Productivity in industry and government in 1988

Arthur S. Herman

Productivity, as measured by output per employee hour, grew in 1988 in about 60 percent of the industries for which current data are available. In 1987, a somewhat higher proportion of the same industries, about two thirds, posted gains.

This article discusses all of the indexes included in the Bureau of Labor Statistics industry productivity measurement program.[1] It includes the extensions of the labor productivity measures through 1988, the industry multifactor productivity measures through 1987, and the Federal, State, and local government measures through fiscal year 1988.

Table 1 shows percent changes in labor productivity for 1986–87 and 1987–88 and average annual percent changes for 1947–88 (or from 1948–87 or 1948–88) and 1983–88 for all of the industry productivity measures. It includes measures for the following additional industries: auto and home supply stores, photographic equipment and supplies, and scrap and waste materials.[2] Indexes for most of the labor productivity measures are shown in table 47 of the Current Labor Statistics section of this publication. This table provides data for selected years between 1970 and 1988.

Changes by industry

Manufacturing. Both steel and motor vehicles, which are among the important manufacturing industries covered, registered gains in productivity in 1988. The steel industry posted a very large productivity increase, 10.5 percent, significantly better than the above-average 7.4-percent advance in 1988. The 1988 productivity gain marked this industry's sixth consecutive year of productivity growth. Steel output was up 14.8 percent in 1988 based on strong demand from such key markets as motor ve-

Arthur S. Herman is an economist in the Office of Productivity and Technology, Bureau of Labor Statistics.

Table 1. **Productivity trends in selected industries, percent changes 1986–87, 1987–88, and average annual percent changes, 1947–88, except as indicated, and 1983–88**

SIC code[1]	Industry	Percent change, 1986–87	Percent change, 1987–88	Average annual percent change, 1947–88[2]	Average annual percent change, 1983–88[2]
	Mining				
1011	Iron mining, crude ore	27.1	1.7	[5]4.2	13.2
1011	Iron mining, usable ore	26.6	–.9	[5]3.3	12.4
1021	Copper mining, crude ore	.8	5.0	[5]3.9	10.6
1021	Copper mining, recoverable metal	–7.7	8.9	[5]3.2	11.8
111, 121	Coal mining	8.1	10.7	[5]1.7	7.5
121	Bituminous coal and lignite mining	8.4	10.7	[5]1.7	7.6
14	Nonmetallic minerals except fuels	6.4	–1.1	[5]2.6	3.0
142	Crushed and broken stone	15.6	–1.0	[5]2.6	3.3
	Manufacturing				
2011, 13	Red meat products	–1.7	[3]	[6]2.7	[7]–.1
2011	Meat packing plants	[4]	–.4	[5]3.0	.2
2013	Sausages and other prepared meats	–4.3	[3]	[6]1.8	[7]–1.2
2016, 17	Poultry dressing and processing	6.4	[3]	[6]2.9	[7]3
2026	Fluid milk	3.4	4.8	[5]4.6	4.2
203	Preserved fruits and vegetables	–1.6	[3]	[6]2.7	[7]1.5
2033	Canned fruits and vegetables	1.1	[3]	[6]3.1	[7]4.5
204	Grain mill products	5.3	[3]	[6]3.6	[7]4.3
2041, 45	Flour (including flour mixes) and other grains	1.0	[3]	[6]2.7	[7]2.6
2041	Flour and other grain mill products	2.6	1.8	3.6	3.8
2043	Cereal breakfast foods	[4]	[3]	[6]2.1	[7]2.8
2044	Rice milling	7.1	–5.7	[5]2.0	3.9
2046	Wet corn milling	7.7	[3]	[6]8.2	[7]9.8
2047, 48	Prepared feeds for animals and fowls	8.6	[3]	[6]3.5	[7]4.2
2051, 2052	Bakery products, except frozen	–1.0	[3]	72.0	[7]1.9
2061, 62, 63	Sugar	14.0	.6	3.0	5.8
2061, 62	Raw and refined cane sugar	6.8	1.5	[5]2.2	4.4
2063	Beet sugar	24.5	–.7	[5]2.0	8.2
2082	Malt beverages	8.8	–1.3	5.9	5.3
2086	Bottled and canned soft drinks	7.8	5.4	[5]3.4	6.5
2111, 21, 31	All tobacco products	6.0	–3.1	2.5	3.1
2111, 31	Cigarettes, chewing and smoking tobacco	6.6	–2.6	1.5	3.4
2121	Cigars	4.5	–7.0	4.1	2.0
2211, 21	Cotton and synthetic broadwoven fabrics	–.5	–.5	[5]3.6	2.2
2251, 52	Hosiery	–2.2	7.3	5.6	1.0
2281	Nonwool yarn mills	15.2	–.9	[5]2.8	5.5
2311	Men's and boys' suits and coats	–1.6	3.9	[5]1.8	3.7
2421	Sawmills and planing mills, general	–2.6	–1.6	[5]2.5	3.8
2431	Millwork	4.6	[3]	[6].6	[7]1.5
2434	Wood kitchen cabinets	20.1	[3]	[6]1.1	[7]1.3
2435, 36	Veneer and plywood	2.6	[3]	[6]3.6	[7]2.5
2435	Hardwood veneer and plywood	16.4	[3]	[6]3.0	[7]7.1
2436	Softwood veneer and plywood	–4.5	[3]	[6]2.7	[4][7]
251	Household furniture	–.2	5.2	[5]2.1	2.4
2511, 17	Wood household furniture	–1.3	[3]	[6]1.8	[7]1.9
2512	Upholstered household furniture	–1.5	[3]	[6]2.1	[7].9
2514	Metal household furniture	–2.1	[3]	[6]2.2	[7]3.6
2515	Mattresses and bedsprings	11.0	–5.5	[5]3.3	3.7
252	Office furniture	.8	–4.0	[5]1.9	.3
2521	Wood office furniture	5.7	[3]	[6]1.2	[7].7
2522	Metal office furniture	–1.5	[3]	[6]2.2	[7]1.4
2611, 21, 31, 61	Paper, paperboard, and pulp mills	3.4	3.5	3.7	4.0
2643	Paper and plastic bags	–1.6	[3]	[6]2.3	[7]2.1
2651	Folding paperboard boxes	–3.3	.6	[5]1.4	–1.1
2653	Corrugated and solid fiber boxes	–2.7	.8	[5]3.5	1.7
281	Industrial inorganic chemicals	2.0	[3]	6.3	[7]2.8
2812	Alkalies and chlorine	–3.9	[3]	[6]4.0	[7]11.5
2816	Inorganic pigments	8.6	[3]	[6]1.5	77.9
2819 Part	Industrial inorganic chemicals, n.e.c.	1.5	[3]	[6]–.5	[7].9
2823, 24	Synthetic fibers	7.0	.1	[5]6.0	5.3
2834	Pharmaceutical preparations	–.7	–3.4	[5]3.4	.7
2841	Soaps and detergents	6.9	[3]	[6]2.1	[7]3.0

