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MULTIFACTOR PRODUCTIVITY TRENDS IN MANUFACTURING, 2001

The Bureau of Labor Statistics of the U.S. Department of Labor today reported multifactor productivity data--output per unit of combined inputs—for the manufacturing sector and for durable goods, nondurable goods, and two-digit (SIC) manufacturing industries through the year 2001. 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. Multifactor productivity, therefore, differs from the labor productivity (output per hour) measures that are published quarterly by BLS since it requires information on capital services and other data that are available only on an annual basis.

In 2001, multifactor productivity in manufacturing changed at the following percentage rates:

	2000-01
Manufacturing	-0.8
Durable manufacturing	0.6
Nondurable manufacturing	-2.2

The decline in multifactor productivity in manufacturing was the first in 10 years. The 2001 annual changes are summarized in table A; further detail and historical measures are shown in tables 1 through 3.

This is the last release of manufacturing productivity measures based on the Standard Industrial Classification (SIC) system. SIC-based productivity and related series through 2001 will remain available but will no longer be updated. In the future, historical and new measures will be based on the North American Industrial Classfication System (NAICS).

The data sources and methods used in the preparation of the manufacturing series differ from those used in preparing the private business and private nonfarm business series published elsewhere, and these measures are not directly comparable. See BLS News Release USDL 03-158, Multifactor Productivity Trends, 2001 and see page 8 and the Summary of Methods for further information on data sources and methods.

The multifactor productivity measures for manufacturing differ in several ways from those for private business and private nonfarm business in their treatment of labor input, output, and classes of factor inputs. First, the manufacturing measure of labor input is a direct aggregate of hours. This is in contrast to the major sector measures for which estimates of the effects of changing labor composition have been developed.

Next, the output concept used for multifactor productivity in manufacturing is “sectoral output.” Sectoral output is similar to gross output, but excludes shipments from one establishment to another within the same manufacturing industry or sector. In contrast, the output concept used for private business and nonfarm business is “gross product originating”. Gross product originating in private business equals gross domestic product in the economy less government, private households, and non-profit institutions. Gross product originating excludes intermediate transactions between businesses.

The resulting manufacturing multifactor productivity measure compares what is produced in the manufacturing sector for use outside of manufacturing with the inputs used in the manufacturing process obtained from outside of manufacturing. The comparison excludes flows of intermediate inputs between manufacturing establishments from measures of both output and inputs. However, the comparison does include capital service inputs and capital goods produced, even when these goods are produced and consumed in manufacturing.

Finally, multifactor productivity in manufacturing compares "sectoral output" to three classes of inputs: 1) hours at work of labor employed within manufacturing; 2) capital services employed by manufacturing establishments; and 3) purchases of energy, materials, and business services from outside of manufacturing (intermediates).

In manufacturing, intermediates are the largest input in terms of costs. Furthermore, research has shown that substitution among inputs, including intermediates, affects productivity change. Therefore, it is important to include intermediates 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 methods, productivity change in manufacturing cannot be directly compared with changes in private business or private nonfarm business.

Manufacturing productivity in 2001 and historical trends

Multifactor productivity in manufacturing declined 0.8 percent in 2001. The decline was the result of a 4.5 percent decline in sectoral output and a 3.7 percent decrease in combined inputs. Capital services continued to grow in 2001, but at a much more modest rate, posting a 1.5 percent advance. The decline in hours accelerated in 2001, falling 5.6 percent.

Multifactor productivity grew 1.2 percent annually from 1949 (when the manufacturing series started) to 2001. Sectoral output increased at a 3.1 percent annual rate, and combined inputs rose 1.9 percent per year (table A). Unlike the private business and private nonfarm business sectors, the productivity slowdown in manufacturing was confined to the 1973-79 period. Multifactor productivity, which had been growing 1.5 percent annually prior to 1973, fell 0.6 percent per year between 1973 and 1979. Output growth slowed to 2.5 percent, while combined inputs grew 3.1 percent over the 1973-79 time period.

