BLS completes major expansion of industry productivity series

Complete coverage of manufacturing and retail trade industries highlights a new database made possible by increases in data availability in recent years

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The Bureau of Labor Statistics (BLS) has expanded its database of labor productivity series and, in the process, has increased its industry coverage within most sectors of the economy. The new data provide complete coverage in manufacturing and retail trade for all three- and four-digit industries.[1] Coverage also has increased substantially in the mining and service industries.

BLS has produced measures of labor productivity at the industry level for many years. In 1940, Congress authorized that productivity studies be conducted on a continuing basis. From 1940 to 1997, the number of industries for which series were published increased steadily to 180.[2] As recently as 1997, many industries were still not covered by the program, due to lack of adequate basic data. However, major advances in data collection over the last 10 to 15 years have increased the amount of data available to measure labor productivity for industries. This provided an impetus for the major expansion.

One of the most important advances is the large increase in the number of Producer Price Indexes (PPI's) developed by the BLS Industrial Prices and Price Indexes program.[3] This development greatly enhanced the industry productivity program because it made the following BLS goals more feasible:

- provide more productivity and related data to the public;
- present a more comprehensive data set featuring measures for all industries within as many sectors as possible;
- incorporate aggregates of the industry series as part of the measures for the private nonfarm business sector; and
- provide a database that can be used to research productivity trends and the factors underlying them

With these goals, BLS established an intensive project to increase significantly the coverage of its industry labor productivity series.

Coverage of the four-digit industry productivity series has expanded to include all 457 manufacturing industries, as well as 92 nonmanufacturing industries. At the three-digit level, 140 manufacturing and 62 nonmanufacturing industries are covered. Historical data on the new industry series are available from 1987 through 1996. These data were first introduced in a press release (USDL 98-310) on July 23, 1998. Data presented here include updates and revisions that supersede those series.

This article provides an overview of the data in the new database and examines some highlights of the 1987–96 productivity trends. Appendix A explains the methodology and data employed to construct the series.

Details on the database

The new database contains labor productivity and the underlying output and labor input measures for 549 four-digit industries and 202 three-digit industries as defined in the *Standard Industrial Classification Manual* (SIC).[4] There are also eight

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series available at the two-digit SIC level.[5] In manufacturing, all of the three-digit industries are aggregations of the underlying four-digit industry measures. In nonmanufacturing sectors, some of the three-digit industries were calculated directly at that level. In addition, aggregates of two or more four-digit or three-digit industries are available for a group of 33 combination industries. For example, red meat products (SIC 2011,13) is a combination industry that is an aggregate of the four-digit industries—meatpacking plants (SIC 2011) and sausages and other prepared meats (SIC 2013).

Employment coverage of productivity series. With the expansion of the BLS industry productivity database, the detailed industry series now cover 54 percent of the employment of the private nonfarm business sector. (See table 1.) However, the proportion of industry employment covered varies by sector. Detailed industry productivity measures now cover 73 percent of employment in the overall goods-producing sector. The coverage in manufacturing is complete, and the coverage in mining is very high (96 percent). However, the construction sector is not covered at all. Industry productivity measures cover 47 percent of employment in the service-producing sector. Within this sector, retail trade has complete coverage and communications has 98 percent coverage. Productivity measures cover 78 percent of utilities, while coverage in transportation is 57 percent. Coverage is lowest for finance, insurance, and real estate (19 percent); services (16 percent); and wholesale trade (2 percent).

