.8	2.5
Annual percent change, 2014-2015					
Private nonfarm business					
Previous	0.6	3.2	2.5	2.6	2.5
Revised	0.9	3.5	2.5	2.4	2.6
Private business					
Previous	0.5	3.2	2.6	2.7	2.4
Revised	0.9	3.5	2.6	2.6	2.5

1 Output per combined units of labor input and capital services.

2 The growth rate of each input is weighted by its share of current dollar costs.

3 Hours worked by age, education, and gender group, weighted by each group's share of total wages.

Technical Notes

Capital Services

Capital services are the services derived from the stock of physical assets and intellectual property assets. There are 90 asset types for fixed business equipment, structures, inventories, land, and intellectual property products. Data on investment for fixed assets are obtained from the Bureau of Economic Analysis (BEA). Data on inventories are estimated using information from BEA and the Internal Revenue Service (IRS) Corporation Income Returns. Data for land in the farm sector are obtained from the U.S. Department of Agriculture (USDA). Nonfarm industry detail for land is based on IRS book value data. Current-dollar value-added data, obtained from BEA, are used in estimating capital rental prices.

BLS provides additional detail in table C on information processing equipment and intellectual property products. Information processing equipment is composed of three broad classes of assets: computers and related equipment, communications equipment, and other information processing equipment. Computers and related equipment includes mainframe computers, personal computers, printers, terminals, tape drives, storage devices, and integrated systems. Communications equipment is not further differentiated. Other information processing equipment includes medical equipment and related instruments, electromedical instruments, nonmedical instruments, photocopying and related equipment, and office and accounting machinery. Intellectual property products are composed of three broad classes of assets: software, research and development, and artistic originals. Software is comprised of pre-packaged, custom, and own-account software. Research and development is creative work undertaken to increase the stock of knowledge for the purpose of discovering or developing new products or improving existing ones. Artistic originals include theatrical movies, long-lived television programs, books, music, and other forms of entertainment. Structures include nonresidential structures and residential capital that are rented out by profit-making firms or persons.

Financial assets are excluded from capital services measures, as are owner-occupied residential structures. The aggregate capital services measures are obtained by Tornqvist aggregation of the capital stocks for each asset type within each of 60 NAICS industry groupings using estimated rental prices for each asset type. Each rental price reflects the nominal rate of return to all assets within the industry and rates of economic depreciation and revaluation for the specific asset; rental prices are adjusted for the effects of taxes. Current-dollar capital costs can be defined as each asset's rental price multiplied by its constant-dollar stock, adjusting for capital composition effects.

Capital services measures constructed for the most recent year are preliminary and are based on less detail than the rest of the series. These measures consist of 6 asset types as opposed to the 90 asset types for fixed business equipment, structures, inventories, land, and intellectual property products included in estimates for all previous years. The assets included in the most recent year are structures, fixed business equipment, intellectual property products, inventories, rental residences, and land. Investments, depreciation, and capital income are estimated for each of these six aggregates. Capital services are calculated by a chained superlative Tornqvist index combining stocks of the six asset categories, weighted by capital income shares. See the June 2005 Monthly Labor Review article, "Preliminary estimates of multifactor productivity growth" located at www.bls.gov/opub/mlr/2005/06/art3full.pdf.

Labor Input

Labor input in private business and private nonfarm business is obtained by a chained superlative Tornqvist aggregation of the hours worked, classified by age, education, and gender with weights determined by each group's share of the total wage bill. Hours paid of employees are largely obtained from the Current Employment Statistics (CES) program. Weekly paid hours are adjusted to hours worked using data from the National Compensation Survey (NCS) for 1996 forward and data from the BLS Hours at Work survey, conducted for this purpose, prior to 1990. Between 1990 and 1995, weekly paid hours are adjusted to hours at work using a combination of NCS and Hours at Work survey data. Hours worked for nonproduction and supervisory workers are derived using data from the Current Population Survey (CPS), CES, and NCS. The hours worked of proprietors, unpaid family workers, and farm employees are derived from the CPS. Hours worked data reflect estimates in the February 1, 2018 "Productivity and Costs" news release (USDL-18-0153).

The estimates of 2017 hours worked for the private nonfarm business and private business sectors are extrapolated from the hours worked reported in the nonfarm business and business sectors, respectively, in the February 1, 2018 "Productivity and Costs" news release (USDL-18-0153). The growth rate of labor composition is defined as the difference between the growth rate of weighted labor input and the growth rate of the hours of all persons.

Additional information concerning data sources and methods of measuring labor composition can be found in "Changes in the Composition of Labor for BLS Multifactor Productivity Measures, 2014" (www.bls.gov/mfp/mprlabor.pdf).

