

# New Service Industry Productivity Measures



U.S. Department of Labor  
U.S. Bureau of Labor Statistics  
February 2006

Report 993

The Bureau of Labor Statistics (BLS) has developed labor productivity measures and related series for two new service industries: architectural services (NAICS 54131) and engineering services (NAICS 54133). The introduction of these measures reflects ongoing BLS efforts to expand data collection and productivity measurement in the service sector. This report discusses productivity trends from 1987 through 2003.

Labor productivity rose in both the architectural services industry and the engineering services industry between 1987 and 2003. Output per hour increased at an average annual rate of 1.4 percent in architectural services and 0.6 percent in engineering services over the period. (See tables 1 and 2.) Productivity growth in the architectural services industry was strongest during the first half of the 1990s, while, in the engineering services industry, productivity declined over the same period, but recovered in the latter half of the decade. From 2000 to 2003, productivity increased in architectural services, but declined in engineering services.

In the architectural services industry, the average annual productivity gain of 1.4 percent per year from 1987 to 2003 reflected average output growth of 3.6 percent per year and average growth in hours of 2.2 percent per year. Productivity growth in architectural services was especially strong during the early to mid-1990s, rising an average 2.7 percent per year from 1990 to 1995, as output rose 2.1 percent and hours declined 0.6 percent. In the second half of the decade, output and hours both advanced a brisk 6.9 percent per year, leaving productivity unchanged. From 2000 to 2003 productivity rose 1.5 percent per year, on average, as output growth slowed to 0.9 percent per year and hours declined 0.6 percent. Unit labor costs rose at an average annual rate of 1.9 percent per year from 1987 to 2003 in the architectural services industry.

In the engineering services industry, the average annual productivity growth of 0.6 percent between 1987 and 2003 reflected an output growth of 2.4 percent per year and a growth in hours of 1.8 percent per year. Productivity in engineering services grew most rapidly at the end of the 1980s and during the second half of the 1990s. From 1995 to 2000, output per hour grew 1.8 percent per year as output rose 6.2 percent per year and hours increased 4.3 percent.

Productivity declined during the first half of the 1990s, with output falling an average 0.6 percent per year and hours rising 0.4 percent per year. Productivity also declined from 2000 to 2003, as output fell an average 2.5 percent per year and hours declined 1.1 percent per year. Unit labor costs rose 3.8 percent per year in engineering services from 1987 to 2003.

Measures of labor productivity describe the relationship between output and the labor time involved in its production and are constructed by dividing an index of real output by an index of labor hours. The output indexes for the architectural services industry and the engineering services industry are based on current-dollar revenues from the economic censuses and annual surveys of the Census Bureau of the U.S. Department of Commerce. Annual receipts are adjusted for price change by “deflating” those receipts with appropriate price indexes. In recent years, BLS has extended coverage of its producer price indexes (PPIs) to a number of new service-sector industries, allowing for the construction of improved measures of output and productivity. For the two industries covered here, annual PPIs are available to deflate receipts beginning in 1997. To provide a longer productivity time series for analysis, industry output prices were extrapolated back to 1987, using changes in alternative, related series. For the architectural services industry, total revenues for the years prior to 1997 were deflated with an implicit price deflator for the value of construction put in place, a measure maintained by the Census Bureau. For the engineering services industry, the price index used to deflate industry revenues was extrapolated back to 1987 with annual changes in the average hourly wages in that industry. Estimating historical industry price trends with these alternative price series is useful for extending the productivity measures and establishing a baseline for productivity analysis. However, the alternative price indexes do not explicitly measure changes in the prices of the final industry outputs, nor do they include price adjustments or other improvements reflected in the PPIs. Therefore, the pre-1997 productivity series should be interpreted with caution.

Comparing productivity changes in the pre-1997 and post-1997 periods reveals similar average productivity growth for

the two industries from 1987 to 1997, but different productivity trends after 1997. From 1987 to 1997, productivity rose at an average annual rate of 1.0 percent in both industries, reflecting growth in both output and hours for each industry over the period. From 1997 to 2003, output

per hour in the architectural services industry grew at an even faster rate of 1.9 percent per year. In the engineering services industry, however, productivity declined 0.2 percent per year, on average, reflecting continued declines in output and productivity after 2000.

