

For release 10:00 am (EDT) Thursday, May 19, 2011

USDL-11-0723

Technical information: (202) 691-5606 • mfpweb@bls.gov • www.bls.gov/mfp

Media contact: (202) 691-5902 • PressOffice@bls.gov

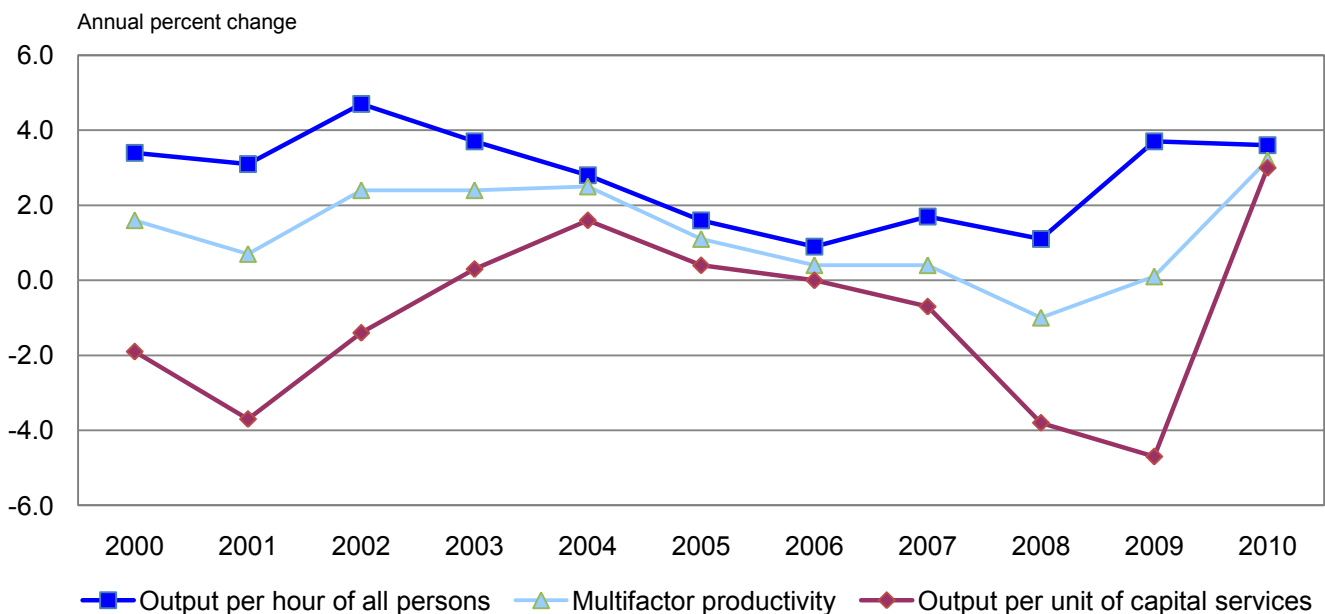
## PRELIMINARY MULTIFACTOR PRODUCTIVITY TRENDS - 2010

**Private nonfarm business sector** multifactor productivity increased at a 3.2 percent annual rate in 2010, the largest increase recorded in this series which began in 1987, the U.S. Bureau of Labor Statistics reported today. (See chart 1, table A.) The multifactor productivity gain in 2010 reflected a 3.7 percent increase in output and a 0.5 percent increase in the combined inputs of capital and labor. Capital services grew by 0.6 percent, the smallest gain in the series which began in 1987. The combination of fast-rising output and a modest increase in capital services caused output per unit of capital services to jump 3.0 percent, the largest gain since the series began in 1987. Labor input, the combined effect of hours worked and labor composition, increased 0.5 percent in the private nonfarm business sector after falling in the previous two years.

