

# New Transportation and Service Productivity Measures



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The Bureau of Labor Statistics (BLS) has developed labor productivity measures and related series for two transportation industries—local trucking without storage (SIC 4212) and public warehousing and storage (SIC 422)—and four service industries—advertising agencies (SIC 7311), prepackaged software (SIC 7372), truck rental and leasing (SIC 7513), and passenger car rental (SIC 7514). The introduction of these measures reflects the ongoing BLS effort to expand productivity measurement in the service-producing sector. This report discusses developments in the new measures over the period 1990-2000.<sup>1</sup>

Between 1990 and 2000, labor productivity increased in all six industries. The gains in productivity ranged from a high of 14.2 percent per year, on average, in the prepackaged software industry to a modest increase of 1.2 percent per year in public warehousing and storage. All of the industries recorded gains in both output and hours over the decade.

In 4 of the 6 industries, productivity growth was slower between 1995 and 2000 than it had been between 1990 and 1995. Productivity accelerated in the later period only in advertising agencies and in the passenger car rental industry. The largest slowdown occurred in the prepackaged software industry, where the rate of growth in productivity declined from 20.1 percent per year in 1990-95 to 8.6 percent per year in 1995-2000.

## Industry Developments

The local trucking without storage industry (SIC 4212) recorded an average gain of 5.2 percent per year in labor productivity (output per hour) over the 1990-2000 period. This increase reflected average annual gains of 6.9 percent in output and 1.7 percent in hours. The output gain was spurred particularly by the growth of the solid waste collection segment of the industry, for which revenue in current dollars more than quintupled over the period. Local trucking experienced a slowdown in labor productivity growth after 1995. After posting increases averaging 6.2 percent per year from 1990 to 1995, local trucking saw its productivity growth rate fall off to 4.2 percent during the 1995-2000 period. Output growth slowed only slightly from 7.1 percent per year in the

earlier period to 6.7 percent in the later period. But the rate of growth in hours rose from 0.9 percent to 2.4 percent per year, on average.

In the public warehousing industry (SIC 422) over the 1990-2000 period, output gains averaging 7.2 percent per year outpaced the 5.9-percent average increase in hours to yield a 1.2-percent average gain in labor productivity. Rapid growth in revenue for self-storage units, as well as for the refrigerated warehousing sector, contributed greatly to the vigorous growth in industry output. A substantial falloff in productivity growth occurred in this industry after 1995. From 1990 to 1995, productivity gains averaged 4.5 percent per year, with output increasing 8.8 percent per year and hours gaining 4.0 percent per year, on average. From 1995 to 2000, however, productivity declined at a 2.0-percent average annual rate. In the later period, the growth rate of output slackened to 5.8 percent per year, while growth in hours accelerated to 7.9 percent per year.

Output per hour for the advertising agency industry (SIC 7311) increased at an average annual rate of 1.5 percent between 1990 and 2000, reflecting an average annual increase in output of 2.6 percent and a 1.0-percent increase in hours. This modest growth masked different trends in the second half of the decade compared with the first half. From 1990 to 1995, productivity in the industry declined by 0.6 percent per year on average, with output decreasing at 2.1 percent annually and hours falling 1.4 percent. From 1995 to 2000 productivity rebounded, increasing at a rate of 3.8 percent per year. During this period, output increased at a robust rate of 7.4 percent per year, with hours increasing at 3.5 percent.

Output per hour in the prepackaged software industry (SIC 7372) rose rapidly during the 1990-2000 period, increasing at an average annual rate of 14.2 percent. This increase reflected an average annual increase of 26.5 percent in output and a 10.7-percent increase in hours of all persons. The rapid growth in the prepackaged software industry can be attributed to the increased use of computers and the rising demand for reliable, user-friendly software. After posting increases averaging 20.1 percent per year from 1990 to 1995, the industry saw productivity growth fall off to 8.6 percent per year during the 1995-2000 period. Output growth fell from 31.8 percent per year in the earlier period to 21.4 percent per year in the later period. The rate of growth in hours, meanwhile, increased from 9.7 percent per year in the 1990-95

<sup>1</sup> Data for the six industries are available back to 1987.

period to 11.8 percent per year in the 1995-2000 period.

Output per hour in the truck rental and leasing industry (SIC 7513) rose 2.5 percent per year from 1990 to 2000. This increase reflected average annual growth of 2.9 percent in output and a 0.4-percent increase in hours. The truck rental and leasing industry experienced a falloff in labor productivity after 1995. Output per hour grew at an average annual rate of 3.1 percent from 1990 to 1995, but growth slowed to 1.9 percent per year from 1995 to 2000. Output grew more rapidly in the later period, increasing 4.8 percent per year versus 1.1 percent per year during the 1990-1995 period. However, hours also accelerated, increasing 2.8 percent per year from 1995 to 2000, on average, compared with a decline

of 2.0 percent per year over the 1990-95 period.