Combined Inputs

Labor input and capital services are combined using chained superlative Tornqvist aggregation, applying weights that represent each component's average share of total costs. The chained superlative Tornqvist index uses changing weights; the share in each year is averaged with the preceding year's share. Total costs are defined as the value of output less a portion of taxes on production and imports. Most taxes on production and imports, such as excise taxes, are excluded from costs; however, property and motor vehicle taxes remain in total costs.

Capital Intensity

Capital intensity is the ratio of capital services to hours worked in the production process. The higher the capital to hours ratio, the more capital intensive the production process becomes.

In a production process, profit-maximizing/cost-minimizing firms adjust the factor proportions of capital and labor when the price of one factor is less than the other factor; there is a tendency for the firms to substitute the less expensive factor for the more expensive one. In the short run, changes in hours worked are more variable than changes in capital services. Changes in hours worked in business cycles can result in volatility of the capital intensity ratio over short periods of time. In the long run an increase in wages relative to the price of capital will induce the firm to substitute capital for labor, resulting in an increase in capital intensity.

Rising labor costs are, in fact, an incentive for firms to introduce automated production processes. Industry estimates of capital to hours ratios can be obtained at www.bls.gov/mfp/mprdload.htm.

Value-Added Output

Private business sector output is a chain-type, current-weighted index constructed after excluding from gross domestic product (GDP) the following outputs: general government, nonprofit institutions, private households (including owner-occupied housing), and government enterprises. This release presents data for the private business and private nonfarm business sectors. The private business sector accounted for approximately 74 percent of GDP in 2016. Additionally, the private nonfarm business sector excludes farms from the private business sector, but includes agricultural services. Multifactor productivity measures exclude government enterprises, while the BLS quarterly Productivity and Costs series include them.

The output measures are based on the National Income and Product Accounts (NIPA) data released by BEA on January 29, 2018. The estimates of 2016 output for the private nonfarm business and private business sectors are extrapolated from the output reported in the nonfarm business and business sectors, respectively, in the February 1, 2018 "Productivity and Costs" news release (USDL-18-0153).

Multifactor Productivity

Multifactor productivity measures describe the relationship between output in real terms and the inputs involved in its production. They do not measure the specific contributions of labor or capital, or any other factor of production. Rather, multifactor productivity is designed to measure the joint influences of technological change, efficiency improvements, returns to scale, reallocation of resources, and other factors on economic growth, allowing for the effects of capital and labor.

The multifactor productivity indexes for private business and private nonfarm business are derived by dividing an output index by an index of combined inputs of capital services and labor input. The output indexes are computed as chained superlative indexes (Fisher Ideal indexes) of components of real output.

Research and Development

The stock of research and development in private nonfarm business is derived by aggregating different vintages of constant dollar measures of research and development expenditures and allowing for depreciation. Current dollar expenditures for privately financed research and development are obtained from annual issues of Research and Development in Industry published by the National Science Foundation. BLS develops price deflators and estimates of the rate of depreciation.

The research and development data in the private nonfarm business sector presented here show the effect of spillovers from economic units that conduct research and development. BEA publishes measures of research and development investments in each industry that include estimates of the direct returns to firms conducting such research and development activities. By combining the direct returns to firms conducting research and development with the spillover effect of other firms, a picture of the total overall effects of research and development can be drawn.

Further description of these data and methods can be found in BLS Bulletin 2331 (September 1989), "The Impact of Research and Development on Productivity Growth" at www.bls.gov/mfp/mfparchive.htm. BLS measures of year-to-year contributions of research and development to the private nonfarm business sector and measures of the stock of research and development are available at www.bls.gov/mfp/rdtable.pdf.

Other Information

Comprehensive tables containing additional data beyond the scope of this press release are available upon request at (202) 691-5606 or at www.bls.gov/mfp/mprdload.htm. More detailed information on methods, limitations, and data sources of capital and labor are provided in BLS Bulletin 2178 (September 1983), "Trends in Multifactor Productivity, 1948-81" (www.bls.gov/mfp/mfparchive.htm) and on the BLS Multifactor Productivity website under the title "Technical Information About the BLS Multifactor Productivity Measures for Major Sectors and 18 NAICS 3-digit Manufacturing Industries" (www.bls.gov/mfp/mprtech.pdf). General information is available on the BLS website at www.bls.gov/mfp/mprover.htm. Additional data not contained in the release can be obtained at www.bls.gov/mfp. Comprehensive tables can be downloaded at www.bls.gov/mfp/mprdload.htm, including data that links 1948-87 SIC data to NAICS data from 1987 forward. This file includes data for the private business and private nonfarm business sector.

