

For release 10:00 a.m. (EST) Thursday, November 18, 2010

USDL-10-1603

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

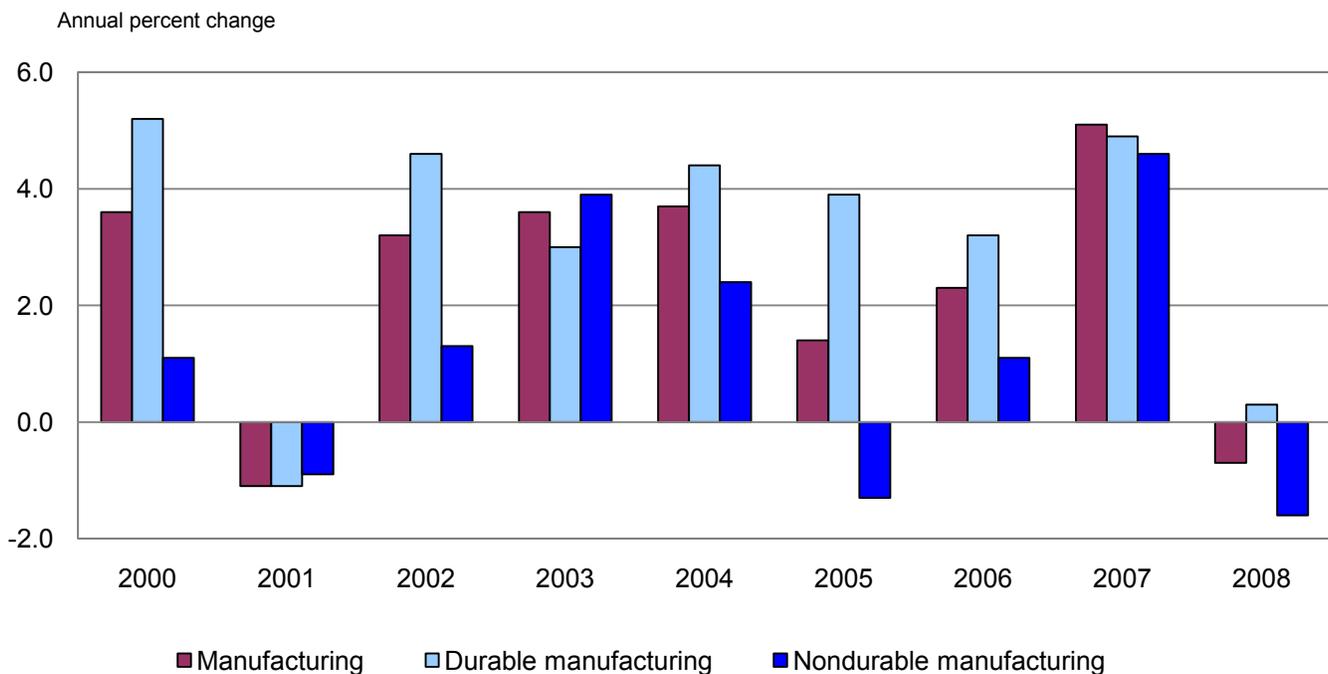
Media contact: (202) 691-5902 • PressOffice@bls.gov

MULTIFACTOR PRODUCTIVITY TRENDS IN MANUFACTURING - 2008

Manufacturing sector multifactor productivity decreased at a 0.7 percent annual rate in 2008, the U.S. Bureau of Labor Statistics reported today. (See chart 1.) This was the largest annual decline in multifactor productivity since 2001. (See table 1.) Multifactor productivity measures the change in output per unit of combined inputs. Multifactor productivity is designed to measure the joint influences on economic growth of technological change, efficiency improvements, returns to scale, reallocation of resources, and other factors, allowing for the effects of capital, labor and, in the case of the manufacturing sector, intermediate inputs (energy, materials, purchased business services). Multifactor productivity, therefore, differs from labor productivity (output per hour worked) measures that are published quarterly by BLS since it includes information on capital services and other data that are not available on a quarterly basis.