Multifactor productivity measures the change in output per unit of combined capital and labor. 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. Multifactor productivity, therefore, differs from labor productivity (output per hour worked) measures that BLS publishes quarterly since it includes information on capital services and other data that are not available on a quarterly basis. Additionally, multifactor productivity measures for the private business and private nonfarm business sectors account for shifts in the composition of labor. Estimates of labor composition are not included in the quarterly labor productivity measures.

**Private business sector** multifactor productivity grew by 3.2 percent in 2010, the largest gain in the series which began in 1987. (See table 2.) The multifactor productivity gain in 2010 reflected a 3.7 percent increase in output and a 0.6 percent increase in the combined inputs of capital and labor.

**Chart 1. Output per hour of all persons, multifactor productivity, and output per unit of capital services in the private nonfarm business sector, 2000-2010**



## Historical trends in private nonfarm business

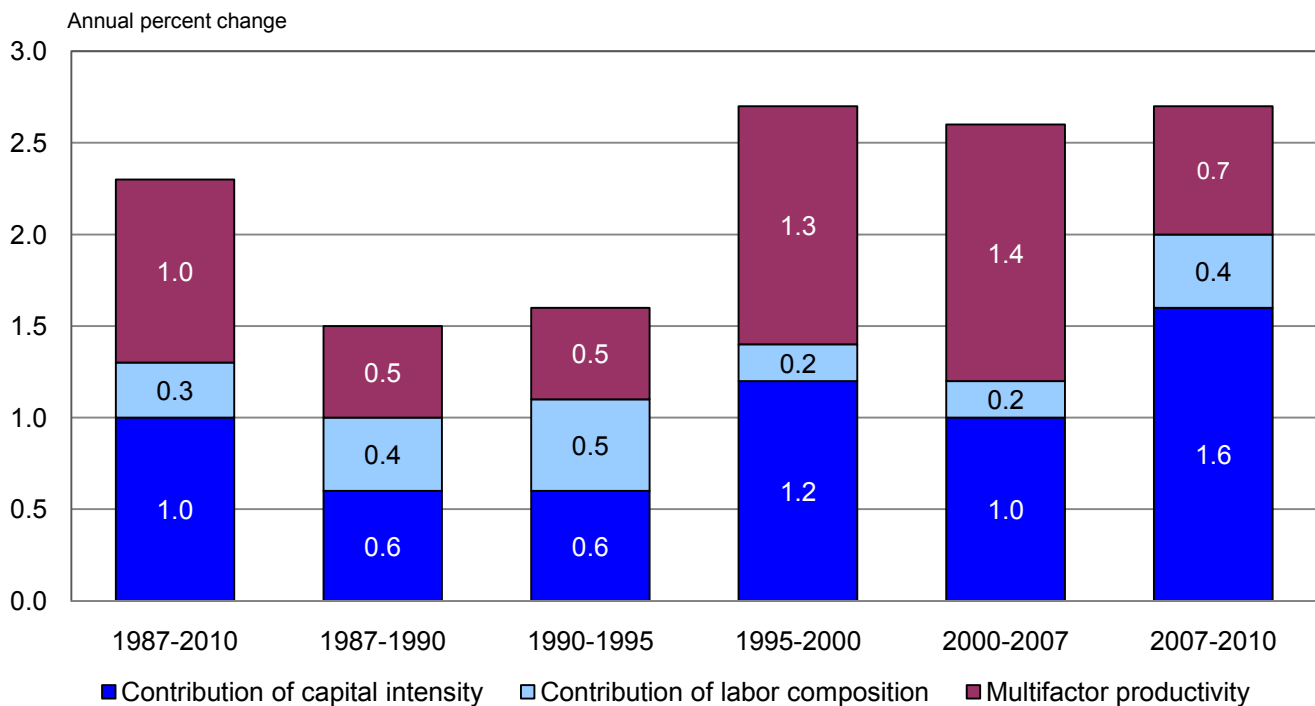
Multifactor productivity in private nonfarm business grew 1.0 percent annually from 1987 to 2010. (See table A.) For the 2007-2010 period, multifactor productivity grew 0.7 percent, primarily due to a 0.4 percent decline in output coupled with a 1.1 percent decline in combined inputs. In contrast, the 3.2 percent increase in multifactor productivity in 2010 was a result of an increase in output much larger than the increase in combined inputs. The 3.7 percent rise in output over the year represents the largest increase since 2004. (See table 1.)