In the sectors that still have low coverage, the development of measures is prevented by the lack of adequate basic data and, in some cases, serious conceptual issues. For example, significant impediments to the development of output measures in some industries include the lack of consistent historical data, especially adequate price indexes, and the lack of a well defined and measurable concept of output. Obtaining a reliable measure of output can be particularly difficult in some service industries in which the output of the service depends, in part, on the participation of the consumer, or in which an increase in the number of transactions may be linked to a decrease in the quality of service provided. Medical and educational services are examples of areas in which it is not always clear whether the preferred measure should focus on the quantity of services (transactions), or on the actual outcomes of those services.[6]

Table 1. Employment coverage of BLS industry productivity statistics by industry group, 1996

Industry	Employment coverage (percent)
Private nonfarm business	54
Goods–producing	73
Mining	96
Manufacturing	100
Contract construction	0
Service–producing	47
Transportation	57
Communications	98
Utilities	78
Trade	78
Wholesale trade	2
Retail trade	100
Finance, insurance, and real estate	19
Services	16

NOTE: Data are for the nonfarm business sector; general government, owner-occupied housing, and nonprofit organizations are excluded.

Publication criteria. The industry productivity indexes are developed from secondary data sources that have been compiled for purposes other than productivity measurement. Because of this, BLS staff evaluated the reliability of the productivity measures and the components of those measures.

The industry series that did not meet the criteria are not published. The staff considered several indicators in assessing the reliability of these series. The indicators included: the employment level for each industry; the standard deviation of the annual percent changes in labor productivity for the 1987–96 period for each industry; the percent of products covered by PPI's (for each manufacturing industry); the percent of the value of shipments, at the product class level, that was not reported by the Census Bureau and therefore had to be estimated (for each manufacturing industry); whether the average annual growth rate of labor productivity for the 1987–96 period was below –2.0 percent; the relative standard error of the industry value of shipments from the Census Bureau for 4 different years; and information from the BLS Office of Employment and Unemployment Statistics about industries with potential problems in unpublished employment and hours data.

Ultimately, BLS selected the employment size of the industry and the standard deviation of the 1987–96 annual productivity changes as the most appropriate criteria for determining if the productivity series for an industry is unreliable.[7] This does not mean that all industries meeting the publication criteria are completely free of problems. For example, some industries that met the criteria are based on output concepts that still are being discussed by researchers active in this field. Further research could result in changes in the methodology for these industries.

Most of the productivity indexes developed for each sector satisfied the publication criteria and are published. In the nonmanufacturing sector, 61 of the 92 four-digit industries and 47 of the 62 three-digit industries are published. In the manufacturing sector, 294 of the 457 four-digit and 122 of the 140 three-digit industries are published. The series for

Chart 1. Distribution of industries by average annual change in output per hour, 1987–96