See footnotes at end of table.

Table 1. **Continued—Productivity trends in selected industries, percent changes 1986–87, 1987–88, and average annual percent changes,1947–88, except as indicated, and 1983–88**

SIC code[1]	Industry	Percent change, 1986–87	Percent change, 1987–88	Average annual percent change, 1947–88[2]	Average annual percent change, 1983–88[2]
2844	Cosmetics and other toiletries	2.0	(3)	[6]2.7	[7]3.3
2851	Paints and allied products	6.0	2.1	[5]2.7	3.8
2869	Industrial organic chemicals, n.e.c.	10.5	(3)	[6]4.0	[7]5.2
287	Agricultural chemicals	17.6	(3)	[6]2.5	[7]3.1
2873	Nitrogenous fertilizers	20.9	(3)	[6]4.0	[7]3.3
2874	Phosphatic fertilizers	26.4	(3)	[6]2.4	[7]2.6
2875	Fertilizers, mixing only	4.0	(3)	[6].5	[7]1.2
2879	Pesticides and agricultural chemicals, n.e.c.	12.2	(3)	[6]2.4	[7]2.9
2911	Petroleum refining	5.5	4.7	4.0	9.1
3011	Tires and inner tubes	7.1	4.6	3.6	4.2
3079	Miscellaneous plastic products	9.9	(3)	[6]2.2	[7]3.5
314	Footwear	−1.5	1.6	.8	1.0
3221	Glass containers	10.6	−.2	2.1	7.0
3241	Hydraulic cement	6.1	2.6	3.4	5.9
325	Structural clay products	3.7	(3)	[6]2.7	[7]3.0
3251, 53, 59	Clay construction products	4.8	.5	[5]2.7	3.3
3251	Brick and structural clay tile	6.3	(4)	[5]1.8	4.0
3253	Ceramic wall and floor tile	4.2	(3)	[6]3.9	[7]2.8
3255	Clay refractories	−.8	(3)	[6]2.7	[7].7
3271, 72	Concrete products	−3.6	(3)	[7]2.4	[6]1.6
3273	Ready-mixed concrete	4.4	(3)	[6].8	[7]2.6
331	Steel	7.4	10.5	2.0	6.8
3321	Gray iron foundries	1.3	3.0	[5]1.9	2.1
3324, 25	Steel foundries	−5.3	(3)	[6].7	[7]1.3
3325	Steel foundries, n.e.c.	(4)	6.4	[5]−.1	3.2
3331, 32, 33	Primary copper, lead, and zinc	23.2	(3)	3.1	[7]17.0
3331	Primary copper	29.5	13.8	3.2	21.0
3334	Primary aluminum	−.5	1.2	3.1	3.5
3351	Copper rolling and drawing	3.9	.1	[5]2.5	2.3
3353, 54, 55	Aluminum rolling and drawing	2.7	(4)	[5]4.2	3.3
3411	Metal cans	5.2	8.0	2.6	3.2
3423	Hand and edge tools	5.3	(3)	[6].6	1.1
3433	Heating equipment, except electric	4.1	(3)	[6]1.8	3.5
3441	Fabricated structural metal	(4,7).0	(3)	[6]1.0	[7]3.6
3442	Metal doors, sash, and trim	.8	(3)	[6]1.1	[7]1.1
3465, 66, 69	Metal stampings	6.3	(3)	[6]1.1	[7]1.8
3465	Automotive stampings	4.2	(3)	[6]2.2	[7].3
3469	Metal stampings, n.e.c.	10.1	(3)	[6]−.2	[7]3.5
3494	Valves and pipe fittings	6.1	(3)	[6]1.1	[7]1.3
3498	Fabricated pipe and fittings	−16.5	(3)	[6]−.2	−3.4
3519	Internal combustion engines, n.e.c.	.3	(3)	[6]1.7	[7]5.5
352	Farm and garden machinery	6.4	(3)	[6]2.0	[7]2.7
3523	Farm machinery and equipment	4.0	(3)	[6].1	[7].6
3524	Lawn and garden equipment	8.3	(3)	[6]2.5	[7]6.9
3531	Construction machinery and equipment	−5.9	.8	[5]1.4	2.0
3532	Mining machinery	4.9	(3)	[6]−.4	[7]4.1
3533	Oilfield machinery and equipment	3.3	−4.8	[5]−.7	−4.9
3541, 42	Machine tools	13.4	−4.3	[5].4	5.1
3541	Metal-cutting machine tools	15.2	−15.4	[5].6	4.0
3542	Metal-forming machine tools	9.1	20.3	[5]−.2	6.6
3545	Machine tool accessories	4.7	(3)	[6].7	[7]3.8
3561, 63	Pumps and compressors	6.6	(3)	[6]1.7	[7]3.1
3561	Pumps and pumping equipment	7.4	(3)	[6]1.1	[7]3.0
3562	Ball and roller bearings	8.4	2.6	[5]1.4	4.0
3563	Air and gas compressors	4.6	(3)	[6]1.1	[7]3.2
3585	Refrigeration and heating equipment	6.3	(3)	[6]1.0	[7]1.0
3592	Carburetors, pistons, rings, and valves	6.9	(3)	(4,6)	[7]3.7
3612	Transformers	1.1	1.6	[5]1.4	.9
3613	Switchgear and switchboard apparatus	−2.5	4.5	[5]1.8	.9
3621	Motors and generators	6.1	−1.5	[5]2.4	2.6
3631, 32, 33, 39	Major household appliances	2.3	1.2	[5]4.1	3.5
3631	Household cooking equipment	6.4	1.4	[5]4.1	7.8
3632	Household refrigerators and freezers	−3.4	1.7	[5]4.5	.5
3633	Household laundry equipment	1.8	3.6	[5]3.8	2.8
3639	Household appliances, n.e.c.	6.2	−2.0	[5]3.0	2.7
3641	Electric lamps	10.2	4.1	[5]2.2	3.6