Between 1979 and 1990, multifactor productivity growth in manufacturing rebounded sharply to 1.1 percent per year. Sectoral output growth continued to slow, and, in this period, all input growth rates fell. Hours declined, and the growth rates for both capital services and materials fell sharply. As a result, combined inputs grew only 0.8 percent annually. The rebound in productivity was associated mainly with slower growth in combined inputs.

From 1990 to 1995, multifactor productivity growth accelerated further, almost matching the pre-1973 growth rate. Multifactor productivity advanced 1.2 percent per year during this period. Output growth increased to 3.1 percent per year, while combined inputs rose 1.9 percent annually. The decline in hours slowed to 0.1 percent, and energy, materials, and purchased business services all grew much more rapidly than in the 1979-90 period.

From 1995 to 2000, multifactor productivity advanced still faster at 2.3 percent per year. Sectoral output growth increased to 3.9 percent per year, while combined inputs continued to advance at about the same rate as in the early 1990s. Hours declined slightly during the 1995-2000 period, but the increase in the growth rate of capital services, to 3.8 percent, was notable. Each intermediate input--energy, non-energy materials, and purchased business services--grew less rapidly in the 1995-2000 period than in 1990-95.

Among detailed manufacturing industries, only durable goods manufacturers experienced multifactor productivity gains in 2001 (table 3), while nondurable goods manufacturers experienced declines. Little difference existed prior to 1979, but the productivity gap between the two sectors widened thereafter, primarily due to the rapid productivity growth in industrial and commercial machinery and in electronic and other electrical equipment. Eleven of the 18 detailed industries experienced multifactor productivity declines in 2001.

Over the 1949-2001 period, multifactor productivity advanced most rapidly in electronic and other electrical equipment, textile mill products, and industrial machinery. The printing and publishing industry was the only industry to experience a multifactor productivity decline over the entire period. In the more recent period of 1995-2000, multifactor productivity grew very rapidly in the information processing equipment industries. It rose 8.2 percent per year in electronic and other electrical equipment and 7.7 percent per year in industrial machinery, the two industries where most information processing equipment is produced.

Table A. Productivity and related data in manufacturing, percent changes, 1949-2001

(percent per year)

	1949-01	1949-73	1973-79	1979-90	1990-95	1995-00	2000-01
Productivity							
Multifactor productivity[1]	1.2	1.5	-0.6	1.1	1.2	2.3	-0.8
Output per hour of all persons	2.7	2.5	2.2	2.6	3.3	4.1	1.2
Output per unit of capital services	-0.5	0.0	-2.1	-0.8	0.6	0.1	-5.8
Sectoral output	3.1	4.0	2.5	2.0	3.1	3.9	-4.5
Inputs							
Hours[2]	0.4	1.4	0.3	-0.7	-0.1	-0.2	-5.6
Capital services	3.6	4.0	4.7	2.8	2.5	3.8	1.5
Energy	2.5	4.9	0.8	0.3	1.9	0.4	-5.2
Non-energy materials	2.7	2.4	6.2	1.5	3.8	2.8	-1.3
Purchased business services	3.6	5.1	5.4	1.9	3.5	1.2	-8.3
Combined inputs[3]	1.9	2.4	3.1	0.8	1.9	1.5	-3.7

1. Output per unit of combined hours, capital, energy, materials, and purchased business services inputs.
2. Hours at work of all persons.
3. The growth rate of each input is weighted by its share of nominal costs.

Revisions

The multifactor productivity data for the 1997-2000 period reflect a number of revisions to source data. For example, updated input-output tables and revised BEA chain-type price indexes have been incorporated. In addition, methods underlying energy and non-energy materials data have been improved, which affect estimates for many years in the series.

Comprehensive tables containing additional data beyond the scope of this press release are available upon request at 202-691-5606 or at http://www.bls.gov/web/prod3.supp.toc.htm.

Summary of Methods for the Manufacturing sector and manufacturing industries

This note describes the major data sources and the procedures used in deriving BLS multifactor productivity indexes. More detailed information on methods, limitations, and data sources is provided in BLS Bulletin 2178 (September 1983), "Trends in Multifactor Productivity, 1948-81." 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. Additional data not contained in the release can be obtained in print at 202-691-5606 or at http://www.bls.gov/mfp/home.htm.