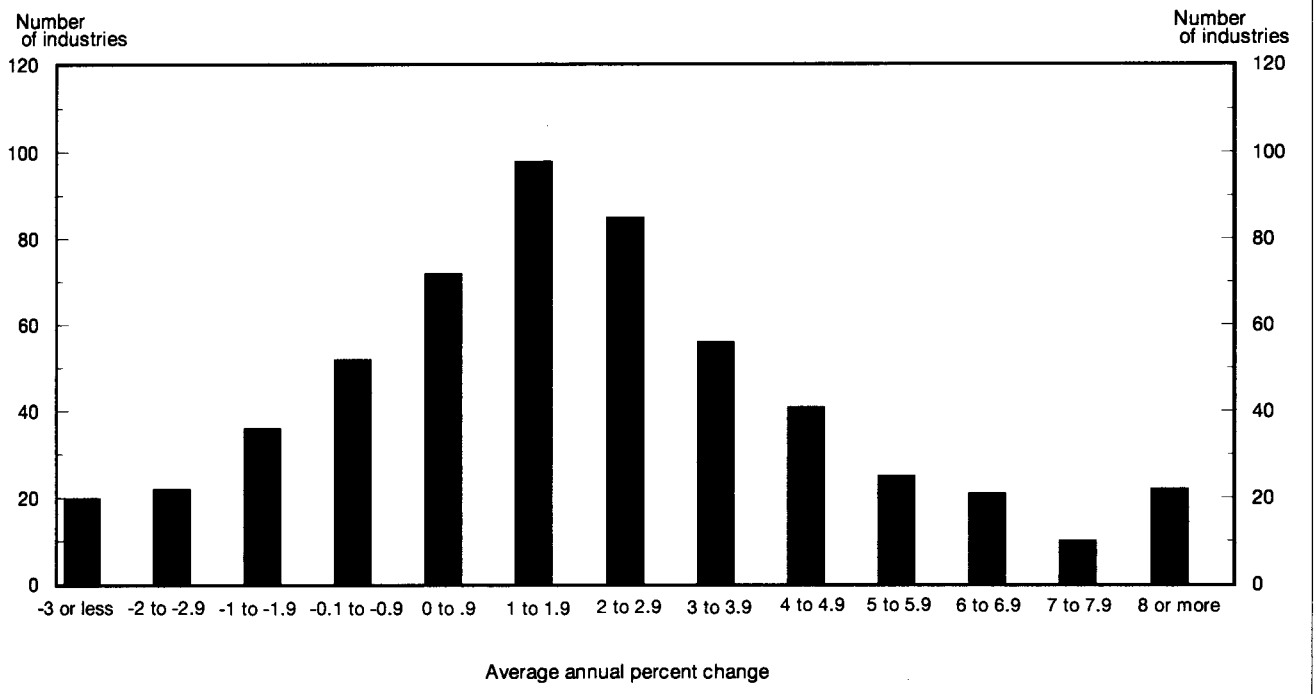

Chart 2. Percent of employment in industries with rising productivity, 1987–96

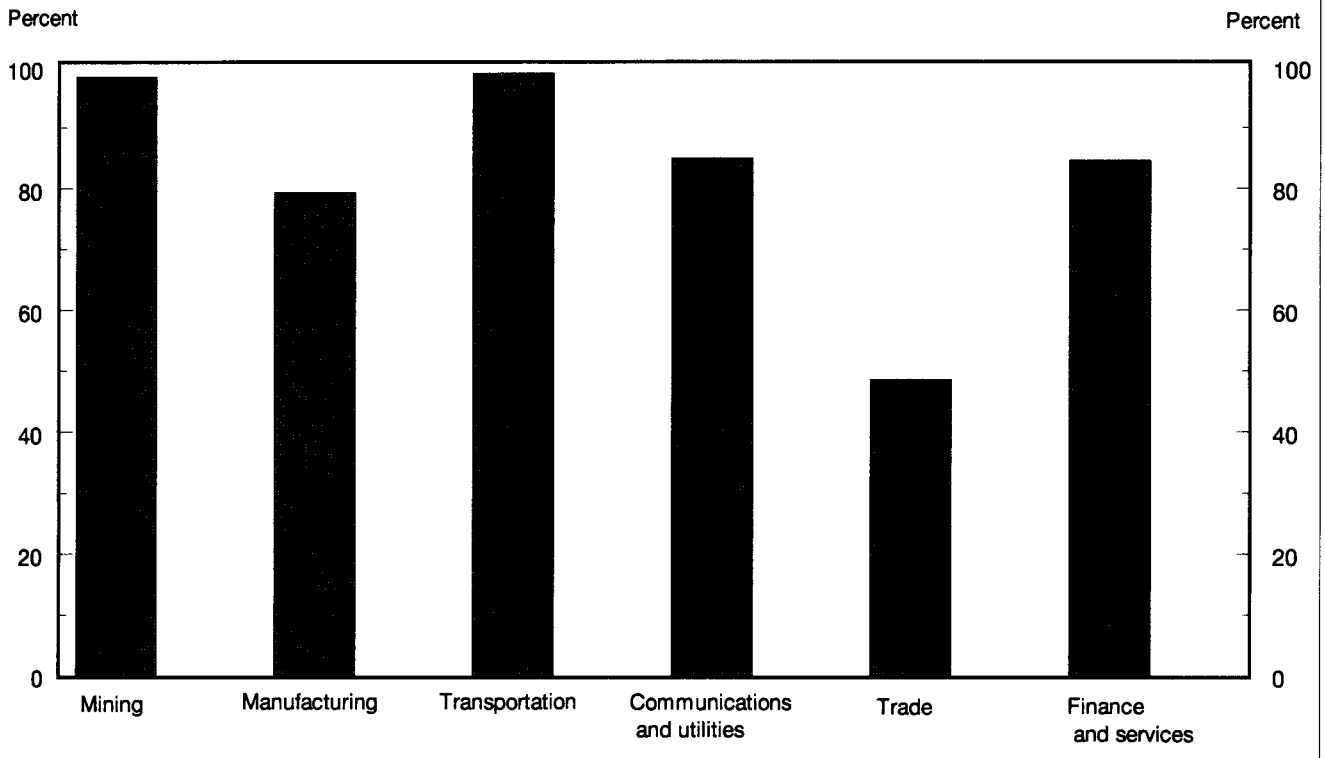

Table 2. Changes in output per hour, output, and employee hours for selected three-digit industries, 1987–96

SIC code	Industry	1996 employment (thousands)[1]	Average annual percent change, 1987–96		
			Output per hour[2]	Output	Employee hours
	Mining				
102	Copper ores	16	1.6	4.6	2.9
104	Gold and silver ores	20	3.4	7.6	4.0
122	Bituminous coal and lignite mining	90	6.1	1.0	–4.8
131	Crude petroleum and natural gas	143	2.6	–.9	–3.5
142	Crushed and broken stone	40	.8	1.2	.4
	Manufacturing				
201	Meat products	481	–.3	2.3	2.6
202	Dairy products	144	1.7	.5	–1.1
203	Preserved fruits and vegetables	237	1.0	1.7	.7
204	Grain mill products	127	.8	1.3	.5
205	Bakery products	210	–.5	–.7	–.2
206	Sugar and confectionery products	99	1.3	1.6	.3
207	Fats and oils	31	1.2	1.0	–.2
208	Beverages	179	3.4	2.2	–1.2
209	Miscellaneous food and kindred products	186	.8	2.2	1.4
211	Cigarettes	28	4.4	.7	–3.6
221	Broadwoven fabric mills, cotton	75	3.6	–.1	–3.6
222	Broadwoven fabric mills, manmade	66	4.7	1.2	–3.4
224	Narrow fabric mills	21	2.7	1.3	–1.4
225	Knitting mills	180	4.7	2.2	–2.3
226	Textile finishing, except wool	69	–2.5	–1.1	1.4
227	Carpets and rugs	61	.1	.3	.2
228	Yarn and thread mills	87	4.3	1.2	–3.0
229	Miscellaneous textile goods	51	2.5	2.2	–.3
231	Men's and boys' suits and coats	33	–.4	–6.5	–6.1
232	Men's and boys' furnishings	224	3.3	–.3	–3.5