See footnotes at end of table.

hicles, construction machinery, and rail transportation, while employee hours increased by only 3.8 percent.

The motor vehicle manufacturing industry registered an above average productivity gain of 3.6 percent, down somewhat from the 6.1-percent advance in 1987. Output grew by 5.2 percent in 1988 as production of passenger cars, trucks, truck trailers, buses, and replacement parts more than compensated for a small drop in the number of motor homes made. Employee hours increased 1.5 percent in 1988, although the total number of employees actually declined. Continuous productivity gains have been recorded in the motor vehicle industry over the past 8 years.

The highest 1988 productivity gain of all the industries measured, 20.3 percent, was registered by another manufacturing industry, the metal-forming machine tool industry. Output grew by 33.8 percent based on expanding demand from such industries as motor vehicles and aerospace, while hours were up 11.2 percent. The primary copper industry continued its high rate of productivity growth over the past 8 years, gaining 13.8 percent in 1988. Output increased 13.8 percent as demand for copper was strong, while employee hours registered no change. Semiconductors posted a 1988 productivity advance of 8.9 percent. Output was up 14.9 percent, based in part upon increased production of computer chips, while employee hours grew 5.5 percent.

Other manufacturing industries with significant productivity gains in 1988 included metal cans, 8.0 percent, hosiery, 7.3 percent, steel foundries, not elsewhere classified, 6.4 percent, and soft drinks, 5.4 percent. Output growth was recorded by all of these industries.

Among industries posting declines in 1988, the metal-cutting machine tool industry was notable because, in direct contrast to the metal-forming tool industry, it posted the largest drop, 15.4 percent. Although output fell 8.1 percent, the industry received a large influx of orders for future delivery and consequently added employees; therefore, employee hours grew 8.6 percent. Other industries with notable declines included the cigar industry (–7.0 percent), rice milling (–5.7 percent), mattresses

(–5.5 percent), and oilfield machinery (–4.8 percent).

Mining. Productivity changes were mixed among the mining industries. Coal mining posted a large gain of 10.7 percent in 1988, up from 8.1 percent in the previous year and the sixth consecutive increase. Output grew 3.4 percent in 1988 as demand from electric utilities remained strong. Employee hours continued to decline (–6.6 percent), attributable in part to a reduction in the number of small mines operating and an increase in automation. Copper mining (recoverable metal) recorded an 8.9-percent productivity gain in 1988. Output grew 14.3 percent as copper prices were high and demand remained strong for domestic copper, while employee hours grew 5.0 percent.

Small productivity declines were registered by iron mining (usable ore) and nonmetallic minerals in 1988. Output of iron mines grew 20.6 percent as strong demand continued from the steel industry. However, hours grew 21.7 percent, as workers were called back to mines operating near capacity, leading to a 0.9-percent productivity falloff. In nonmetallic minerals, a small output gain of 1.6 percent was more than compensated for by a 2.8-percent gain in hours, resulting in a 1.1-percent productivity decline.

Transportation. Productivity changes varied among the transportation industries. Railroads (revenue traffic) posted a significant gain of 9.7 percent in 1988. Although down somewhat from the 15.9-percent advance the previous year, it marked the 13th consecutive productivity gain for the industry. Output grew 5.4 percent, as shipments of coal and industrial chemicals, and passenger travel increased, while employee hours fell 4.0 percent. Petroleum pipelines recorded a 5.5-percent productivity gain, as output was up 4.1 percent while employee hours dropped 1.4 percent. Conversely, air transportation posted an unusual productivity decline in 1988. Although output grew 5.0 percent as passenger and freight traffic increased, employment grew even more, up 8.9 percent, as airlines continued to hire workers to handle increased airport congestion.

