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National Economic Trends

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Productivity and Technology

Increases in labor productivity—the ratio of output to hours worked—are often attributed to improvements in technology. This ratio is the common measure of productivity that the Bureau of Labor Statistics (BLS) updates quarterly and is regularly reported in the news. Labor productivity may grow for many reasons: people are more skilled or working harder, they are working with more or better inputs, or managers have discovered ways to make the production process more efficient.

For the overall economy, labor productivity slowed sharply after 1973. The manufacturing sector was an exception, continuing to produce a relatively constant share of the nation's output with a declining share of its labor force. Although manufacturing output is only 17 percent of GDP, it is the only major sector for which the government has good data on inputs and output. Between 1949 and 1973, manufacturing output rose at an average annual rate of 4.1 percent. At the same time, the labor input grew at a 1.4 percent annual rate, implying that labor productivity rose at an average annual rate of 2.6 percent. After 1973, manufacturing output growth slowed to 2.2 percent per year. Despite the dramatic decline in output growth, labor productivity growth slowed only slightly, to an annual average rate of 2.5 percent, because manufacturing employment fell (the index of hours worked fell 0.3 percent per year).

For the manufacturing sector, the BLS tries to separate the effects of using more inputs from the effects of improved technology with an annual statistic called multifactor productivity (MFP). MFP in manufacturing is the ratio of manufacturing output to an index of inputs—labor, capital and intermediate inputs including energy, materials and purchased business services—weighted by their respective shares of total costs. So, MFP growth measures the excess of output growth over the growth in this index of combined inputs and is an attempt to measure that part of output growth that cannot be explained by changes in the quantity of inputs. (MFP growth is shown on page 20.)

During the 1949 to 1973 period, the index of combined inputs rose at an annual rate of 2.3 percent—suggesting that some of the increase in labor productivity should be attributed to greater use of machines and other inputs. In fact, MFP grew 1.7 percent per year. From 1974 to 1993, the index of combined inputs grew at a 1.1 percent annual rate, just half the growth rate of output, so that MFP in manufacturing also rose at a 1.1 percent annual rate.

MFP growth is what remains after the BLS tries to account for the use of all inputs, so it is arguably a better way to measure technological change than labor productivity. But nearly 40 years ago, Robert Solow referred to MFP as a "confession of ignorance rather than a claim to knowledge." Despite more elaborate measurement and extensive research, it is still mostly that.

—William T. Gavin

Components of Manufacturing Productivity Growth
Compound annual growth rates

		1949-73	1974-93
1	Manufacturing output	4.1	2.2
2	Hours worked	1.4	-0.3
3	Labor productivity (approximately 1 - 2)	2.6	2.5
4	Combined Inputs	2.3	1.1
5	Multifactor productivity (approximately 1 - 4)	1.7	1.1