Durable manufacturing sector multifactor productivity grew 0.3 percent in 2008, after increasing 4.9 percent in 2007. **Nondurable manufacturing sector** multifactor productivity fell 1.6 percent in 2008, following a 4.6 percent increase in 2007.

Chart 1. Multifactor productivity for the manufacturing, durable manufacturing, and nondurable manufacturing sectors, 2000-2008



Multifactor productivity measures are now developed from data based on the 2002 North American Industry Classification System (NAICS). Previous measures were on a 1997 NAICS basis. Additionally, the index series have been rebased from 2000=100 to 2005=100.

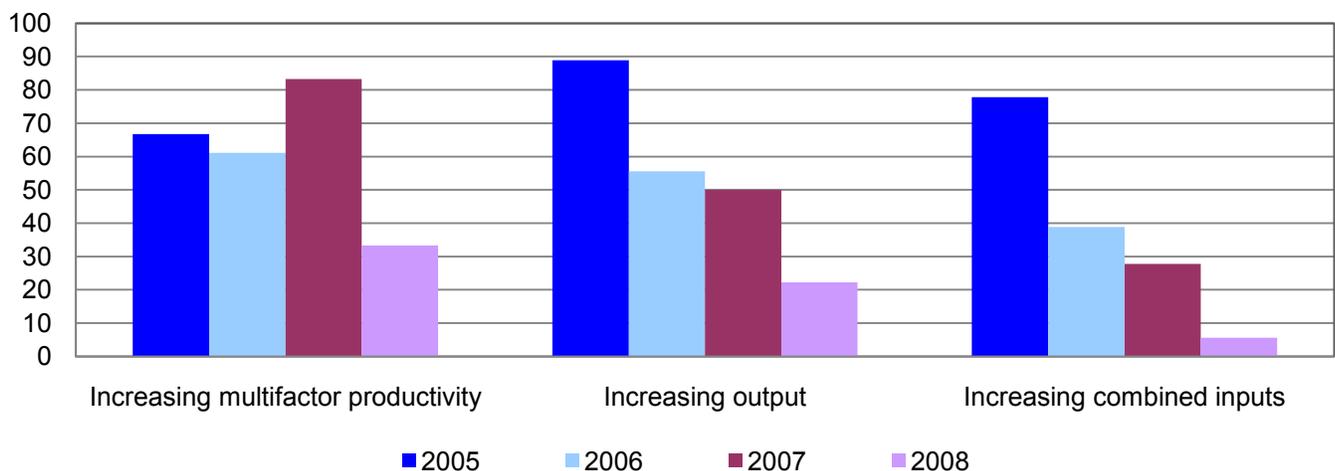
Historical trends in manufacturing

Multifactor productivity in manufacturing grew 1.6 percent annually between 1987 (the starting point of the series) and 2008. Sectoral output increased at a 2.2 percent annual rate over the period and combined inputs rose an average of 0.6 percent per year. Output per hour (labor productivity) grew 3.5 percent. For the 2000-2007 period, multifactor productivity in manufacturing rose more rapidly than in previous periods, averaging 2.6 percent per year, outpacing the 2.1 percent growth rate in the 1995-2000 period. (See table A.)

Of the 3.5 percent growth rate in labor productivity in the 1987-2008 period, 1.6 percent can be attributed to increases in multifactor productivity, 0.6 percent to the contribution of capital intensity, 0.1 percent to energy intensity, 0.8 percent to materials intensity, and 0.4 percent to purchased business services intensity. Multifactor productivity, the contribution of intermediate inputs, and the contribution of capital intensity may not sum to output per hour due to independent rounding. (See table B.)

Fewer industries recorded multifactor productivity, output, and combined input increases in 2008 than in any other year since 2001. Of the 18 industries that comprise the manufacturing sector, fewer industries each year experienced growth in output and combined inputs from 2005 to 2008. (See chart 2.)