The passenger car rental industry (SIC 7514) recorded a modest gain in labor productivity of 1.7 percent per year over the 1990-2000 period. This increase reflected average annual gains of 5.3 percent in output and 3.6 percent in hours. The productivity gain was consistent throughout the decade, although both output and hours growth accelerated after 1995. During the 1990-95 period, the industry posted a labor productivity increase of 1.5 percent per year, as output increased 3.6 percent and hours increased 2.1 percent annually. In the 1995-2000 period, productivity grew 1.9 percent per year as output grew 7.1 percent and hours increased 5.1 percent.

**Table 1. Average annual percent change in output per hour and related series for selected transportation and service industries, selected periods, 1990-2000**

SIC code	Industry	1990-2000			1990-1995			1995-2000		
		Output per hour	Output	Hours <sup>1</sup>	Output per hour	Output	Hours <sup>1</sup>	Output per hour	Output	Hours <sup>1</sup>
4212	Local trucking, without storage	5.2	6.9	1.7	6.2	7.1	0.9	4.2	6.7	2.4
422	Public warehousing and storage	1.2	7.2	5.9	4.5	8.8	4.0	-2.0	5.8	7.9
7311	Advertising agencies	1.5	2.6	1.0	-.6	-2.1	-1.4	3.8	7.4	3.5
7372	Prepackaged software	14.2	26.5	10.7	20.1	31.8	9.7	8.6	21.4	11.8
7513	Truck rental and leasing	2.5	2.9	.4	3.1	1.1	-2.0	1.9	4.8	2.8
7514	Passenger car rental	1.7	5.3	3.6	1.5	3.6	2.1	1.9	7.1	5.1

<sup>1</sup> Employee hours are measured for all of the industries except advertising agencies (SIC 7311), for which hours of all persons are used. All persons include self-employed and unpaid family workers as well as employees.

**Table 2. Annual indexes of productivity, output, and hours<sup>1</sup> for selected transportation and service industries, 1990-2000**

(1987=100)

SIC code	Industry	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
<b>4212</b>	<b>Local trucking, without storage</b>											
	Output per hour	98.9	103.7	119.4	122.0	127.6	133.3	136.5	140.0	152.9	161.2	163.5
	Output	112.8	115.0	125.1	135.5	149.9	159.1	169.3	179.5	199.4	215.2	220.0
	Hours	114.1	110.9	104.8	111.0	117.4	119.4	124.0	128.1	130.4	133.5	134.6
<b>422</b>	<b>Public warehousing and storage</b>											
	Output per hour	112.6	115.9	125.8	129.4	132.7	140.6	143.0	148.6	150.4	135.5	127.3
	Output	125.2	132.5	148.5	159.1	173.7	190.5	200.7	222.6	243.7	246.0	251.9
	Hours	111.2	114.4	118.1	122.9	130.9	135.5	140.4	149.8	162.0	181.6	197.8
<b>7311</b>	<b>Advertising agencies</b>											
	Output per hour	108.1	102.6	115.1	114.7	110.2	104.7	108.0	107.2	103.2	117.3	125.9
	Output	116.1	108.3	111.8	109.1	102.6	104.5	108.1	110.4	116.5	129.5	149.4
	Hours	107.4	105.5	97.1	95.1	93.1	99.9	100.1	103.0	112.9	110.4	118.7
<b>7372</b>	<b>Prepackaged software</b>											
	Output per hour	283.9	302.4	419.9	506.3	629.4	710.0	853.9	968.2	1119.2	1120.3	1074.2
	Output	413.9	480.0	691.7	933.8	1260.3	1644.4	2199.9	2797.5	3555.6	4019.5	4340.5
	Hours	145.8	158.7	164.7	184.4	200.2	231.6	257.6	288.9	317.7	358.8	404.1
<b>7513</b>	<b>Truck rental and leasing</b>											
	Output per hour	110.1	109.5	106.8	114.0	118.6	128.5	136.4	137.4	143.3	149.5	141.2
	Output	115.4	104.4	98.5	105.9	111.7	121.7	128.9	127.4	135.6	150.0	153.5
	Hours	104.8	95.4	92.3	92.9	94.2	94.7	94.5	92.7	94.6	100.3	108.7
<b>7514</b>	<b>Passenger car rental</b>											
	Output per hour	97.7	106.4	112.6	112.6	112.9	105.0	112.8	103.0	105.5	118.7	115.5
	Output	112.4	116.5	125.2	130.0	137.4	134.0	155.9	148.8	158.6	181.5	188.5
	Hours	115.1	109.5	111.1	115.5	121.7	127.6	138.2	144.5	150.4	152.9	163.3

<sup>1</sup> Employee hours are measured for all of the industries except advertising agencies (SIC 7311), for which hours of all persons are used. All persons include self-employed and unpaid family workers as well as employees.