Table 1. **Continued—Productivity trends in selected industries, percent changes 1986–87, 1987–88, and average annual percent changes, 1947–88, except as indicated, and 1983–88**

SIC code[1]	Industry	Percent change, 1986–87	Percent change, 1987–88	Average annual percent change, 1947–88[2]	Average annual percent change, 1983–88[2]
3645, 46, 47, 48	Lighting fixtures	–3.5	–.1	[5]1.9	2.7
3651	Radio and television receiving sets	–7.3	.3	[5]6.3	5.1
3674	Semiconductors and related devices	35.5	8.9	[5]12.7	8.4
371	Motor vehicles and equipment	6.1	3.6	[5]3.1	3.9
3825	Instruments to measure electricity	8.2	[3]	[6]3.0	[7]7.7
3861	Photographic equipment and supplies	6.3	[3]	[6]4.3	[7]5.2
	Other				
401 Class I	Railroad transportation, revenue traffic	15.9	9.7	4.8	10.0
401 Class I	Railroad transportation, car–miles	13.0	7.1	3.5	6.8
4111, 413, 414 Parts	Bus carriers, class I	4.4	[3]	[6]–.2	[7]–1.5
4213 Part	Intercity trucking	3.3	[3]	[6]2.7	[7]1.2
4213 Part	Intercity trucking (general freight)	2.8	[3]	[6]2.8	[7]1.5
4512, 4522	Air transportation	5.9	–3.6	6.0	2.5
4612, 13	Petroleum pipelines	–2.0	5.5	[5]4.5	2.4
4811	Telephone communications	2.9	6.5	[5]6.1	4.4
491, 92, 93	Gas and electric utilities	3.2	4.7	4.3	1.6
491, 493 Part	Electric utilities	5.1	4.9	[5]3.3	2.8
492, 493 Part	Gas utilities	–3.4	4.3	[5].8	–2.8
5093	Scrap and waste materials	3.7	[3]	[6]3.0	[7]3.3
5251	Hardware stores	2.1	7.3	[5]2.6	6.0
5311	Department stores	2.4	2.3	[5]3.2	3.4
5331	Variety stores	–3.9	–3.5	[5]–.7	–6.2
54	Retail food stores	–1.1	–1.0	[5].6	–.8
5411	Grocery stores	–2.6	–1.8	[5]–.4	–1.6
546	Retail bakeries	7.2	–2.5	[5]–2.5	–1.8
5511	Franchised new car dealers	–3.0	4.1	[5]1.8	.1
5531	Auto and home supply stores	6.8	1.9	[5]3.0	3.1
5541	Gasoline service stations	–2.8	1.2	[5]3.9	3.0
56	Apparel and accessory stores	–7.3	–.8	[5]3.3	1.1
5611	Men's and boys' clothing stores	–.7	–.2	[5]2.5	2.3
5621	Women's ready-to-wear stores	–5.8	–2.0	[5]4.6	1.7
5651	Family clothing stores	–5.3	–.6	[5]3.2	–3.3
5661	Shoe stores	–6.0	–1.4	[5]1.3	2.2
57	Furniture, furnishings, and equipment stores	1.7	5.2	[5]3.4	5.2
571	Furniture and home furnishings stores	–2.2	–1.8	[5]1.9	1.1
572, 73	Appliance, radio, TV, and music stores	6.5	14.8	[5]5.7	10.9
572	Household appliance stores	–2.9	3.0	[5]4.9	9.2
573	Radio, television, and music stores	9.8	18.9	[5]6.9	11.0
58	Eating and drinking places	1.1	.7	[5].1	–.6
5912	Drug and proprietary stores	–.8	1.4	[5]3.2	–.9
5921	Liquor stores	–6.5	–3.4	[5]–.2	–2.8
602	Commercial banking	4.2	[3]	[6]1.4	[7]3.6
7011	Hotels motels and tourist courts	–5.2	[3]	[6]1.5	[7]–2.5
721	Laundry and cleaning services	–1.1	–.4	[5].2	–1.9
7231, 41	Beauty and barber shops	1.8	–3.1	[5]–.1	–2.9
7231	Beauty shops	1.3	–3.9	[5]–.1	–4.2

[1] As defined in the *Standard Industrial Classification Manual, 1972*, published by the Office of Management and Budget.

[2] Based on the linear least squares trends of the logarithms of the index numbers.

[3] Not available.

[4] Less than .05 percent.

[5] Begins in a year later than 1947.

[6] Begins in a year later than 1947 and ends in 1987.

[7] Ends in 1987.

Communications and utilities. Productivity gains were registered by all the communications and utilities covered. Telephone communication productivity grew 6.5 percent. Output continued to increase, up 5.7 percent, based in part on gains in such long-distance services as facsimile and data transmission as well as toll free "800" numbers. Employee hours were down 0.8 percent, continuing a decline attributable partially to such technological changes as digital switching and fiber optic cables.

Both electric and gas utilities posted productivity gains in 1988. Electric was up 4.9 percent and gas grew 4.3 percent.