233	Women's and misses' outerwear	255	4.2	.5	–3.5
234	Women's and children's undergarments	41	6.2	–.5	–6.3
235	Hats, caps, and millinery	19	–2.3	.7	3.1
238	Miscellaneous apparel and accessories	34	2.2	–.3	–2.4
239	Miscellaneous fabricated textile products	221	.7	2.3	1.6
241	Logging	80	–1.7	–2.0	–.4
242	Sawmills and planing mills	182	1.5	.4	–1.1
243	Millwork, plywood, and structural members	288	–.9	–.1	.8
244	Wood containers	53	.7	3.4	2.6
245	Wood buildings and mobile homes	89	–.3	2.5	2.9
249	Miscellaneous wood products	89	1.5	1.7	.2
251	Household furniture	275	2.3	.8	–1.5
252	Office furniture	62	.7	–.6	–1.3
253	Public building and related furniture	43	6.7	11.8	4.7
254	Partitions and fixtures	85	–.3	1.4	1.7
259	Miscellaneous furniture and fixtures	38	1.4	1.7	.3
261	Pulp mills	13	3.2	1.3	–1.8
262	Paper mills	161	1.3	.5	–.8
263	Paperboard mills	50	1.9	1.2	–.7
265	Paperboard containers and boxes	218	.7	1.6	.9
267	Miscellaneous converted paper products	240	1.5	1.8	.3
271	Newspapers	442	–2.8	–3.5	–.7
272	Periodicals	132	–1.1	–.4	.7
273	Books	125	.1	1.4	1.4
274	Miscellaneous publishing	86	–.8	.5	1.2
275	Commercial printing	564	.9	1.9	.9
276	Manifold business forms	44	–3.2	–4.4	–1.2
277	Greeting cards	27	–.9	.9	1.9
278	Blankbooks and bookbinding	66	1.6	.8	–.7
279	Printing trade services	52	2.7	1.3	–1.3
281	Industrial inorganic chemicals	83	1.1	.7	–.4
282	Plastics materials and synthetics	159	2.5	2.0	–.5
283	Drugs	259	1.4	3.4	2.1
284	Soaps, cleaners, and toilet goods	154	2.2	2.2	.1
285	Paints and allied products	53	2.4	.6	–1.8