Chart 2. Percent of manufacturing industries with increases in multifactor productivity, output, and combined inputs, 2005-2008



Revised measures

Previous and revised productivity measures and related data for 2006 and 2007 for the manufacturing, durable goods manufacturing, and nondurable goods manufacturing sectors are displayed in table C. In 2007, multifactor productivity growth was revised upward to 5.1 percent from 4.7 percent in the manufacturing sector. Multifactor productivity was also revised upward to 4.6 percent from 3.0 percent in the nondurable manufacturing sector but revised downward to 4.9 percent from 6.0 percent in the durable manufacturing sector. The revisions in both years were due to comprehensive revisions in source data in the revised National Income and Products (NIPA) data released by the Bureau of Economic Analysis (BEA) on July 31, 2009.

The Bureau of Labor Statistics is conducting a customer survey to solicit suggestions from the public to enhance the quality and relevance of BLS productivity data and publications. The survey is available at <http://www.bls.gov/mfp> until December 15, 2010.

Table A. Compound annual growth rates for productivity, sectoral output, and inputs in the manufacturing sector for selected periods, 1987 to 2008

In percent

	1987- 2008	1987- 1990	1990- 1995	1995- 2000	2000- 2007	2007- 2008
<u>Productivity</u>						
Multifactor productivity ¹	1.6	0.2	1.2	2.1	2.6	-0.7
Output per hour of all persons	3.5	1.8	3.4	4.8	3.9	-0.3
Output per unit of capital services	0.0	-0.1	0.6	0.7	-0.1	-5.4
<u>Sectoral Output</u>						
	2.2	2.1	3.3	4.7	0.7	-4.4
<u>Inputs</u>						
Combined inputs ²	0.6	1.9	2.1	2.5	-1.8	-3.7
Hours ³	-1.2	0.4	-0.1	-0.1	-3.1	-4.0
Capital services	2.2	2.3	2.7	4.0	0.8	1.1
Energy	0.5	1.8	1.6	5.8	-3.8	-2.6
Non-energy materials	1.4	1.7	3.6	5.5	-2.2	-5.3
Purchased business services	1.1	5.2	3.2	0.6	-0.9	-5.4

¹Output per unit of combined hours, capital services, energy, materials, and purchased business services inputs.

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

³Hours at work of all persons.

Table B. Compound annual growth rates in output per hour of all persons and contributions of capital intensity, intermediate inputs intensity, and multifactor productivity in the manufacturing sector for selected periods, 1987-2008

In percent

	1987-2008	1987-1990	1990-1995	1995-2000	2000-2007	2007-2008
<u>Manufacturing</u>						
Output per hour of all persons	3.5	1.8	3.4	4.8	3.9	-0.3
Contribution of capital intensity ¹	0.6	0.3	0.4	0.7	0.7	1.0
Contribution of information processing equipment and software ²	0.2	0.2	0.2	0.4	0.2	0.3
Contribution of all other capital services	0.3	0.1	0.2	0.3	0.5	0.8
Contribution of intermediate inputs ³	1.2	1.3	1.7	1.9	0.6	-0.6
Contribution of energy intensity ⁴	0.1	0.0	0.0	0.2	0.0	0.1
Contribution of materials intensity ⁵	0.8	0.4	1.1	1.6	0.2	-0.4
Contribution of purchased business services intensity ⁶	0.4	0.8	0.6	0.1	0.4	-0.2
Multifactor productivity ⁷	1.6	0.2	1.2	2.1	2.6	-0.7

¹ Growth rate in capital services per hour multiplied by capital's share of current dollar costs.

² Growth rate of information processing equipment and software per hour multiplied by its share of total current dollar costs.

³ Growth rate in intermediate inputs per hour multiplied by intermediate inputs share of current dollar costs.

⁴ Growth rate in energy services per hour multiplied by energy's share of current dollar costs.

⁵ Growth rate in materials services per hour multiplied by materials' share of current dollar costs.