Annual 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. The historical relationship between labor productivity growth and these three components can be seen in chart 2 and table B. Chart 2 shows how output per hour shifted upwards after the 1990-1995 period. In particular, the contribution of capital intensity to labor productivity growth became more pronounced after 1995.

For the 2007-2010 period, the contribution of capital intensity increased at a 1.6 percent annual rate and the contribution of labor composition increased at a 0.4 percent annual rate, faster than the gains seen in the 1995-2000 and 2000-2007 periods. Gains made in private nonfarm business output per hour due to the rising contributions of capital intensity and of labor composition were tempered by slower multifactor productivity growth. As a result, output per hour was little changed during 2007-2010 compared to the two previous periods. (See chart 2, table B.)

The methodology for measuring preliminary multifactor productivity for 2010 is a simplified version of the methodology that BLS uses when more detailed information is available. Measures will be revised in early 2012.

**Chart 2. Percentage point contributions to growth in output per hour in the private nonfarm business sector, 1987-2010**



Multifactor productivity plus the contributions of capital intensity and labor composition may not sum to output per hour due to independent rounding.

**Table A. Compound annual growth rates for productivity, output, and inputs in the private nonfarm business and private business sectors for selected periods, 1987-2010**

In percent

	1987-2010	1987-1990	1990-1995	1995-2000	2000-2007	2007-2010	2009-2010
<u>Private nonfarm business<sup>1</sup></u>							
Productivity							
Multifactor Productivity <sup>2</sup>	1.0	0.5	0.5	1.3	1.4	0.7	3.2
Output per hour of all persons	2.3	1.4	1.6	2.8	2.6	2.8	3.6
Output per unit of capital services	-0.8	-0.4	-0.4	-1.0	-0.5	-1.9	3.0
Output	2.9	3.2	2.9	5.0	2.7	-0.4	3.7
Inputs							
Combined inputs <sup>3</sup>	1.9	2.7	2.4	3.6	1.3	-1.1	0.5
Labor Input <sup>4</sup>	1.1	2.3	2.0	2.5	0.4	-2.5	0.5
Hours	0.6	1.7	1.3	2.2	0.1	-3.1	0.1
Labor composition <sup>5</sup>	0.5	0.6	0.7	0.3	0.3	0.6	0.4
Capital services	3.7	3.6	3.3	6.0	3.2	1.5	0.6
Analytic ratio							
Capital services per hour of all persons	3.1	1.9	1.9	3.8	3.2	4.7	0.4
<u>Private business<sup>1</sup></u>							
Productivity							
Multifactor Productivity <sup>2</sup>	1.0	0.6	0.4	1.5	1.5	0.8	3.2
Output per hour of all persons	2.3	1.6	1.5	2.9	2.7	2.8	3.6
Output per unit of capital services	-0.6	-0.4	-0.3	-0.7	-0.4	-1.8	3.0
Output	2.9	3.2	2.8	5.0	2.7	-0.3	3.7
Inputs							
Combined inputs <sup>3</sup>	1.8	2.6	2.4	3.4	1.2	-1.1	0.6
Labor Input <sup>4</sup>	1.0	2.1	2.0	2.3	0.3	-2.5	0.5
Hours	0.5	1.6	1.3	2.0	0.0	-3.0	0.1
Labor composition <sup>5</sup>	0.5	0.6	0.7	0.3	0.3	0.6	0.3
Capital services	3.5	3.6	3.1	5.8	3.1	1.4	0.6
Analytic ratio							
Capital services per hour of all persons	3.0	2.0	1.8	3.7	3.1	4.6	0.5