Table 2. **Multifactor and related productivity indexes[1] for selected industries, 1983–87, and percent changes, 1986–87 and 1983–87**

[1977=100]

Industry and measure	1983	1984	1985	1986	1987[2]	Percent change, 1986–87	Average annual percent change, 1983–87[3]
Tires and tubes (SIC 3011):							
Multifactor productivity	126.9	132.6	130.9	133.9	144.9	8.2	2.8
Output per hour	136.6	147.7	147.3	151.1	162.0	7.2	3.7
Output per unit of capital	107.2	128.2	120.5	116.5	132.6	13.8	3.4
Output per unit of intermediate purchases	126.6	124.2	124.0	129.2	137.7	6.6	2.1
Footwear (SIC 314):							
Multifactor productivity	99.2	97.6	91.4	90.9	90.5	–.4	–2.5
Output per hour	104.1	105.0	105.4	107.3	101.5	–5.4	–.3
Output per unit of capital	85.2	77.9	69.4	64.5	63.8	–1.1	–7.4
Output per unit of intermediate purchases	101.8	101.6	93.5	94.0	96.4	2.6	–1.9
Steel (SIC 331):							
Multifactor productivity	115.0	119.4	121.9	124.9	139.7	11.8	4.4
Output per hour	119.5	131.3	138.6	145.0	160.9	11.0	7.2
Output per unit of capital	82.6	95.4	95.8	96.7	116.6	20.6	7.3
Output per unit of intermediate purchases	114.0	113.6	114.4	116.3	128.1	10.1	2.6
Motor vehicles and equipment (SIC 371):							
Multifactor productivity	96.7	101.1	105.2	100.0	101.4	1.4	.8
Output per hour	109.4	115.3	121.3	121.8	128.7	5.7	3.9
Output per unit of capital	80.7	104.1	110.9	104.8	105.4	.6	5.6
Output per unit of intermediate purchases	94.1	93.9	96.9	90.7	91.1	.4	–1.0

[1] The output measures underlying the productivity indexes relate to the gross output of the industry, adjusted to exclude intraindustry transactions. They do not relate to the specific output of any single factor of production.

[2] Preliminary.

[3] Based on the linear least squares trends of the logarithms of the index numbers.

Output was up as extremes in weather contributed to strong demand in both industries. Productivity in these industries was aided by improvements in transmission and distribution systems; electronic meter reading; and new types of mobile equipment for off-road digging and transportation.

Retail stores. Productivity changes varied greatly among the retail stores measured. Radio, television, and music stores had a very high gain of 18.9 percent in 1988, the 11th continuous increase in productivity. Output was up 14.4 percent, attributable to strong sales of color TV's, prerecorded audio tapes, and home computers, while hours dropped 3.7 percent. Hardware stores recorded a productivity gain of 7.3 percent. Output increased 4.8 percent attributable largely to the strength of the home improvement market, while employee hours fell 2.3 percent. Productivity of new car dealers was up 4.1 percent with strong car sales increasing output by 8.0 percent. Smaller productivity gains were posted in a number of other retail industries with department stores at 2.3 percent, auto and home supply stores, 1.9 percent, drug stores, 1.4 percent, gasoline service stations, 1.2 percent, and eating and drinking places, 0.7 percent.

A significant number of retail industries had productivity declines in 1988. The largest drop was variety stores, which experienced a 3.5-percent falloff as continued losses in their share of the market depressed output 3.2 percent while hours were up slightly. Liquor stores had a productivity decline of 3.4 percent and retail bakeries dropped 2.5 percent. The grocery store industry had a decline of 1.8 percent, the fourth continuous productivity drop. The apparel store industry and its component industries all registered declines in 1988.

Service. Among the service industries covered, the automotive repair shops industry had a productivity gain of 5.2 percent. Output was up 8.0 percent, attributable in part to growth in repair needs reflecting the increasing number and average age of cars and trucks in operation, while employee hours grew 2.6 percent. Beauty and barber shops had a productivity decline of 3.1 percent, as output grew 5.0 percent, but hours were up even more (8.3 percent). The laundry and cleaning industry registered a small productivity decline (–0.4 percent). Output grew 7.4 percent and hours were up 7.7 percent in 1988.

Trends

Almost all of the industries measured experienced an average annual increase in productivity over the long term (beginning in 1947 for some of the industries). The industry posting the highest rate of gain was semiconductors at 12.7 percent. A very high rate of output growth (19.3 percent) coupled with rapid improvements in product design and advances in manufacturing techniques contributed to this spectacular advance in productivity. The second highest growth rate was posted by the wet corn milling industry at 8.2 percent. Until 1972, output and productivity growth were modest. After 1972, output and productivity expanded rapidly attributable to increased market penetration of high fructose and glucose corn syrup—two of the industry's key products—and to new plants which use highly automatic equipment.

Other industries with high long-term rates of growth included radio, television, and music stores (6.9 percent); radio and television set manufacturing (6.3 percent); telephone communications (6.1 percent); as well as synthetic fibers and air transportation (both 6.0 percent). All of these industries recorded average annual output growth rates over the long term.

Although just a small proportion of the industries measured registered long-term declines in productivity, it is noteworthy that more than half of these were in the nonmanufacturing area. The largest decline was posted by retail bakeries (–2.5 percent), while automotive repair shops (– 0.9 percent) and variety stores (– 0.7 percent) were next. Other nonmanufacturing industries with negative long-term productivity included grocery stores, beauty and barber shops, bus carriers, and liquor stores.