**Table 1. Average annual percent change in output per hour, output, hours, and unit labor costs, selected periods, 1987–2003**

Year	Architectural services				Engineering services			
	Output per hour	Output	Hours	Unit labor cost	Output per hour	Output	Hours	Unit labor cost
1987–2003	1.4	3.6	2.2	1.9	0.6	2.4	1.8	3.8
1987–1997	1.0	3.0	1.9	2.4	1.0	2.8	1.8	3.8
1997–2003	1.9	4.8	2.8	1.2	–.2	1.6	1.8	3.7
1990–1995	2.7	2.1	–.6	–0.9	–1.0	–.6	0.4	4.9
1995–2000	.0	6.9	6.9	4.9	1.8	6.2	4.3	2.1
2000–2003	1.5	.9	–.6	–.5	–1.5	–2.5	–1.1	4.1

**Table 2. Annual indexes of output per hour, output, hours, and unit labor costs, 1987–2003**

Year	Architectural services				Engineering services			
	Output per hour	Output	Hours	Unit labor cost	Output per hour	Output	Hours	Unit labor cost
1987	90.2	74.8	82.9	79.1	90.4	75.8	83.8	68.7
1988	90.8	76.2	83.9	83.7	93.5	79.0	84.6	71.4
1989	94.4	82.0	86.9	85.0	99.3	88.1	88.8	71.9
1990	94.0	83.3	88.6	90.2	99.4	90.7	91.2	78.5
1991	94.2	77.7	82.6	89.5	99.1	86.3	87.0	84.9
1992	100.9	79.3	78.6	86.9	97.3	84.6	86.9	91.1
1993	103.5	81.7	78.9	86.9	94.8	84.0	88.6	93.8
1994	101.5	85.9	84.7	88.4	93.9	84.8	90.4	95.6
1995	107.2	92.2	86.0	86.0	94.7	88.1	93.0	99.6
1996	110.4	101.0	91.5	87.1	98.3	94.3	95.9	97.7
1997	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1998	110.9	116.7	105.2	96.0	102.1	105.2	103.0	103.1
1999	106.5	119.4	112.1	105.2	101.1	109.1	107.9	107.8
2000	107.0	128.7	120.3	109.4	103.6	118.9	114.7	110.3
2001	110.7	135.3	122.3	109.5	100.6	117.1	116.3	116.8
2002	107.3	125.8	117.3	114.4	99.9	111.9	112.0	120.7
2003	111.9	132.4	118.3	107.7	99.0	110.1	111.1	124.4

# Technical Note

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 Törnqvist 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.

The industry labor input measures represent the hours paid of all workers in the industry. The primary source of data on employment and hours is the BLS Current Employment Statistics (CES) survey, which provides monthly survey data on the number of jobs held by wage and salary workers in nonfarm establishments. The CES survey also provides data on the average weekly hours of production and nonsupervisory workers in these establishments. The Office of Productivity and Technology estimates the average weekly hours of supervisory and nonproduction workers by industry, using information from the Current Population Survey (CPS) together with the CES data. For the industries covered in this study, estimates of the hours of self-employed workers and unpaid family workers from the CPS are added to estimates of the hours of supervisory and nonsupervisory employees. The hours for different types of workers are treated as homogeneous and are directly aggregated.

The unit labor cost series describe the cost of labor input required to produce one unit of output. The indexes of unit labor costs for each industry are computed by dividing an index of industry labor compensation by the index of industry output. Compensation, defined as payroll plus supplemental payments, is a measure of the cost to the employer of securing the services of labor. Payroll includes salaries, wages, commissions, dismissal pay, bonuses, vacation and sick leave pay, and compensation in kind. Supplemental payments include legally required expenditures and payments for voluntary programs. The legally required portion consists primarily of Federal old age and survivors' insurance, unemployment compensation, and workers' compensation. Payments for voluntary programs include all

programs not specifically required by legislation, such as the employer portion of private health insurance and pension plans.

Although the labor productivity measures relate output to hours of employees or all persons engaged in an industry, they do not measure the specific contribution of labor, capital, or any other factor of production. Rather, they reflect the joint effects of many influences, including changes in technology; capital investment; level of output; utilization of capacity, energy, and materials; the organization of production; managerial skill; and the characteristics and effort of the workforce.

Year-to-year movements in productivity measures for some industries might be erratic, particularly in the smaller industries. The annual changes in an industry's output and use of labor may reflect cyclical changes in the economy rather than long-term trends. Also, annual productivity indexes are based on sample data, which are likely to differ from data generated by a census of establishments in the industry. As a result, long-term trends tend to be more reliable indicators of the performance of an industry than are the year-to-year changes.

Published productivity and unit labor cost indexes for selected NAICS industries, including the industries covered in this report, can be accessed electronically by visiting the Labor Productivity and Costs Web site: <https://www.bls.gov/lpc/home.htm>. Measures for additional detailed manufacturing and trade industries are available upon request by calling the Division of Industry Productivity Studies (202-691-5618) or by sending a request by e-mail: [dipsweb@bls.gov](mailto:dipsweb@bls.gov). Data on industry employment, annual hours, the net value of production, and the implicit price deflator for output also are available upon request.

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