Table 2. Continued—Changes in output per hour, output, and employee hours for selected three-digit industries, 1987–96

SIC code	Industry	1996 employment (thousands)[1]	Average annual percent change, 1987–96		
			Output per hour[2]	Output	Employee hours
286	Industrial organic chemicals	144	–0.2	–0.4	–0.2
287	Agricultural chemicals	52	1.2	1.7	.5
289	Miscellaneous chemical products	93	1.1	.9	–.1
291	Petroleum refining	100	4.0	1.3	–2.5
295	Asphalt paving and roofing materials	27	1.5	1.7	.2
299	Miscellaneous petroleum and coal products	14	–1.6	.5	2.1
301	Tires and inner tubes	80	3.7	2.8	–.9
305	Hose and belting and gaskets and packing	68	.8	3.3	2.5
306	Fabricated rubber products, n.e.c.	113	2.1	2.9	.8
308	Miscellaneous plastics products, n.e.c.	714	2.5	4.8	2.2
314	Footwear, except rubber	45	2.6	–4.6	–7.0
316	Luggage	11	.9	.6	–.3
317	Handbags and personal leather goods	11	–1.9	–6.5	–4.7
321	Flat glass	16	.5	.8	.4
322	Glass and glassware, pressed or blown	72	2.2	.4	–1.8
323	Products of purchased glass	60	2.5	4.4	1.8
324	Cement, hydraulic	17	2.8	1.4	–1.4
325	Structural clay products	33	2.0	.4	–1.6
326	Pottery and related products	40	2.0	2.9	.9
327	Concrete, gypsum, and plaster products	212	.8	1.0	.2
329	Miscellaneous nonmetallic mineral products	74	1.2	1.3	.1
331	Blast furnace and basic steel products	240	4.9	3.7	–1.1
332	Iron and steel foundries	129	1.6	2.0	.3
333	Primary nonferrous metals	40	1.2	1.0	–.2
335	Nonferrous rolling and drawing	168	.4	–.1	–.5
336	Nonferrous foundries (castings)	89	2.3	3.0	.7
339	Miscellaneous primary metal products	29	4.6	6.1	1.5
341	Metal cans and shipping containers	39	5.0	.7	–4.1
342	Cutlery, handtools, and hardware	125	1.8	1.2	–.6
343	Plumbing and heating, except electric	58	1.9	1.2	–.7
344	Fabricated structural metal products	439	.7	1.5	.8
345	Screw machine products, bolts, etc.	101	1.1	2.2	1.1
346	Metal forgings and stampings	253	1.4	2.8	1.4
347	Metal services, n.e.c.	133	2.7	4.8	2.0
348	Ordnance and accessories, n.e.c.	48	–1.5	–6.6	–5.2
349	Miscellaneous fabricated metal products	254	.9	2.7	1.7
351	Engines and turbines	84	3.6	2.6	–.9
352	Farm and garden machinery	99	3.5	4.3	.7
353	Construction and related machinery	232	2.4	3.8	1.3
354	Metalworking machinery	346	1.5	3.0	1.4
355	Special industry machinery	178	3.4	5.3	1.8
356	General industrial machinery	257	1.1	2.6	1.5
358	Refrigeration and service machinery	205	1.5	3.6	2.0
359	Industrial machinery, n.e.c.	349	4.0	5.7	1.7
361	Electric distribution equipment	82	4.2	1.7	–2.4
362	Electrical industrial apparatus	156	4.9	3.5	–1.3
363	Household appliances	121	2.7	1.6	–1.1
364	Electric lighting and wiring equipment	178	1.8	1.1	–.7
366	Communications equipment	269	7.4	7.1	–.3
369	Miscellaneous electrical equipment and supplies	153	2.3	1.5	–.8
371	Motor vehicles and equipment	963	.4	2.2	1.8
372	Aircraft and parts	460	1.3	–2.9	–4.1
373	Ship and boat building and repairing	157	.1	–1.6	–1.7
374	Railroad equipment	36	4.3	8.4	3.9
375	Motorcycles, bicycles, and parts	22	2.4	9.7	7.2
376	Guided missiles, space vehicles, parts	90	2.7	–6.2	–8.7
381	Search and navigation equipment	161	4.0	–4.1	–7.7
382	Measuring and controlling devices	297	4.6	4.2	–.4
384	Medical instruments and supplies	268	3.8	6.2	2.3
385	Ophthalmic goods	36	7.3	6.7	–.6
386	Photographic equipment and supplies	85	2.9	.2	–2.6
391	Jewelry, silverware, and plated ware	49	.4	–.5	–.8
393	Musical instruments	16	–2.6	–.4	2.3
394	Toys and sporting goods	114	2.0	4.0	1.9