Manufacturing industries posting declines included oilfield machinery

(–0.7 percent), industrial inorganic chemicals, not elsewhere classified, (– 0.5 percent), and mining machinery (– 0.4 percent).

Productivity trends varied greatly among the industries over the 1983–88 period. Most of the industries posted growth in productivity over this period. It is noteworthy that many of the industries with very large increases from 1983–88 were metals related, involving either mining or smelting and refining. For example, the industry with the largest gain was primary copper, up 21.0 percent. Output grew at a 2.9-percent average as demand strengthened toward the end of the period, while employee hours fell sharply (–15.0 percent) as less efficient facilities were closed. Iron mining (usable ore) had a rate of productivity gain of 12.4 percent. Output averaged a 4.4-percent increase, as demand was up from the domestic steel industry, while hours fell at a 7.1 percent rate. The copper mining (recoverable metal) industry posted an 11.8-percent gain. Very strong international competition in recent years resulted in the introduction of advanced mining and ore recovery methods and the shutdown of old mines and facilities. Although not among the highest productivity growth industries, the steel industry posted a significant 6.8-percent average rate of gain over the 1983–88 period. Output was up at a 3.4-percent rate while hours declined an average of 3.2 percent in this industry.

Among the limited number of industries posting declines for 1983–88, about three-quarters were in nonmanufacturing. Variety stores had the largest falloff at – 6.2 percent. Output averaged – 4.1 percent, attributable in part to competition from other types of outlets, while hours were up an average of 2.3 percent. Other nonmanufacturing industries with significant declines included beauty shops (– 4.2 percent), family clothing stores, (– 3.3 percent), liquor stores and gas utilities (–2.8 percent), and hotels and motels (–2.5 percent).

Among manufacturing industries, the largest falloff (– 4.9 percent) was posted by oilfield machinery. Fabricated pipe and fittings was next, at –3.4 percent.

New measures

Photographic equipment and supplies. Productivity in the photographic equipment and supply industry grew at a 4.3-percent rate between 1967 and 1987,

Table 3. **Productivity indexes for government, 1983–88, and percent changes, 1987–88 and 1983–88**

[1977=100]

Functional group	1983	1984	1985	1986	1987	1988	Percent change, 1987–88	Average annual percent change, 1983–88
Federal								
Total measured portion	110.2	110.2	110.9	112.7	113.0	113.9	.8	.7
Audit of operations	95.3	97.9	100.6	93.7	84.5	89.2	5.6	–2.4
Buildings and grounds	127.9	130.4	128.8	122.5	121.8	128.6	5.5	–.7
Communications	196.1	213.8	226.1	236.2	247.4	259.1	4.7	5.5
Education and training	109.2	108.1	108.6	109.2	107.8	113.4	5.1	.5
Electric power production and distribution	77.9	67.2	58.5	54.5	44.2	42.0	–5.0	–11.8
Equipment maintenance	110.5	115.5	117.1	119.5	119.2	125.0	4.8	2.1
Finance and accounting	166.9	163.9	163.6	168.8	174.1	181.3	4.1	1.8
General support services	158.2	148.6	136.1	142.7	144.1	139.0	–3.5	–2.0
Information services	114.1	118.8	125.2	126.6	130.4	126.6	–2.9	2.3
Legal and judicial activities	111.7	110.1	113.1	113.5	113.7	115.1	1.2	.7
Library services	110.1	118.6	120.9	130.8	128.7	134.1	4.2	3.8
Loans and grants	117.3	112.2	122.4	122.7	112.8	93.2	–17.4	–3.2
Medical services	104.0	103.4	103.6	105.5	106.1	109.1	2.8	1.0
Military base services	107.9	99.4	100.4	108.0	110.2	106.5	–3.4	.9
Natural resources and environmental management	112.7	115.6	119.3	120.4	125.7	126.4	–.6	2.4
Personnel investigations	99.4	102.2	105.6	98.6	106.9	109.4	2.3	1.6
Personnel management	94.3	101.9	100.1	100.7	98.4	99.2	.8	.4
Postal service (SIC 4311)	107.4	108.8	109.1	110.9	110.9	110.8	–.1	.7
Printing and duplication	113.1	120.3	122.1	125.0	126.8	135.9	7.1	3.2
Procurement	124.7	127.2	122.5	119.5	121.4	114.7	–5.5	–1.6
Records management	122.0	125.2	121.4	128.5	125.3	119.5	–4.6	–.1
Regulation – compliance and enforcement	126.6	126.9	130.2	140.6	136.6	129.7	–5.1	1.2
Regulation – rulemaking and licensing	139.3	146.1	153.6	150.9	154.8	153.3	–1.0	1.8
Social services and benefits	109.7	110.1	118.4	114.6	120.3	124.7	3.7	2.5
Specialized manufacturing	138.0	143.8	146.9	149.1	146.2	156.8	7.3	2.0
Supply and inventory control	104.3	100.2	96.7	99.1	104.2	109.3	4.9	1.1
Traffic management	115.8	112.7	120.8	111.8	130.8	149.8	14.6	4.9
Transportation	114.6	113.2	114.4	116.4	115.0	115.9	.8	.4
State and local								
Electric power (SIC 4911)	96.2	94.9	95.4	97.7	97.9	102.8	5.0	1.3
Alcoholic beverages (SIC 5182 pt and 5921 pt)	107.5	108.5	102.6	99.7	100.9	100.6	–.3	–1.6
Unemployment insurance (SIC 9441)	115.4	99.7	101.7	106.3	104.3	97.8	–6.2	–1.8

compared with 2.7 percent for all manufacturing. Output increased at a 4.9-percent rate and employee hours grew 0.6 percent per year over this period.