Table 1. Private nonfarm business sector: productivity and related measures for the 1987-2017[1] period

Annual percent change from previous year

Year	Productivity			Value-added output[4]	Inputs			Capital Intensity[8]
	Labor produc-tivity[2]	Output per unit of capital services	Multifactor Productivity[3]		Labor[5]	Capital Services[6]	Combined units of labor and capital services[7]	
1988	1.6	0.7	1.1	4.6	3.2	3.9	3.4	1.0
1989	0.9	-0.5	0.0	3.7	3.4	4.2	3.7	1.4
1990	1.8	-1.9	0.3	1.5	0.1	3.5	1.2	3.8
1991	1.8	-3.6	-0.7	-0.5	-1.3	3.2	0.2	5.6
1992	4.4	1.3	3.0	4.0	0.2	2.7	1.0	3.0
1993	0.2	-0.3	-0.5	3.2	3.8	3.5	3.7	0.5
1994	0.8	0.8	0.5	4.6	4.3	3.8	4.2	0.0
1995	1.2	-0.9	0.0	3.6	3.0	4.5	3.5	2.2
1996	2.1	-0.3	1.1	4.6	2.7	4.9	3.5	2.5
1997	1.9	-0.4	0.9	5.2	3.6	5.6	4.3	2.3
1998	3.0	-0.9	1.5	5.3	2.6	6.3	3.8	3.9
1999	3.7	-1.0	1.8	5.6	2.4	6.7	3.8	4.8
2000	3.0	-2.0	1.3	4.4	1.4	6.5	3.1	5.1
2001	2.9	-3.8	0.5	0.9	-1.6	4.8	0.4	7.0
2002	4.5	-1.5	2.0	1.8	-1.9	3.4	-0.2	6.1
2003	3.7	0.4	2.1	3.2	0.1	2.8	1.0	3.3
2004	3.1	1.9	2.6	4.5	1.5	2.6	1.9	1.2
2005	2.1	0.6	1.5	3.8	1.7	3.2	2.2	1.5
2006	0.9	-0.2	0.3	3.3	2.6	3.4	2.9	1.1
2007	1.7	-0.6	0.5	2.4	1.2	3.0	1.9	2.3
2008	0.8	-3.7	-1.3	-1.3	-1.4	2.5	0.0	4.7
2009	3.4	-4.8	-0.4	-4.1	-6.2	0.7	-3.7	8.5
2010	3.3	3.3	3.3	3.2	-0.1	0.0	-0.1	0.0
2011	0.1	1.0	0.2	2.2	2.6	1.2	2.0	-0.9
2012	0.8	1.8	0.9	3.1	2.7	1.3	2.2	-0.9
2013	0.3	0.1	0.1	2.1	2.0	1.9	2.0	0.1
2014	1.0	1.0	1.0	3.3	2.4	2.3	2.4	0.0
2015	1.3	0.8	0.9	3.5	2.4	2.6	2.5	0.4
2016	0.0	-1.1	-0.6	1.5	1.8	2.5	2.1	1.1
2017	1.2	0.6	0.9	2.9	1.9	2.2	2.0	0.6

See footnotes following table 4.   Source: Bureau of Labor Statistics

Table 2. Private business sector: productivity and related measures for the 1987-2017[1] period