1 Excludes government enterprises.

2 Output per unit of combined labor input and capital services.

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

4 Hours at work by age, education, and gender group are weighted by each group's share of the total wage bill.

5 Ratio of labor input to hours.

**Table B. Compound annual growth rates in output per hour of all persons and the contributions of capital intensity, labor composition, and multifactor productivity in the private nonfarm business and private business sectors for selected periods, 1987-2010**

In percent

	1987-2010	1987-1990	1990-1995	1995-2000	2000-2007	2007-2010	2009-2010
<u>Private nonfarm business<sup>1</sup></u>							
Output per hour of all persons	2.3	1.4	1.6	2.8	2.6	2.8	3.6
Contribution of capital intensity <sup>2</sup>	1.0	0.6	0.6	1.2	1.0	1.6	0.2
Contribution of labor composition <sup>3</sup>	0.3	0.4	0.5	0.2	0.2	0.4	0.2
Multifactor productivity <sup>4</sup>	1.0	0.5	0.5	1.3	1.4	0.7	3.2
<u>Private business<sup>1</sup></u>							
Output per hour of all persons	2.3	1.6	1.5	2.9	2.7	2.8	3.6
Contribution of capital intensity <sup>2</sup>	1.0	0.6	0.6	1.2	1.0	1.6	0.2
Contribution of labor composition <sup>3</sup>	0.3	0.4	0.5	0.2	0.2	0.4	0.2
Multifactor productivity <sup>4</sup>	1.0	0.6	0.4	1.5	1.5	0.8	3.2

1 Excludes government enterprises.

2 Capital services per hour multiplied by capital's share of current dollar costs.

3 Labor composition multiplied by labor's share of current dollar costs.

4 Output per unit of combined labor input and capital services.

Multifactor productivity plus the contributions of capital intensity and labor composition may not sum to output per hour due to independent rounding.

## Technical Notes

The simplified methodology for preparing preliminary estimates of MFP is outlined in the June 2005 Monthly Labor Review article, “Preliminary estimates of multifactor productivity growth” located at <http://www.bls.gov/opub/mlr/2005/06/art3abs.htm>. This methodology is applied to both the private nonfarm business and private business sectors and measures are calculated only for the most recent year. Measures for all previous years are not different from the March 30, 2011 “Multifactor Productivity Trends” news release (USDL-11-0435).

**Capital Services:** Capital services are the services derived from the stock of physical assets and software. Capital services measures constructed for the preliminary MFP measures are based on less detail only for the most recent year. The preliminary measures consist of eight asset types as opposed to the 86 asset types for fixed business equipment and software, structures, inventories, and land included in estimates for all previous years. The assets included in the preliminary estimates are computers, software, communications and other information processing equipment, other fixed business equipment, structures, inventories, rental residences, and land. Investments, depreciation, and capital income are estimated for each of these eight aggregates. Capital services are calculated by a chained superlative Tornqvist index combining stocks of the eight asset categories, weighted by capital income shares.

**Labor Input:** Labor input is composed of hours worked and labor composition for the private business and private nonfarm business sectors. It is calculated by the chained superlative Tornqvist aggregation of the hours at work by all persons, classified by age, education, and gender with weights determined by each group’s share of the total wage bill. The preliminary estimates of 2010 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 3, 2011 “Productivity and Costs” news release (USDL-11-0128).

The labor composition index estimates the effect of shifts in the age, education, and gender composition of the work force on the efficiency of hours worked. The preliminary MFP labor composition index calculates the number of hours worked by each type of worker based on Current Population Survey (CPS) data. The estimate of the 2010 labor composition index assumes relative wages across groups remain constant between 2009 and 2010.

Additional information concerning data sources and methods of measuring labor composition can be found in Cindy Zoghi, 2007, “Measuring Labor Composition: A Comparison of Alternate Methodologies” <http://www.bls.gov/bls/fesacp1121407.pdf>.