This industry manufactures two types of products. One consists of equipment such as cameras, projectors, screens, photocopying, and micrographic units. The other consists of sensitized materials such as film, photographic paper, and chemicals. During the 1967–79 period, productivity grew at a relatively high rate of 5.5 percent. Demand was strong and output advanced at a rate of 7.5 percent while employee hours averaged a 2.0-percent gain. However, for 1979–87, productivity slowed to a rate of 3.8 percent. Facing strong competition from imports, the industry experienced a 1.0-percent increase in output over this period, while employee hours dropped 2.7 percent, as the industry restructured and adopted the latest in automation and manufacturing techniques.

Scrap and waste materials. Between 1977 and 1987, the scrap and waste materials industry registered a productivity gain of 3.0 percent. Output grew at an average rate of 1.7 percent per year while employee hours declined 1.2 percent per year over this period. Output growth was affected by increased demand for processed ferrous scrap for use in electric furnaces by the steel industry and for processed paper scrap for export. Productivity was aided by a shift from shearing to more high-speed shredding scrap processing equipment, more automatic paper balers, and advanced materials handling equipment.

Auto and home supply store industry. Productivity in the auto and home supply store industry grew at an average annual rate of 3.0 percent from 1972 to 1988. This productivity advance reflects average annual increases in output of 5.5 percent and in hours of 2.4 percent. The strong output growth is based on the expanding number of motor vehicles on the road and their increasing age, leading to an expansion in demand for motor vehicle accessories and repair parts. Productivity growth has been assisted by the increasing use of computers for retail operations such as point-of-sale terminals, electric scanning devices, and, in some cases, companywide computer systems as well as better store layouts.

Industry multifactor productivity

In multifactor productivity measures, output is related to the combined inputs of labor, capital, and intermediate purchases (materials, fuels, electricity, and services). Multifactor productivity is equal to output per hour adjusted to remove the effects of changes in capital per hour and intermediate purchases per hour. These effects are measured as the change in the ratio of nonlabor to labor inputs, weighted by the nonlabor input's share in total output. The capital effect, for example, is the change in the capital-labor ratio weighted by capital's share in output. Multifactor measures still show the effect of many influences such as economies of scale, capacity utilization, skill and effort of the work force, as well as technological change. Multifactor measures are available for the tires and tubes, footwear, steel, and motor vehicle industries and have been updated through 1987.[3] Data for multifactor productivity and related indexes for 1983–87 are presented in table 2.

Current developments. In 1987, multifactor productivity increased in the steel industry (11.8 percent), tires and tubes (8.2 percent), and motor vehicles (1.4 percent), but declined slightly in footwear manufacturing (– 0.4 percent). The large multifactor productivity gains in steel and tires and tubes were spurred by substantial output gains while output was up moderately in motor vehicle manufacturing. However, footwear output continued its long-term decline.

In the steel industry, the large output gain in 1987 (13.4 percent) far exceeded the rise in combined inputs of 1.5 percent, resulting in the substantial multifactor productivity advance. Capital input dropped 6.0 percent, while labor hours were up 2.4 percent and intermediate purchases rose 3.0 percent. The multifactor productivity gain in tires and tubes was based on a 10.3-percent rise in output, accompanied by an increase of only 1.8 percent in combined inputs. Capital input fell 3.1 percent in this industry, but was offset by a gain in labor hours (2.9 percent) and in intermediate purchases (3.4 percent). In motor vehicle manufacturing, a 3.8-percent increase in output outpaced the 2.3-percent rise in combined inputs to produce the multifactor productivity advance. Labor hours declined by 1.9 percent, but 3.3-percent increases were recorded by both capital input and intermediate purchases. In the footwear industry, the decline in multifactor productivity reflected a 6.3-percent decline in combined inputs and a 6.5-percent decrease in output. The fall in output was the 11th consecutive annual decline. Decreases occurred in all inputs in 1987, with capital falling 5.5 percent, labor hours dropping 1.4 percent, and intermediate purchases down 9.0 percent.

Over the 1983–87 period, the steel industry, at 4.4 percent, registered the highest average annual gain in multifactor productivity of the industries measured. The results of a massive program of restructuring and modernization, including a shift toward advanced technologies such as continuous casting, aided productivity growth. In tires and tubes manufacturing, the earlier elimination of old, inefficient plants assisted multifactor productivity growth leading to a 2.8-percent gain over the 1983–87 period.

The motor vehicle industry had a 0.8-percent multifactor productivity advance for 1983–87. Strong output gains in 1984 and 1985 spurred above average gains in multifactor productivity in these years (4.6 percent in 1984 and 4.1 percent in 1985). However, a 4.9-percent decline in 1986 as output fell off lowered the average growth rate for the period.

Multifactor productivity in footwear manufacturing averaged a decline of 2.5 percent over the 1983–87 period. In line with a previous trend, output declined in every year during the period, attributable to continued growth in imports. The steep falloff in output combined with slow rates of introduction and diffusion of technological innovations has reduced productivity growth in this industry.

Government productivity

Measures of output per employee year for the Federal Government and

selected State and local government services are updated to 1988. Data are presented for fiscal years 1983–88 and are shown in table 3.[4]

Federal, 1988. Output per employee year in the series covering the measured portion of Federal Government organizations increased 0.8 percent in fiscal 1988. This gain compares favorably with the 0.2-percent productivity increase registered in the previous year. The fiscal 1988 productivity advance reflects a 1.3-percent increase in output and a 0.5-percent gain in employee years.