Annual percent change from previous year

Year	Productivity			Value-added output[4]	Inputs			Capital Intensity[8]
	Labor produc-tivity[2]	Output per unit of capital services	Multifactor Productivity[3]		Labor[5]	Capital Services[6]	Combined units of labor and capital services[7]	
1988	1.5	0.3	0.9	4.3	3.1	3.9	3.4	1.2
1989	1.1	-0.3	0.3	3.8	3.3	4.1	3.6	1.4
1990	2.1	-1.7	0.5	1.6	-0.1	3.3	1.1	3.8
1991	1.8	-3.4	-0.7	-0.5	-1.2	3.0	0.2	5.3
1992	4.6	1.7	3.2	4.2	0.3	2.5	1.0	2.9
1993	0.2	-0.4	-0.6	2.9	3.6	3.4	3.6	0.6
1994	0.7	1.1	0.5	4.9	4.7	3.7	4.4	-0.4
1995	0.8	-1.1	-0.3	3.2	3.0	4.3	3.5	1.9
1996	2.5	0.0	1.4	4.7	2.5	4.7	3.3	2.5
1997	2.2	-0.1	1.1	5.3	3.4	5.4	4.1	2.3
1998	3.1	-0.9	1.5	5.2	2.4	6.1	3.6	4.0
1999	3.9	-0.9	1.9	5.6	2.2	6.5	3.6	4.8
2000	3.1	-1.7	1.4	4.5	1.4	6.3	3.0	4.9
2001	3.0	-3.7	0.4	0.8	-1.7	4.7	0.3	7.0
2002	4.4	-1.3	2.0	1.8	-1.9	3.2	-0.2	5.8
2003	3.9	0.6	2.3	3.2	0.0	2.6	0.9	3.3
2004	3.2	1.9	2.6	4.5	1.4	2.6	1.8	1.3
2005	2.1	0.6	1.5	3.8	1.7	3.3	2.3	1.5
2006	1.0	-0.2	0.4	3.2	2.5	3.5	2.9	1.2
2007	1.5	-0.7	0.4	2.2	1.2	2.9	1.8	2.2
2008	0.9	-3.4	-1.2	-1.2	-1.3	2.3	0.0	4.4
2009	3.5	-4.4	-0.3	-3.9	-6.1	0.6	-3.7	8.3
2010	3.3	3.2	3.3	3.2	-0.1	0.0	-0.1	0.0
2011	0.0	0.8	0.1	2.1	2.6	1.3	2.1	-0.8
2012	0.6	1.5	0.7	2.9	2.7	1.4	2.2	-0.8
2013	0.7	0.3	0.4	2.3	1.8	1.9	1.9	0.3
2014	0.9	1.0	0.9	3.3	2.5	2.2	2.4	-0.2
2015	1.2	1.0	0.9	3.5	2.6	2.5	2.6	0.2
2016	0.1	-0.9	-0.5	1.6	1.8	2.5	2.0	1.0
2017	1.2	0.5	0.8	2.7	1.8	2.2	2.0	0.7

See footnotes following table 4.   Source: Bureau of Labor Statistics

Table 3. Private nonfarm business sector: indexes of productivity and related measures, 1987-2017[1]

Indexes 2009=100

| Year | Productivity | | | Value-added output[4] | Inputs | | | Capital Intensity[8] |
	Labor productivity[2]	Output per unit of capital services	Multifactor Productivity[3]		Labor[5]	Capital Services[6]	Combined units of labor and capital services[7]	
1987	61.4	123.5	83.7	53.5	78.0	43.3	63.9	49.7
1988	62.4	124.4	84.7	55.9	80.5	45.0	66.1	50.2
1989	62.9	123.7	84.7	58.0	83.2	46.8	68.5	50.8
1990	64.0	121.4	84.9	58.9	83.3	48.5	69.3	52.8
1991	65.2	117.0	84.3	58.5	82.3	50.0	69.4	55.7
1992	68.1	118.6	86.8	60.9	82.5	51.4	70.2	57.4
1993	68.2	118.2	86.4	62.9	85.6	53.2	72.8	57.7
1994	68.7	119.1	86.8	65.8	89.3	55.2	75.8	57.7
1995	69.6	118.0	86.8	68.1	92.0	57.7	78.5	59.0
1996	71.0	117.6	87.7	71.2	94.5	60.5	81.2	60.4
1997	72.4	117.2	88.5	74.9	97.9	63.9	84.6	61.8
1998	74.6	116.2	89.8	78.9	100.5	67.9	87.9	64.2
1999	77.4	115.0	91.4	83.3	102.8	72.5	91.2	67.3
2000	79.7	112.7	92.5	87.0	104.3	77.2	94.0	70.7
2001	82.0	108.4	93.0	87.7	102.6	80.9	94.3	75.6
2002	85.6	106.8	94.8	89.3	100.6	83.6	94.1	80.2
2003	88.8	107.2	96.9	92.1	100.8	85.9	95.1	82.9
2004	91.6	109.2	99.4	96.2	102.3	88.1	96.8	83.9
2005	93.5	109.9	100.9	99.9	104.0	90.9	99.0	85.1
2006	94.4	109.7	101.3	103.2	106.8	94.1	101.9	86.0
2007	95.9	109.0	101.8	105.6	108.1	96.9	103.8	88.0
2008	96.7	105.0	100.4	104.3	106.6	99.3	103.8	92.1
2009	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
2010	103.3	103.3	103.3	103.2	99.9	100.0	99.9	100.0
2011	103.4	104.3	103.5	105.5	102.5	101.1	102.0	99.1
2012	104.3	106.2	104.5	108.8	105.3	102.5	104.2	98.2
2013	104.5	106.4	104.6	111.1	107.4	104.4	106.2	98.3
2014	105.6	107.5	105.6	114.8	109.9	106.8	108.7	98.3
2015	106.9	108.4	106.6	118.8	112.6	109.6	111.5	98.7
2016	106.9	107.2	105.9	120.5	114.6	112.4	113.8	99.7
2017	108.2	107.9	106.8	123.9	116.8	114.9	116.1	100.4