**Combined Inputs:** Labor input and capital services are combined using chained superlative Tornqvist aggregation, applying weights that represent each component's 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 of the 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 is.

In a production process, profit maximizing/cost-minimizing firms adjust the factor proportions of capital and labor if the price of one factor is less than the other factor; there would be 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 capital intensity 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 <http://www.bls.gov/mfp/mprdownload.htm>.

**Output:** Private business sector output is a chain-type, current-weighted index constructed after excluding the following outputs from gross domestic product (GDP): 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 76 percent of gross domestic product in 2005. 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 Cost series include them. The output measures reflect the National Income and Product Accounts (NIPA) data released by the Bureau of Economic Analysis (BEA) on January 28, 2011 but do not reflect the revised data released by BEA on February 25, 2011. The preliminary estimates of 2010 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 3, 2011 “Productivity and Costs” news release (USD-11-0128).

**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, 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 labor input and capital services. The output indexes are computed as chained superlative indexes (Fisher Ideal indexes) of components of real output.

**Table 1. Private nonfarm business sector: productivity and related measures for the 1987-2010<sup>1</sup> period**

Annual percent change from previous year

Year	Productivity			Output <sup>3</sup>	Inputs			Capital services per hour of all persons
	Output per hour of all persons	Output per unit of capital services	Multifactor Productivity <sup>2</sup>		Labor Input <sup>4</sup>	Capital Services <sup>5</sup>	Combined units of labor input and capital services <sup>6</sup>	
1988	1.7	0.9	1.0	4.6	3.5	3.6	3.5	0.7
1989	0.8	-0.4	0.0	3.5	3.3	4.0	3.5	1.2
1990	1.9	-1.7	0.4	1.4	0.1	3.2	1.1	3.7
1991	1.7	-3.6	-1.0	-0.9	-1.1	2.9	0.1	5.5
1992	4.0	1.5	2.3	3.8	1.0	2.3	1.4	2.5
1993	0.6	0.3	0.3	3.6	3.3	3.2	3.3	0.3
1994	1.1	1.1	0.7	4.7	4.1	3.6	3.9	0.0
1995	0.5	-1.1	0.0	3.3	2.7	4.4	3.2	1.6
1996	2.6	-0.3	1.4	4.4	2.2	4.8	3.0	2.9
1997	1.5	-0.4	0.6	5.1	4.0	5.5	4.5	1.9
1998	2.9	-1.2	1.5	5.2	2.4	6.4	3.6	4.1
1999	3.3	-1.1	1.7	5.6	2.6	6.8	3.9	4.5
2000	3.4	-1.9	1.6	4.5	1.2	6.5	2.8	5.5
2001	3.1	-3.7	0.7	1.0	-1.6	4.9	0.3	7.1
2002	4.7	-1.4	2.4	1.9	-2.0	3.4	-0.4	6.1
2003	3.7	0.3	2.4	3.1	-0.4	2.8	0.6	3.4
2004	2.8	1.6	2.5	4.2	1.2	2.5	1.6	1.1
2005	1.6	0.4	1.1	3.4	2.0	3.0	2.3	1.2
2006	0.9	0.0	0.4	3.2	2.5	3.2	2.8	1.0
2007	1.7	-0.7	0.4	2.2	1.2	3.0	1.8	2.4
2008	1.1	-3.8	-1.0	-1.1	-1.5	2.8	-0.1	5.1
2009	3.7	-4.7	0.1	-3.7	-6.3	1.1	-3.8	8.8
2010	3.6	3.0	3.2	3.7	0.5	0.6	0.5	0.4

See footnotes following table 4.