⁶ Growth rate in business services per hour multiplied by business services' share of current dollar costs.

⁷ Output per unit of combined hours, capital services, energy, materials, and purchased business services inputs.

Table C. Previous and revised multifactor productivity and related measures for the 2006-2007 and 2005-2006 periods

Sector	Multifactor productivity ¹	Sectoral output	Inputs					
			Combined inputs ²	Hours ³	Capital services	Energy	Materials	Purchased business services
Annual percent change, 2006-2007								
<u>Manufacturing</u>								
Previous	4.7	1.6	-3.0	-1.7	0.5	-2.7	-8.1	-0.3
Revised	5.1	2.4	-2.5	-1.7	1.2	6.0	-7.2	-0.8
<u>Durable manufacturing</u>								
Previous	6.0	2.1	-3.7	-2.1	0.6	-3.8	-11.1	0.2
Revised	4.9	3.5	-1.3	-2.1	0.8	8.6	-4.8	2.2
<u>Nondurable manufacturing</u>								
Previous	3.0	1.1	-1.8	-1.1	0.4	-2.0	-3.5	-0.9
Revised	4.6	1.3	-3.2	-1.0	1.4	4.3	-6.4	-4.7
Annual percent change, 2005-2006								
<u>Manufacturing</u>								
Previous	2.5	1.6	-0.9	0.7	0.5	-6.7	-2.5	-1.2
Revised	2.3	1.5	-0.7	0.7	0.9	-7.8	-1.7	-1.6
<u>Durable manufacturing</u>								
Previous	4.2	3.1	-1.0	1.1	0.4	-7.5	-4.0	-0.9
Revised	3.2	3.1	-0.1	1.1	1.0	-5.0	-1.4	-0.4
<u>Nondurable manufacturing</u>								
Previous	0.6	-0.1	-0.6	0.1	0.6	-6.3	-0.5	-1.5
Revised	1.1	-0.1	-1.2	0.0	0.8	-9.6	-1.2	-3.1

¹Output per unit of combined hours, capital services, energy, materials, and purchased business services inputs.

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

³Hours at work of all persons.

TECHNICAL NOTES

Capital Services: Capital services are the services derived from the stock of physical assets and software. Capital services asset detail consists of 44 types of equipment, 28 types of structures, 3 categories of inventory, and land. The aggregate capital services measures are obtained by Tornqvist aggregation of the capital stocks for each asset type within each of the eighteen manufacturing 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. Data on investments in physical assets and software are obtained from Bureau of Economic Analysis (BEA). Nonfarm industry detail for land is based on IRS book value data.

Labor Hours: The construction of the hours measures follows the methods used in the private business sector described in USDL 10-1171, *Multifactor Productivity Trends, 2008*, <http://www.bls.gov/news.release/pdf/prod3.pdf>, except that hours in manufacturing are directly aggregated and do not include the effects of labor composition. Hours data for the manufacturing multifactor productivity measures include hours for all persons working in the manufacturing sector – wage and salary workers, the self-employed and unpaid family workers. The primary source of hours data is the BLS Current Employment Statistics (CES) survey. Hours paid of production workers are also obtained primarily from the CES survey. The hours of these employees are then converted to an at-work basis by using information from the Employment Cost Index (ECI) of the National Compensation Survey (NCS) and the BLS Hours at Work Survey. Hours at work for nonproduction workers are derived using data from the Current Population Survey (CPS), the CES, and the NCS. The hours at work of proprietors are derived from the CPS.

Hours at work data are based on underlying hours data published in the June 3, 2010, Productivity and Costs news release. Therefore, the data reflect the benchmark revisions to the CES and other revisions to hours released on February 5, 2010. Data in this release do not reflect the comprehensive revision to the National Income and Product Accounts (NIPA) released by the Bureau of Economic Analysis of the U.S. Department of Commerce on July 30, 2010.