The manufacturing 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 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 input of labor, capital services, energy, non-energy materials, and business service inputs. The output indexes are computed as chained superlative indexes (Tornqvist indexes) of components of output.

Capital input measures the services derived from the stock of physical assets and software. The assets included are fixed business equipment, structures, inventories, and land. Among equipment, BLS provides additional detail for information processing equipment and software (IPES). IPES is composed of four broad classes of assets: computers and related equipment, software, communications equipment, and other IPES equipment. Computers and related equipment includes mainframe computers, personal computers, printers, video displays, and other related equipment. Software is comprised of pre-packaged, custom, and own-account software. Communications equipment is not further differentiated. Other IPES includes scientific and related equipment, photocopying and related equipment, and office and accounting equipment. Structures include nonresidential structures and residential capital that is rented out by profit-making firms or persons. Financial assets are excluded. The aggregate capital measures are obtained by Tornqvist aggregation of the capital stocks for each asset type within each of 53 industries 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 are obtained from BEA. Current-dollar gross product originating (GPO) data, obtained from BEA, are used in estimating capital rental prices.

Hours paid of employees are obtained from the Current Employment Statistics program. The hours at work of proprietors, unpaid family workers, and farm employees are derived from the Current Population Survey. The hours of employees are converted to an at-work basis by using the Hours at Work survey. Labor input in manufacturing is measured as the sum of hours at work of all persons. The construction of hours at work follows the methods used in the private business sector described in USDL 03-158 Multifactor Productivity Trends, 2001, except that hours in manufacturing are directly aggregated and do not include the effects of changing labor composition.

The labor and capital components of the input indexes are combined with Tornqvist weights that represent each component's share of total costs. Total costs are defined as the value of output (gross product originating) less a portion of indirect business taxes. Most indirect taxes, such as excise taxes, are excluded from costs; however, property and motor vehicle taxes remain in total costs. The index uses changing weights: The share in each year is averaged with the preceding year's share.

The output index for total manufacturing is computed using a chained superlative index (Tornqvist) of 4-digit SIC industry outputs. Industry outputs are developed by BLS from data obtained from the Annual Survey of Manufactures (ASM) and the Census of Manufactures (CM) from the Bureau of the Census, U.S. Department of Commerce, together with Producer Price Indexes from BLS and price data from BEA.

Energy input is constructed using costs and quantity data from the ASM, the CM, and the Manufacturing Energy Consumption Survey of the Energy Information Administration, U.S. Department of Energy, together with BLS Producer Price Indexes. The series on non-energy materials input also relies on ASM and CM data. Indexes of purchased business services are developed by BLS using input-output tables to estimate the proportion of costs attributed to nine types of services. Tornqvist indexes of each of these three input classes are developed at the 2-digit SIC level and then aggregated to total manufacturing. As with the sectoral output measures, materials and energy inputs are adjusted to exclude transactions between establishments within the same sector.

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. The index uses changing weights: The share in each year is averaged with the preceding year's share.