Source: Bureau of Labor Statistics

**Table 2. Private business sector: productivity and related measures for the 1987-2010<sup>1</sup> period**

Annual percent change from previous year

Year	Productivity			Output <sup>3</sup>	Inputs			Capital services per hour of all persons
	Output per hour of all persons	Output per unit of capital services	Multifactor Productivity <sup>2</sup>		Labor Input <sup>4</sup>	Capital Services <sup>5</sup>	Combined units of labor input and capital services <sup>6</sup>	
1988	1.5	0.5	0.8	4.3	3.4	3.8	3.5	1.0
1989	1.0	-0.2	0.3	3.7	3.2	3.9	3.5	1.2
1990	2.2	-1.5	0.6	1.5	-0.1	3.0	0.9	3.7
1991	1.6	-3.4	-1.0	-0.8	-1.0	2.7	0.2	5.2
1992	4.2	1.8	2.6	4.0	1.0	2.1	1.4	2.3
1993	0.6	0.2	0.2	3.3	3.1	3.1	3.1	0.4
1994	0.9	1.4	0.7	5.0	4.5	3.5	4.2	-0.4
1995	0.1	-1.2	-0.3	2.9	2.7	4.2	3.2	1.4
1996	2.9	0.0	1.7	4.6	2.0	4.6	2.8	2.9
1997	1.8	-0.1	0.8	5.2	3.9	5.3	4.4	1.8
1998	3.0	-1.1	1.5	5.0	2.3	6.2	3.5	4.1
1999	3.5	-0.9	1.9	5.6	2.4	6.6	3.7	4.5
2000	3.5	-1.7	1.7	4.6	1.2	6.3	2.8	5.3
2001	3.2	-3.6	0.8	0.9	-1.8	4.8	0.2	7.1
2002	4.6	-1.3	2.3	2.0	-1.9	3.3	-0.4	5.9
2003	3.9	0.5	2.6	3.1	-0.4	2.7	0.5	3.4
2004	2.9	1.6	2.6	4.2	1.1	2.5	1.6	1.3
2005	1.6	0.4	1.1	3.4	2.0	3.0	2.3	1.2
2006	1.0	0.2	0.5	3.1	2.4	2.9	2.6	0.8
2007	1.6	-0.8	0.3	2.1	1.2	2.9	1.8	2.4
2008	1.2	-3.6	-0.9	-0.9	-1.5	2.7	0.0	4.9
2009	3.7	-4.5	0.2	-3.6	-6.3	1.0	-3.8	8.6
2010	3.6	3.0	3.2	3.7	0.5	0.6	0.6	0.5

See footnotes following table 4.

Source: Bureau of Labor Statistics



**Table 3. Private nonfarm business sector: indexes of productivity and related measures, 1987-2010<sup>1</sup>**

Indexes 2005=100

Year	Productivity			Output <sup>3</sup>	Inputs			Capital services per hour of all persons
	Output per hour of all persons	Output per unit of capital services	Multifactor Productivity <sup>2</sup>		Labor Input <sup>4</sup>	Capital Services <sup>5</sup>	Combined units of labor input and capital services <sup>6</sup>	
1987	66.2	111.6	82.3	54.2	75.6	48.6	65.9	59.4
1988	67.3	112.6	83.2	56.7	78.2	50.4	68.2	59.8
1989	67.8	112.1	83.2	58.7	80.8	52.4	70.6	60.5
1990	69.1	110.2	83.5	59.6	80.8	54.1	71.4	62.8
1991	70.3	106.2	82.7	59.0	79.9	55.6	71.4	66.2
1992	73.1	107.8	84.6	61.3	80.7	56.9	72.4	67.8
1993	73.6	108.1	84.9	63.5	83.4	58.7	74.8	68.0
1994	74.3	109.3	85.5	66.5	86.9	60.8	77.8	68.0
1995	74.7	108.1	85.5	68.7	89.2	63.5	80.3	69.1
1996	76.6	107.7	86.7	71.7	91.1	66.6	82.7	71.1
1997	77.8	107.3	87.2	75.4	94.8	70.2	86.5	72.5
1998	80.1	106.1	88.5	79.3	97.1	74.7	89.6	75.5
1999	82.7	104.9	89.9	83.7	99.6	79.8	93.1	78.9
2000	85.5	102.9	91.4	87.5	100.8	85.0	95.7	83.2
2001	88.2	99.1	92.0	88.4	99.2	89.2	96.0	89.0
2002	92.3	97.7	94.2	90.1	97.2	92.2	95.6	94.5
2003	95.7	98.0	96.5	92.8	96.9	94.7	96.2	97.7
2004	98.4	99.6	98.9	96.7	98.1	97.1	97.7	98.8
2005	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
2006	100.9	100.0	100.4	103.2	102.5	103.2	102.8	101.0
2007	102.6	99.2	100.8	105.5	103.8	106.3	104.6	103.4
2008	103.8	95.4	99.8	104.3	102.2	109.3	104.6	108.7
2009	107.6	90.9	99.9	100.5	95.8	110.5	100.6	118.3
2010	111.4	93.7	103.0	104.2	96.3	111.1	101.1	118.8