Intermediate Inputs: In manufacturing, intermediate inputs are energy, materials, and purchased business services, and represent a large share of production costs. Research has shown that substitution among inputs, including intermediate inputs, affects productivity change. Therefore, it is important to account for intermediate inputs in productivity measures at the level of manufacturing. In contrast, the more aggregate productivity measures compare "value-added" output with two classes of inputs, capital and labor. Because of these differences in concepts and methodology, productivity change in manufacturing cannot be directly compared with changes in private business or private nonfarm business.

Data on intermediate inputs are obtained from BEA based on BEA annual input-output tables. Tornqvist indexes of each of these three input classes are derived at the 3-digit NAICS level and then aggregated to total manufacturing. Materials inputs are adjusted to exclude transactions between establishments within the same sector.

Combined Inputs: The five input indexes (capital services, hours, energy, materials, and purchased business services) are combined using Tornqvist aggregation, employing weights that represent each component's share of total costs. Total costs are defined as the value of manufacturing sectoral output.

Sectoral Output: The output concept used for multifactor productivity in manufacturing is “sectoral output”. Sectoral output equals gross output (sales, receipts, and other operating income, plus commodity taxes plus changes in inventories), excluding transactions between establishments within the same sector. In contrast, the output concept used for private business and nonfarm business is “real value added”. Real value added output in private business equals gross domestic product in the economy less general government, government enterprises, private households (including the rental value of owner-occupied real estate), and non-profit institutions. Real value added output excludes intermediate transactions between businesses.

The output index for manufacturing is computed using a chained superlative index (Tornqvist) of three-digit NAICS industry outputs. Industry output is measured as sectoral output, the total value of goods and services leaving the industry. Wherever possible, the indexes of industry output are calculated with a Tornqvist formula. This formula aggregates the growth rates of the various industry outputs between two periods, using their relative shares in industry value of production averaged over the two periods as weights. Industry output measures for manufacturing industries are constructed using data from the economic censuses and annual surveys of the Bureau of the Census, U.S. Department of Commerce, together with information on price changes, primarily from BLS.

Multifactor Productivity: The manufacturing multifactor productivity measures describe the relationship between output in real terms and the inputs involved in its production. Manufacturing multifactor productivity measures exclude intermediate inputs between manufacturing establishments from both output and inputs. Multifactor productivity does not measure the specific contributions of labor, capital, or any other factor of production. Rather, multifactor productivity is designed to measure the joint influences on economic growth of technological change, efficiency improvements, returns to scale, reallocation of resources due to shifts in factor inputs across industries, and other factors. The multifactor productivity indexes are derived by dividing an output index by an index of the combined inputs of labor, capital services, energy, non-energy materials, and purchased business services.

Other information: Comprehensive tables containing more detailed data than that which is published in this press release are available upon request at 202-691-5606 or at <http://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* 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 at <http://www.bls.gov/mfp/mprtech.pdf>. Methods for measuring manufacturing multifactor productivity are discussed in "Measurement of productivity growth in U.S. manufacturing" in the July 1995 issue of the *Monthly Labor Review*. See <http://www.bls.gov/mfp/mprgul95.pdf>.