## Technical Note

The output indexes for the industries included in this report are based on current-dollar industry revenues. The industry revenues, which are published by the U.S. Census Bureau, are deflated with appropriate price measures from various sources. Annual current-dollar revenues for the transportation industries are from the *Transportation Annual Survey*, while annual revenues for the service industries are from the *Service Annual Survey*. The Bureau of Labor Statistics (BLS) benchmarks these data every 5 years to data from the Census Bureau's *Census of Transportation Industries* or *Census of Service Industries*, and annual output indexes are adjusted by linear interpolation. For 1997 forward, data classified according to the new North American Industry Classification System (NAICS) are converted to an SIC basis. The indexes of output used in measuring labor productivity are, whenever possible, calculated with a Tornqvist formula. This formula aggregates the growth rates of the various industry products between two periods using the products' shares in industry value of production, averaged over the two periods, as weights.

When available, BLS producer price indexes (PPIs) are used to deflate revenue series. However, the PPIs do not cover the entire period for any of the industries discussed here. Because of this, the PPIs are extrapolated backward for the early years of the period using the movements in alternative, closely related price series.

For each of these industries, the PPI is extrapolated backwards using an industry-specific gross output deflator maintained by the Bureau of Economic Analysis (BEA) of the U.S. Department of Commerce. For the advertising agencies industry, the annual PPI series begins in 1997. The BEA price index used to extrapolate the PPI back to 1987 is a composite that reflects annual growth in various media costs, as measured by McCann-Erickson WorldGroup. For the prepackaged software industry, the annual PPI begins in 1992. The BEA price index is used to extrapolate the PPI back to 1987. For both the truck rental and leasing industry and the passenger car rental industry, the annual PPIs cover the period 1992 forward. The BEA personal consumption expenditures (PCE) price index for auto rental, leasing, and other services is used to extrapolate the PPIs for both industries back to 1987. The BEA PCE deflator reflects movements in the Consumer Price Index for other automobile-related fees.

For local trucking without storage, the PPI covers the period 1994 forward. The index is extrapolated back to 1991, using the BEA implicit deflator based on census revenues and data on long-distance trucking tonmiles from the Eno Transportation Foundation. For the 1987-91 period, an implicit deflator created by BLS is used; the deflator is based on census revenues and local trucking tonmile data published in the *National Transportation Statistics 1993 An-*

*nual Report* of the U.S. Department of Transportation. For public warehousing, the PPIs covering the years 1993 forward are used for SIC 4221, farm products warehousing; SIC 4222, refrigerated products warehousing; and SIC 4225, general warehousing. The PPI for overall public warehousing (SIC 422) is used for SIC 4226, other special warehousing. The BEA implicit deflator is used to extrapolate these deflators backward from 1993 to 1987. For SIC 422 prior to 1993, BEA used the deflator it had developed for combined SICs 4212, 4213 and 4214.

The indexes of labor input are employee-hour indexes or all-person-hour indexes, developed primarily from data from the BLS Current Employment Statistics survey (a monthly survey of establishments) and the Current Population Survey (a monthly household survey conducted by the Census Bureau for BLS). Because of data limitations, all hours are treated as homogeneous and additive, with no distinction made between hours of different groups of workers.

The industry productivity measures describe the relationship between output and the labor time involved in its production. They show the changes from period to period in the amount of goods and services produced per hour. Although these measures relate output to hours of employees or of 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 somewhat erratic, particularly in the smaller industries. The annual changes in an industry's productivity are based on sample data, which are likely to differ from data that would be 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.

The industry productivity measures and related series in this report are based on the Standard Industrial Classification (SIC) system. Beginning with the 2003 annual update, which will incorporate 2001 data, the industry series will be based on the North American Industry Classification System (NAICS). In addition, the base year for all index series will be shifted to 1997.

Published productivity and unit labor cost data for two- and three-digit SIC industries, as well as productivity data for four-digit industries, are available on the Internet at <http://www.bls.gov/lpc.htm>. Productivity series for additional industries have been withheld from publication because they do not meet BLS publication standards. Unit labor costs at the four-digit level are available but not published. Unpub-

lished data can be requested by phoning 202-691-5618 or by sending e-mail to [dipsweb@bls.gov](mailto:dipsweb@bls.gov).

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