See footnotes following table 4.

Source: Bureau of Labor Statistics

**Table 4. Private business sector: indexes of productivity and related measures, 1987-2010<sup>1</sup>**

Indexes 2005=100

Year	Productivity			Output <sup>3</sup>	Inputs			Capital services per hour of all persons
	Output per hour of all persons	Output per unit of capital services	Multifactor Productivity <sup>2</sup>		Labor Input <sup>4</sup>	Capital Services <sup>5</sup>	Combined units of labor input and capital services <sup>6</sup>	
1987	65.4	109.1	81.3	54.2	76.4	49.6	66.6	59.9
1988	66.4	109.7	82.0	56.5	78.9	51.5	68.9	60.5
1989	67.1	109.5	82.2	58.6	81.5	53.5	71.3	61.3
1990	68.6	107.9	82.7	59.5	81.4	55.2	72.0	63.6
1991	69.7	104.2	81.9	59.0	80.6	56.7	72.1	66.9
1992	72.6	106.1	84.0	61.4	81.4	57.9	73.1	68.4
1993	73.0	106.3	84.1	63.4	83.9	59.7	75.4	68.7
1994	73.7	107.8	84.8	66.6	87.7	61.8	78.5	68.4
1995	73.8	106.4	84.5	68.5	90.0	64.3	81.0	69.3
1996	75.9	106.5	86.0	71.6	91.8	67.3	83.3	71.3
1997	77.3	106.4	86.7	75.3	95.4	70.8	86.9	72.6
1998	79.6	105.2	88.0	79.2	97.6	75.2	90.0	75.6
1999	82.4	104.2	89.6	83.6	99.9	80.2	93.3	79.0
2000	85.3	102.5	91.2	87.4	101.1	85.3	95.9	83.2
2001	88.0	98.8	91.8	88.2	99.3	89.3	96.1	89.1
2002	92.1	97.5	94.0	90.0	97.4	92.2	95.7	94.4
2003	95.6	98.0	96.5	92.8	97.0	94.7	96.2	97.6
2004	98.4	99.6	98.9	96.7	98.1	97.1	97.7	98.8
2005	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
2006	101.0	100.2	100.5	103.1	102.4	102.9	102.6	100.8
2007	102.6	99.4	100.9	105.3	103.6	106.0	104.4	103.3
2008	103.8	95.8	99.9	104.3	102.1	108.8	104.4	108.3
2009	107.6	91.5	100.2	100.6	95.6	109.9	100.4	117.6
2010	111.4	94.2	103.3	104.3	96.1	110.6	101.0	118.2

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 includes all of gross domestic product except 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 also excludes farms but includes agricultural services.
- (2) Output per unit of combined labor input and capital services.
- (3) Gross domestic product originating in the sector, chained superlative index.
- (4) Index of hours at work 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 the total wage bill.
- (5) 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 software. The assets included are fixed business equipment, structures, inventories, and land.
- (6) The growth rates of labor input and capital services are combined by weighting with their respective shares of current dollar costs, and aggregating into a chained superlative index.