Table 1. Manufacturing sector: Productivity and related measures, 1988-2008

Annual percent change from previous year

Year	Productivity			Sectoral Output	Inputs					
	Output per hour of all persons	Output per unit of capital	Multifactor Productivity ¹		Hours ²	Capital Services	Energy	Materials	Purchased business services	Combined units of all Inputs ³
1988	2.1	3.4	1.8	5.2	3.0	1.7	4.3	1.4	8.9	3.3
1989	1.0	-0.6	-0.5	1.7	0.6	2.3	-0.5	2.2	5.7	2.2
1990	2.2	-3.0	-0.7	-0.3	-2.5	2.7	1.8	1.6	1.3	0.4
1991	2.6	-4.0	-0.4	-1.7	-4.2	2.4	-0.3	-0.4	-1.0	-1.4
1992	3.8	0.9	-0.7	3.3	-0.5	2.4	-1.0	8.7	7.5	4.0
1993	2.5	1.4	2.6	3.9	1.3	2.5	3.3	0.6	0.8	1.3
1994	3.5	3.2	2.7	5.9	2.3	2.7	3.5	4.0	3.8	3.2
1995	4.5	1.5	1.8	5.2	0.7	3.6	2.6	5.3	4.9	3.4
1996	3.6	-0.6	0.4	3.4	-0.2	4.0	-2.7	8.8	-0.5	3.0
1997	5.5	2.9	2.8	7.4	1.8	4.4	-2.1	8.0	4.1	4.4
1998	5.5	0.5	2.6	5.3	-0.3	4.7	3.3	6.4	-0.3	2.6
1999	4.9	0.4	1.2	4.2	-0.7	3.8	23.3	6.3	1.0	3.0
2000	4.4	0.1	3.6	3.1	-1.3	3.0	9.1	-1.9	-1.3	-0.5
2001	1.9	-6.2	-1.1	-4.8	-6.5	1.6	9.3	-6.3	-1.7	-3.7
2002	7.3	-1.3	3.2	-0.3	-7.1	1.0	-22.6	1.0	-3.2	-3.4
2003	6.3	0.6	3.6	1.1	-4.9	0.4	-10.7	-1.7	-0.6	-2.4
2004	2.3	2.0	3.7	1.7	-0.5	-0.3	-6.3	-0.8	-6.4	-1.9
2005	4.7	2.9	1.4	3.6	-1.1	0.7	10.1	1.5	8.9	2.1
2006	0.8	0.6	2.3	1.5	0.7	0.9	-7.8	-1.7	-1.6	-0.7
2007	4.2	1.2	5.1	2.4	-1.7	1.2	6.0	-7.2	-0.8	-2.5
2008	-0.3	-5.4	-0.7	-4.4	-4.0	1.1	-2.6	-5.3	-5.4	-3.7

¹Output per unit of combined hours, capital services, energy, materials, and purchased business services inputs.²Hours at work of all persons.³Combined units of hours, capital services, energy, materials, and purchased business services, superlative chained index.

Source: Output data are from the Bureau of the Census, U.S. Department of Commerce, and modified by the Bureau of Labor Statistics, U.S. Department of Labor. Compensation and hours data are from the Bureau of Labor Statistics. Capital measures are based on data supplied by the Bureau of Economic Analysis, U.S. Department of Commerce. See also Technical Notes in this release.

Table 2. Manufacturing sector: Productivity and related measures, 1987-2008

Indexes 2005=100

Year	Productivity			Sectoral Output	Inputs					
	Output per hour of all persons	Output per unit of capital	Multifactor Productivity ¹		Hours ²	Capital Services	Energy	Materials	Purchased business services	Combined units of all Inputs ³
1987	51.0	96.6	75.9	62.9	123.2	65.1	84.9	65.1	74.1	82.8
1988	52.1	99.9	77.3	66.1	126.9	66.2	88.6	66.0	80.7	85.6
1989	52.6	99.2	76.9	67.2	127.7	67.8	88.1	67.4	85.3	87.4
1990	53.8	96.2	76.4	67.0	124.5	69.6	89.7	68.6	86.3	87.7
1991	55.2	92.4	76.1	65.8	119.3	71.3	89.4	68.3	85.5	86.5
1992	57.3	93.2	75.6	68.0	118.7	73.0	88.5	74.2	91.9	90.0
1993	58.8	94.5	77.5	70.7	120.3	74.8	91.4	74.7	92.6	91.1
1994	60.8	97.5	79.6	74.8	123.1	76.8	94.6	77.7	96.2	94.0
1995	63.6	99.0	81.1	78.8	123.9	79.6	97.1	81.8	100.9	97.2
1996	65.9	98.4	81.4	81.4	123.6	82.8	94.4	89.0	100.4	100.1
1997	69.5	101.2	83.6	87.4	125.8	86.4	92.4	96.1	104.5	104.6
1998	73.3	101.7	85.8	92.1	125.5	90.5	95.4	102.3	104.1	107.3
1999	77.0	102.1	86.8	95.9	124.7	93.9	117.7	108.7	105.1	110.5
2000	80.4	102.3	89.9	98.9	123.1	96.7	128.4	106.7	103.7	110.0
2001	81.9	95.9	89.0	94.2	115.0	98.3	140.3	100.0	102.0	105.9
2002	87.9	94.6	91.8	93.9	106.9	99.2	108.6	101.0	98.7	102.3
2003	93.4	95.3	95.1	94.9	101.6	99.6	97.0	99.3	98.1	99.8
2004	95.5	97.2	98.6	96.6	101.1	99.3	90.8	98.5	91.8	97.9
2005	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
2006	100.8	100.6	102.3	101.5	100.7	100.9	92.2	98.3	98.4	99.3
2007	105.0	101.9	107.4	104.0	99.0	102.1	97.7	91.3	97.6	96.8
2008	104.7	96.4	106.7	99.4	95.0	103.2	95.2	86.4	92.3	93.2