Table 2. Continued—Changes in output per hour, output, and employee hours for selected three-digit industries, 1987–96

SIC code	Industry	1996 employment (thousands)[1]	Average annual percent change, 1987–96		
			Output per hour[2]	Output	Employee hours
395	Pens, pencils, office, and art supplies	31	4.2	3.5	–0.7
396	Costume jewelry and notions	24	4.0	.3	–3.6
399	Miscellaneous manufactures	153	1.4	2.5	1.1
	Transportation				
431	U.S. Postal Service [3]	856	.5	1.7	1.2
	Communications				
481	Telephone communications	898	5.5	5.7	.1
483	Radio and television broadcasting stations	243	.5	1.2	.6
484	Cable and other pay television stations	171	–2.3	3.2	5.7
	Trade				
521	Lumber and other building materials dealers	546	1.6	4.0	2.3
523	Paint, glass, and wallpaper stores	70	2.1	1.0	–1.0
525	Hardware stores	181	2.0	1.9	–.1
526	Retail nurseries, lawn and garden supply stores	98	1.9	1.2	–.7
531	Department stores	2,388	1.3	4.2	2.8
533	Variety stores	140	6.4	–.6	–6.6
539	Miscellaneous general merchandise stores	208	5.6	5.4	–.2
541	Grocery stores	3,141	–1.3	.0	1.3
542	Meat and fish (seafood) markets	59	–1.6	–3.4	–1.9
546	Retail bakeries	213	–2.8	–1.8	1.0
551	New and used car dealers	1,032	.8	1.9	1.1
553	Auto and home supply stores	411	.6	2.3	1.7
554	Gasoline service stations	698	1.5	1.1	–.4
561	Men's and boys' wear stores	85	2.9	–.6	–3.3
562	Women's clothing stores	314	3.0	–.4	–3.3
565	Family clothing stores	349	3.0	6.0	2.9
566	Shoe stores	200	3.1	1.1	–2.0
569	Miscellaneous apparel and accessory stores	102	1.6	5.1	3.4
571	Furniture and homefurnishings stores	570	1.9	2.6	.7
572	Household appliance stores	87	2.8	1.3	–1.4
573	Radio, television, computer, and music stores	444	7.1	11.9	4.5
581	Eating and drinking places	7,737	–.2	1.7	1.9
591	Drug and proprietary stores	624	.6	1.2	.6
592	Liquor stores	137	1.1	–1.6	–2.6
593	Used merchandise stores	175	–.4	3.7	4.1
594	Miscellaneous shopping goods stores	1,135	1.8	3.6	1.8
596	Nonstore retailers	558	2.9	4.7	1.8
598	Fuel dealers	103	–1.1	–2.1	–1.1
599	Retail stores, n.e.c.	635	2.7	4.4	1.7
	Finance and services				
602	Commercial banks	1,466	3.1	2.1	–.9
701	Hotels and motels	1,694	1.0	2.7	1.7
721	Laundry, cleaning, and garment services	524	.9	1.4	.5
722	Photographic studios, portrait	91	2.3	6.1	3.7
723	Beauty shops	716	.5	1.9	1.4
724	Barber shops	58	2.3	–1.6	–3.8
726	Funeral services and crematories	104	–.3	1.4	1.7
753	Automotive repair shops	891	1.4	3.2	1.8
783	Motion picture theaters	121	.1	1.5	1.5
	Combination industries				
12	Coal mining	96	6.0	1.1	–4.7
13	Oil and gas extraction	317	1.1	–.9	–2.0
14	Nonmetallic minerals, except fuels	106	.5	.4	.0
211,2,3	Tobacco products	34	4.0	.5	–3.3
211,3	Cigarettes, chewing and smoking tobacco	31	4.1	.5	–3.4
221,2	Cotton and synthetic broadwoven fabrics	141	4.3	.7	–3.5
261,2,3	Pulp, paper, and paperboard mills	223	1.8	.9	–.8
491,2,3	Gas and electric utilities	697	3.6	2.0	–1.6
491,3(PT)	Electric utilities[4]	519	4.3	2.6	–1.6
492,3(PT)	Gas utilities [5]	178	1.5	.2	–1.3