Table 1. Manufacturing sector: Productivity and related measures, 1949-2001

Indexes 1996=100

Year	Productivity			Sectoral Output[3]	Inputs					
	Output per hour of all persons	Output per unit of capital	Multifactor Productivity[2]		Hours[4]	Capital Services[1]	Energy	Materials	Purchased business services	Combined units of all inputs[5]
1949	29.7	121.5	59.7	22.7	76.4	18.7	27.0	26.1	15.2	37.9
1950	30.1	128.9	62.8	24.9	82.5	19.3	28.3	25.8	17.7	39.6
1955	34.3	130.7	66.8	31.3	91.2	24.0	39.4	32.0	22.8	46.9
1960	37.0	119.7	67.9	32.8	88.8	27.4	47.9	33.0	25.3	48.3
1965	42.9	131.5	77.2	42.2	98.3	32.1	62.5	35.6	33.3	54.7
1966	43.4	131.7	77.5	45.5	104.8	34.5	67.0	37.9	37.6	58.6
1967	45.0	125.4	77.1	46.9	104.1	37.4	72.3	39.7	42.6	60.8
1968	46.6	125.8	79.4	49.2	105.6	39.1	76.8	40.2	42.5	62.0
1969	47.4	122.8	79.9	50.6	106.9	41.2	79.5	40.2	45.1	63.4
1970	48.0	112.2	78.8	48.2	100.6	43.0	79.7	38.7	43.6	61.2
1971	51.2	112.1	81.0	49.6	96.9	44.3	80.8	41.2	43.1	61.2
1972	53.3	118.4	84.0	54.1	101.4	45.7	83.0	44.0	46.0	64.3
1973	54.3	120.5	85.4	57.9	106.6	48.0	85.6	46.0	50.1	67.7
1974	54.1	110.9	80.8	56.4	104.1	50.8	87.9	50.5	53.7	69.8
1975	56.8	99.9	78.5	53.3	93.9	53.4	81.8	53.1	51.9	67.9
1976	59.2	104.9	81.3	58.2	98.3	55.5	84.9	57.5	53.2	71.6
1977	61.6	108.8	82.4	63.1	102.4	58.0	85.0	64.9	57.6	76.6
1978	62.2	109.8	83.1	66.4	106.7	60.5	86.1	67.7	60.8	79.9
1979	61.8	106.3	82.5	67.1	108.7	63.2	89.7	65.9	68.5	81.4
1980	62.0	97.2	81.2	64.3	103.7	66.1	86.1	63.9	65.8	79.2
1981	62.7	93.3	81.7	64.6	103.0	69.2	85.8	63.5	63.5	79.0
1982	66.0	87.2	83.0	62.0	94.0	71.2	77.6	61.9	55.9	74.7
1983	68.0	90.2	85.1	64.8	95.4	71.9	78.5	62.0	62.7	76.2
1984	70.3	96.6	87.7	71.5	101.6	74.0	83.5	68.2	66.6	81.5
1985	72.9	96.1	89.2	73.5	100.8	76.5	80.7	72.2	62.1	82.4
1986	76.1	96.3	90.7	75.6	99.4	78.5	81.4	74.2	65.4	83.4
1987	78.3	97.6	93.6	78.3	100.0	80.2	86.5	70.9	70.8	83.7
1988	79.9	100.7	95.3	82.2	102.8	81.6	89.9	71.9	77.4	86.2
1989	80.0	99.2	93.5	82.6	103.3	83.2	90.2	75.0	82.6	88.3
1990	82.2	97.5	93.3	83.2	101.1	85.3	93.1	77.5	84.7	89.1
1991	84.1	93.6	92.4	81.5	96.9	87.1	93.2	78.5	84.6	88.3
1992	88.6	95.9	94.0	85.5	96.5	89.1	93.1	83.5	92.0	90.9
1993	90.2	96.9	95.1	88.3	97.8	91.1	96.6	86.5	92.9	92.8
1994	93.0	99.7	97.3	92.9	99.9	93.2	99.9	90.3	96.0	95.5
1995	96.5	100.6	99.2	96.9	100.4	96.4	102.3	93.1	100.4	97.7
1996	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1997	103.8	101.4	103.1	105.6	101.7	104.1	97.5	101.9	103.9	102.4
1998	108.9	101.7	105.7	110.5	101.5	108.7	100.6	107.5	103.1	104.6
1999	114.0	101.7	108.7	114.7	100.7	112.8	102.9	107.9	105.4	105.5
2000	118.3	101.0	111.3	117.4	99.2	116.2	104.3	106.9	106.5	105.5
2001	119.7	95.1	110.3	112.1	93.6	117.9	98.9	105.5	97.7	101.6

See footnotes following table 2.