The fiscal 1988 productivity measure covers 342 organizations in 61 Federal agencies. The organizations included 2.1 million executive branch civilian employees representing 69 percent of the total Federal civilian labor force.

The Federal organizations are divided into 28 functions based on similarity of tasks performed (for example, auditing, medical, personnel, and transportation) in order to better identify and understand the factors which affect Federal productivity. Changes in output per employee year among the functions ranged from an increase of 14.6 percent for traffic management to a decline of 17.4 percent for loans and grants in fiscal year 1988. Productivity increased in 18 functions and decreased in 10 in 1988.

The traffic management function, which includes those organizations responsible for the movement of people and goods, posted the largest gain among the functions (14.6 percent), attributable to a 3.2-percent increase in output and a 9.9-percent decrease in employee years. In contrast, the loans and grants function recorded the largest productivity decline (–17.4 percent) attributable to a 7.3-percent decrease in output and a 12.2-percent increase in employee years. Fourteen of the 21 loans and grants organizations which are included in this measure recorded productivity declines, with output dropping in 11 and employee years increasing in 13, in fiscal year 1988.

The largest of the 28 functions in terms of employees (764,000 in fiscal year 1988) includes only a single organization, the U.S. Postal Service. Productivity declined 0.1 percent in 1988 attributable to an increase in output of 3.0 percent while employee years grew 3.1 percent. In 1987, Postal Service productivity had remained unchanged.

Trends, 1983–88. Over the 1983–88 period, productivity in the measured portion of the Federal Government averaged a 0.7-percent gain. The year-to-year changes ranged from a 1.6-percent increase in 1986 to no change in 1984. The overall growth in Federal productivity reflected gains averaging 2.0 percent in output and 1.3 percent in employee years.

Productivity trends for the 28 functions over the 1983–88 period ranged from a 5.5-percent rate of gain for communications to a decline averaging 11.8 percent for electric power production and distribution.

The high rate of productivity gain in communications is based upon an increase in output of 6.5 percent and a small gain in employee years of 0.9 percent. Technological changes in equipment that receives and transmits messages simultaneously throughout the world have aided productivity growth in this governmental function. The three organizations involved in this function in 1988 are in the Department of Defense, the General Services Administration, and the Department of State.

Traffic management posted the second highest rate of gain at 4.9 percent. Output grew at a rate of 1.8 percent while employee years fell at a 2.9-percent rate in this function, which involves the movement of people and cargo.

Conversely, electric power production and distribution registered the largest 1983–88 productivity falloff (–11.8 percent) of the 28 functions measured. Output fell at the high rate of 15.9 percent over the period. Although employment was cut back and employee years averaged a 4.6-percent drop, the decrease in output exceeded the cuts in labor input by a wide margin.

State and local government services. Output per employee year in State and local government electric power services increased 5.0 percent in 1988 as output grew 4.9 percent and employee years fell 0.1 percent. In 1987, productivity increased 0.2 percent. Over the 1983–88 period, productivity increased at an average annual rate of 1.3 percent, based on an increase of 3.6 percent in output which was larger than the 2.3-percent gain in employment.

State unemployment insurance productivity decreased 6.2 percent in fiscal 1988 as output dropped 4.8 percent and labor input increased 1.4 percent. In 1987, productivity declined 1.9 percent. Over the 1983–88 period, productivity recorded an average annual drop of 1.8 percent. This decrease can be attributed to a falloff in output, which is a reflection of declining unemployment in the Nation and a resulting drop in unemployment insurance claims and payments. While State staffing was cut, employee years did not fall as sharply as output. □

Footnotes

[1] A full report, *Productivity Measures for Selected Industries and Government Services*, Bulletin 2349 (Bureau of Labor Statistics, 1990), is available ($10) from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 or from the Bureau of Labor Statistics Publications Sales Center, P.O. Box 2145, Chicago, IL 60690.

[2] For a detailed report on productivity in these industries, see the following *Monthly Labor Review* articles: Patricia L. Wilder, "Productivity in the retail auto and home supply store industry," August 1989, pp. 36–40; Mark Scott Sieling, "Productivity in scrap and waste materials processing," April 1990, pp. 30–37; and Clyde Huffstutler and Stuart Kipnis, "Productivity trends in the photographic equipment and supplies industry," June 1990, pp. 39–49.

[3] For additional information about multifactor productivity, see the following *Monthly Labor Review* articles: Mark K. Sherwood, "Performance of multifactor productivity in the steel and motor vehicles industries," August 1987, pp. 22–30; John Duke and Lisa Usher, "Multifactor productivity slips in the nonrubber footwear industry," April 1989, pp. 32–38; and Diane Litz and Linda Moore, "Multifactor productivity advances in the tires and inner tubes industry," June 1989, pp. 19–27.

[4] For additional information about productivity in government see: Donald M. Fisk, "Productivity trends in the Federal Government," *Monthly Labor Review*, October 1985, pp. 3–9; Jerome A. Mark, "Public sector productivity measurement: U.S. Federal Government agencies," paper presented at the European Association of National Productivity Centers Conference, Athens, Greece, Oct. 5–8, 1988, 17 pp.; and Donald M. Fisk, "Measuring productivity in State and local government," Bulletin 2166 (Bureau of Labor Statistics, 1983).