Table 2. Continued—Changes in output per hour, output, and employee hours for selected three-digit industries, 1987–96

SIC code	Industry	1996 employment (thousands)[1]	Average annual percent change, 1987–96		
			Output per hour[2]	Output	Employee hours
54	Food stores	3,610	–1.3	–0.1	1.2
56	Apparel and accessory stores	1,156	2.9	2.3	–.5
57	Home furniture, furnishings, and equipment stores	1,101	4.0	5.9	1.8
572,3	Appliance, radio, television, and computer stores	531	6.4	9.8	3.2
58	Eating and drinking places	7,737	–.2	1.7	1.9
723,4	Beauty and barber shops	774	.7	1.5	.8

[1] Employment figures are based primarily on data from the BLS Current Employment Statistics (CES) program and the Current Population Survey (CPS).

[2] Output per hour of all persons is used for all trade and services industries except SIC 531 and SIC 551. "All persons" include self-employed and unpaid family workers as well as employees.

[3] Employee hours in SIC 431 are based on the number of full-time-equivalent employee years, as reported in the U.S. Postal Service budget. Full-time-equivalent employee years are computed by dividing total hours of full-time, part-time, and intermittent workers by the number of hours in a standard work year. The output and hours indexes for SIC 431 reflect the Federal fiscal year.

[4] Only the part of the combination utilities (SIC 493) supplying electric services is included here.

[5] Only the part of the combination utilities (SIC 493) supplying gas services is included here.

NOTE: n.e.c. = not elsewhere classified.

industries not passing the publication criteria are available from BLS upon request.

Productivity trends, 1987–96

Overall database. The wide range of productivity performance among all the industries for which BLS produces productivity series is depicted in chart 1. The chart shows the distribution of productivity growth rates for the 1987–96 period for all nonduplicated industries in the database (that is, all four-digit industries and all three-digit industries for which component four-digit series have not been computed). Despite the wide range of performance, a strong central tendency can be seen; almost half the industries had growth rates in the range between 0.0 and 3.0 percent.

The productivity trend for the 1987–96 period was positive for the majority of industries. Industries with rising productivity accounted for 68 percent of the employment of the industries measured. However, the proportion of industries experiencing productivity growth varied by sector. Chart 2 shows the percent of employment in industries with rising productivity.