Source: Bureau of Labor Statistics

Table 2. Manufacturing sector: Productivity and related measures, 1950-2001

Percent Change

Year	Productivity			Sectoral Output[3]	Inputs					
	Output per hour of all persons	Output per unit of capital	Multifactor Productivity[2]		Hours[4]	Capital Services[1]	Energy	Materials	Purchased business services	Combined units of all inputs[5]
1950	1.5	6.1	5.1	9.7	8.1	3.4	4.8	-1.3	16.8	4.4
1955	4.0	5.7	2.8	9.7	5.5	3.8	14.0	8.7	11.3	6.7
1960	2.2	-0.7	0.3	1.7	-0.4	2.4	1.8	4.1	1.7	1.5
1965	2.4	3.0	2.7	8.4	5.9	5.2	5.7	4.5	7.0	5.5
1966	1.1	0.2	0.4	7.6	6.5	7.4	7.4	6.4	12.9	7.2
1967	3.7	-4.8	-0.6	3.1	-0.6	8.2	7.8	4.6	13.4	3.7
1968	3.5	0.3	3.0	5.0	1.4	4.8	6.2	1.3	-0.2	2.0
1969	1.7	-2.3	0.7	2.9	1.2	5.3	3.5	0.0	6.1	2.2
1970	1.2	-8.6	-1.4	-4.8	-5.9	4.2	0.3	-3.7	-3.4	-3.4
1971	6.7	-0.1	2.8	2.9	-3.6	3.0	1.5	6.5	-1.1	0.0
1972	4.2	5.6	3.7	8.9	4.6	3.2	2.7	6.8	6.7	5.0
1973	1.9	1.8	1.7	7.1	5.1	5.2	3.1	4.6	8.9	5.3
1974	-0.3	-7.9	-5.5	-2.6	-2.3	5.8	2.7	9.6	7.2	3.1
1975	4.9	-10.0	-2.8	-5.4	-9.9	5.1	-7.0	5.3	-3.3	-2.7
1976	4.2	5.0	3.5	9.1	4.8	3.9	3.8	8.3	2.4	5.4
1977	4.1	3.7	1.4	8.4	4.1	4.5	0.1	12.7	8.3	6.9
1978	1.0	0.9	0.9	5.2	4.2	4.3	1.2	4.4	5.6	4.3
1979	-0.7	-3.2	-0.8	1.2	1.9	4.5	4.2	-2.7	12.7	2.0
1980	0.4	-8.5	-1.5	-4.2	-4.6	4.7	-4.0	-3.0	-4.0	-2.7
1981	1.1	-4.1	0.6	0.4	-0.7	4.6	-0.4	-0.7	-3.4	-0.2
1982	5.2	-6.6	1.6	-3.9	-8.7	2.9	-9.6	-2.5	-12.1	-5.4
1983	3.0	3.4	2.5	4.5	1.4	1.0	1.1	0.3	12.1	1.9
1984	3.5	7.1	3.1	10.2	6.5	2.9	6.4	9.9	6.3	6.9
1985	3.7	-0.5	1.7	2.9	-0.8	3.4	-3.3	5.9	-6.8	1.2
1986	4.3	0.2	1.7	2.8	-1.4	2.6	0.8	2.7	5.4	1.2
1987	3.0	1.4	3.2	3.6	0.6	2.2	6.2	-4.4	8.3	0.4
1988	2.0	3.1	1.8	4.9	2.8	1.7	4.0	1.4	9.3	3.0
1989	0.1	-1.4	-1.9	0.5	0.5	2.0	0.2	4.4	6.7	2.5
1990	2.8	-1.7	-0.2	0.7	-2.1	2.5	3.2	3.3	2.5	0.9
1991	2.3	-4.0	-1.0	-2.0	-4.2	2.2	0.2	1.4	-0.1	-1.0
1992	5.3	2.5	1.8	4.8	-0.4	2.2	-0.1	6.4	8.7	3.0
1993	1.8	1.0	1.1	3.3	1.4	2.2	3.7	3.5	1.0	2.1
1994	3.0	2.9	2.3	5.3	2.2	2.3	3.4	4.4	3.4	3.0
1995	3.9	0.9	2.0	4.3	0.4	3.4	2.4	3.2	4.6	2.3
1996	3.6	-0.6	0.8	3.2	-0.4	3.8	-2.2	7.4	-0.4	2.3
1997	3.8	1.4	3.1	5.6	1.7	4.1	-2.5	1.9	3.9	2.4
1998	4.9	0.3	2.6	4.7	-0.2	4.4	3.3	5.4	-0.8	2.1
1999	4.6	0.0	2.8	3.8	-0.8	3.8	2.2	0.4	2.2	0.9
2000	3.8	-0.7	2.3	2.3	-1.5	3.0	1.3	-1.0	1.1	-0.1
2001	1.2	-5.8	-0.8	-4.5	-5.6	1.5	-5.2	-1.3	-8.3	-3.7

See footnotes following table 2.