See footnotes following table 4.   Source: Bureau of Labor Statistics

Table 4. Private business sector: indexes of productivity and related measures, 1987-2017[1]

Indexes 2009=100

Year	Productivity			Value-added output[4]	Inputs			Capital Intensity[8]
	Labor produc-tivity[2]	Output per unit of capital services	Multifactor Productivity[3]		Labor[5]	Capital Services[6]	Combined units of labor and capital services[7]	
1987	60.6	120.2	82.5	53.4	78.8	44.4	64.7	50.4
1988	61.5	120.6	83.3	55.7	81.2	46.2	66.9	51.0
1989	62.2	120.3	83.5	57.8	83.9	48.1	69.3	51.7
1990	63.4	118.2	83.9	58.8	83.9	49.7	70.0	53.7
1991	64.6	114.2	83.4	58.5	82.8	51.2	70.1	56.5
1992	67.5	116.1	86.0	60.9	83.1	52.5	70.8	58.1
1993	67.6	115.6	85.5	62.7	86.1	54.2	73.3	58.5
1994	68.1	116.9	85.9	65.8	90.1	56.2	76.6	58.2
1995	68.7	115.6	85.6	67.8	92.9	58.7	79.2	59.4
1996	70.4	115.6	86.8	71.0	95.2	61.4	81.8	60.8
1997	71.9	115.5	87.8	74.8	98.5	64.7	85.2	62.2
1998	74.1	114.5	89.1	78.7	100.8	68.7	88.3	64.7
1999	77.0	113.6	90.8	83.1	103.0	73.2	91.5	67.8
2000	79.3	111.6	92.1	86.8	104.5	77.8	94.2	71.1
2001	81.7	107.5	92.6	87.5	102.7	81.4	94.5	76.0
2002	85.3	106.0	94.4	89.1	100.8	84.0	94.3	80.4
2003	88.6	106.6	96.6	91.9	100.8	86.2	95.2	83.1
2004	91.5	108.7	99.2	96.1	102.3	88.5	96.9	84.2
2005	93.4	109.3	100.7	99.8	104.0	91.3	99.1	85.5
2006	94.3	109.0	101.1	103.1	106.7	94.5	102.0	86.5
2007	95.8	108.3	101.5	105.3	107.9	97.2	103.8	88.5
2008	96.6	104.7	100.3	104.1	106.5	99.4	103.8	92.3
2009	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
2010	103.3	103.2	103.3	103.2	99.9	100.0	99.9	100.0
2011	103.3	104.1	103.4	105.4	102.4	101.3	102.0	99.2
2012	103.9	105.6	104.1	108.5	105.2	102.7	104.2	98.4
2013	104.6	106.0	104.5	111.0	107.1	104.7	106.2	98.7
2014	105.5	107.1	105.4	114.6	109.8	107.0	108.7	98.6
2015	106.8	108.1	106.4	118.6	112.6	109.7	111.5	98.7
2016	106.8	107.2	105.9	120.5	114.6	112.4	113.8	99.7
2017	108.1	107.7	106.7	123.8	116.7	114.9	116.0	100.3

See footnotes following table 4.   Source: Bureau of Labor Statistics

Footnotes, Tables 1-4

Source: The Bureau of Labor Statistics (BLS) develops productivity measures using output and compensation data published by the Bureau of Economic Analysis (BEA), hours data published by other BLS programs, and capital data supplied by BEA and U.S. Department of Agriculture. Also see Technical Notes in this release.

(1) The private business sector covers gross domestic product with the exception of the output of general government, government enterprises, non-profit institutions, the rental value of owner-occupied real estate, and the output of paid employees of private households. The private nonfarm business sector further excludes farms but includes agricultural services.

(2) Output per hour worked.

(3) Output per combined units of labor input and capital services.

(4) Gross domestic product originating in the sector, chained superlative index.

(5) Index of hours worked of all persons including employees, proprietors, and unpaid family workers, classified by age, education, and gender. This chained superlative index is computed by combining changes in the hours of each age, education, and gender group weighted by each group's share of total wages.

(6) A measure of the flow of capital services used in the sector. Capital services measure the services derived from the stock of physical assets and intellectual property products.

(7) The growth rates of labor input and capital services are combined by weighting with their respective shares of current dollar costs as weights, and aggregating into a chained superlative index.

(8) Capital services per hour.