¹Output per unit of combined hours, capital services, energy, materials, and purchased business services inputs.²Hours at work of all persons.³Combined units of hours, capital services, energy, materials, and purchased business services, superlative chained index.

Source: Output data are from the Bureau of the Census, U.S. Department of Commerce, and modified by the Bureau of Labor Statistics, U.S. Department of Labor. Compensation and hours data are from the Bureau of Labor Statistics. Capital measures are based on data supplied by the Bureau of Economic Analysis, U.S. Department of Commerce. See also Technical Notes in this release.

Table 3. Multifactor productivity measures for manufacturing industries in selected periods, 1987-2008

Compound annual growth rates

	1987-2008	1987-1990	1990-1995	1995-2000	2000-2007	2007-2008
Manufacturing	1.6	0.2	1.2	2.1	2.6	-0.7
<u>Nondurable manufacturing</u>	0.5	-0.5	0.6	0.1	1.6	-1.6
Food, beverage, and tobacco products	0.1	-1.5	1.5	-1.3	1.1	-2.0
Textile mills and textile product mills	0.9	1.2	0.7	1.3	1.4	-5.8
Apparel, leather, and allied products	-0.4	-0.2	2.5	0.2	-2.5	-2.2
Paper products	0.5	-0.3	-0.1	0.8	1.2	-0.3
Printing and related support activities	0.5	0.8	-0.3	-0.4	1.4	1.9
Petroleum and coal products	0.7	0.3	0.5	0.8	0.6	4.4
Chemical products	0.5	-1.0	-0.8	0.2	3.4	-7.1
Plastics and rubber products	0.6	0.6	0.6	1.3	0.6	-3.9
<u>Durable manufacturing</u>	2.4	0.8	1.6	3.5	3.3	0.3
Wood products	-0.1	0.9	-1.2	-0.3	1.1	-4.6
Nonmetallic mineral products	0.3	0.2	1.0	0.2	0.3	-2.1
Primary metals	0.6	1.0	0.2	0.3	0.6	2.1
Fabricated metal products	0.6	-0.1	1.0	0.0	0.7	2.1
Machinery	-0.2	1.0	-1.7	-1.3	1.3	-0.9
Computer and electronic products	10.6	5.6	9.6	15.7	10.6	6.7
Electrical equipment, appliances, and components	-0.5	-2.3	-2.4	-2.1	2.1	5.8
Transportation equipment	0.4	-1.7	-0.3	0.8	2.3	-5.0
Furniture and related products	0.3	-0.8	0.7	0.6	0.7	-2.0
Miscellaneous manufacturing	1.8	2.3	0.2	2.6	2.1	2.4

Note: Multifactor productivity measures by industry do not sum up to aggregate manufacturing measures because industry measures exclude transactions only within the specific industry while the aggregate manufacturing measures also exclude transactions between all manufacturing industries.