Source: Bureau of Labor Statistics

Footnotes, Tables 1-2

Source: Output data are from the Bureau of the Census, U.S. Department of Commerce, and modified by the Bureau of Labor Statistics (BLS), U.S. Department of Labor. Compensation and hours data are from BLS. Capital measures are based on data supplied by BEA and the U.S. Department of Agriculture. See also Summary of Methods in this release.

(1) A measure of the flow of capital services used in the sector.

(2) Sectoral output per combined units of capital, hours, energy, non-energy materials, and purchased business services.

(3) Manufacturing gross output excluding transactions between manufacturing establishments, superlative chained index.

(4) Hours at work of all persons.

(5) Combined units of capital services, hours, energy, non-energy materials, and purchased business services, superlative chained index.

Table 3. Manufacturing industries: Multifactor productivity trends, 1949-2001

Average annual growth rates

Industry	1949-01	1949-73	1973-79	1979-90	1990-95	1995-00	2000-01
Manufacturing	1.2	1.5	-0.6	1.1	1.2	2.3	-0.8
Nondurable manufacturing	0.6	1.3	-0.5	0.3	0.3	0.0	-2.2
Food and kindred products	0.3	0.7	0.1	0.4	0.7	-0.8	-3.1
Tobacco manufactures	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Textile mill products	2.3	2.3	3.3	2.1	1.6	1.8	2.0
Apparel & related products	1.0	0.7	1.9	0.6	0.8	2.1	2.5
Paper and allied products	0.6	1.6	-1.2	0.0	0.2	0.4	-1.9
Printing and publishing	-0.3	0.5	-0.7	-0.9	-1.2	-0.6	-5.0
Chemicals & allied products	0.9	2.5	-2.5	0.7	-0.2	-0.3	-1.1
Petroleum refining	0.4	0.8	-0.6	-0.1	0.3	0.5	0.3
Rubber & misc. plastic products	0.7	1.0	-1.9	1.4	1.2	1.5	-1.0
Leather & leather products	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Durable manufacturing	1.6	1.5	-0.6	1.8	2.0	4.2	0.6
Lumber and wood products	1.0	1.7	0.4	2.5	-1.7	-1.3	-1.2
Furniture and fixtures	0.6	0.6	0.4	0.7	0.9	0.7	-0.4
Stone, clay, glass & concrete products	0.6	1.1	-1.2	1.4	0.7	0.0	-5.2
Primary metals industries	0.1	0.4	-2.3	0.3	0.8	0.0	1.4
Fabricated metals products	0.3	0.5	-1.0	0.5	1.0	0.2	-3.1
Industrial & commercial machinery	2.1	0.7	0.2	3.2	3.1	7.7	1.4
Electronic & other electrical equipment	3.1	2.1	0.9	3.0	5.9	8.2	4.4
Transportation equipment	0.8	1.5	-0.5	0.2	0.5	1.3	1.0
Instruments	1.5	1.8	1.2	1.4	0.0	2.6	-0.9
Miscellaneous manufacturing	1.0	1.6	-0.7	1.1	-0.2	1.8	-3.0

N.A. Multifactor productivity measures for tobacco and leather manufacturers are not published because of the small size of the industry and data limitations. These industries are included in the aggregate measures for total and nondurable manufacturing.

Note: Multifactor productivity measures by industry are not directly comparable to measures for aggregate manufacturing because industry measures exclude transactions only within the specific industry while the aggregate manufacturing measures also exclude transactions between all manufacturing industries.