For example, in the mining sector and the transportation sector, productivity rose in industries accounting for 99 percent of employment. In communications and utilities and in finance and services, 85 percent of employment was in industries in which productivity rose over the period. In the manufacturing sector, industries with rising productivity accounted for 78 percent of employment, while only 49 percent of the employment in the trade sector was in industries recording productivity gains.

The analysis that follows pertains only to the industries with published productivity series. Data for the three-digit industries are presented in tables 2 and 3. (Data for the four-digit industries are presented in appendix B, table B-1.)

Three-digit industries. During the 1987–96 period, the productivity of workers in the U.S. nonfarm business sector increased at an average annual rate of 1.0 percent. Productivity for the manufacturing sector advanced at a much faster rate of 2.8 percent per year. Examining the industries within various sectors can provide some insights into the sources of these differences.

While labor productivity grew in all sectors of the economy during the 1987–96 period, the manufacturing industries overall performed better than did the nonmanufacturing industries. Manufacturing industries with positive productivity change during the period accounted for 87 percent of the employment of published industries in that sector. In contrast, nonmanufacturing industries with rising productivity accounted for only 62 percent of employment of that sector. It should be emphasized, however, that the nonmanufacturing industries presented in this analysis might not be representative of the entire sector, as several subsectors—business services, contract construction, and wholesale trade—have little or no coverage.

Table 2 presents the 1987–96 average annual rates of growth in output per hour, output, and employee hours for 169 three-digit industries. Over the 1987–96 period, labor productivity increased in 142 (84 percent) of these industries. For more than 61 percent of the three-digit industries, labor productivity grew at an annual average rate that was between 0.0 percent and 3.0 percent.

Table 3. Changes in output per hour and related data, 1987–96, for three-digit industries with 1996 employment greater than 400,000

SIC code	Industry	1996 employment (thousands)[1]	Average annual percent change, 1987–96		
			Output per hour[2]	Output	Employee hours
581	Eating and drinking places	7,737	–0.2	1.7	1.9
541	Grocery stores	3,141	–1.3	.0	1.3
531	Department stores[3]	2,388	1.3	4.2	2.8
701	Hotels and motels	1,694	1.0	2.7	1.7
602	Commercial banks[3]	1,466	3.1	2.1	–.9
594	Miscellaneous shopping goods stores	1,135	1.8	3.6	1.8
551	New and used car dealers[3]	1,032	.8	1.9	1.1
371	Motor vehicles and equipment[3]	963	.4	2.2	1.8
481	Telephone communications[3]	898	5.5	5.7	.1
753	Automotive repair shops	891	1.4	3.2	1.8
431	U.S. Postal Service[4]	856	.5	1.7	1.2
723	Beauty shops	716	.5	1.9	1.4
308	Miscellaneous plastics products, n.e.c.[3]	714	2.5	4.8	2.2
554	Gasoline service stations	698	1.5	1.1	–.4
599	Retail stores, n.e.c.	635	2.7	4.4	1.7
591	Drug and proprietary stores	624	.6	1.2	.6
571	Furniture and homefurnishings stores	570	1.9	2.6	.7
275	Commercial printing[3]	564	.9	1.9	.9
596	Nonstore retailers	558	2.9	4.8	1.8
521	Lumber and other building materials dealers	546	1.6	4.0	2.3
721	Laundry, cleaning, and garment services	524	.9	1.4	.5
201	Meat products[3]	481	–.3	2.3	2.6
372	Aircraft and parts[3]	460	1.3	–2.9	–4.1
573	Radio, television, computer, and music stores	444	7.1	11.9	4.5
271	Newspapers[3]	442	–2.8	–3.5	–.7
344	Fabricated structural metal products[3]	439	.7	1.5	.8
553	Auto and home supply stores	411	.6	2.3	1.7

[1] Employment is based primarily on data from the BLS Current Employment Statistics (CES) program and the Current Population Survey (CPS).

[2] Output per hour of all persons including self-employed as well as employees, except as noted.

[3] Output per employee hour.

[4] Employee hours in SIC 431 are based on the number of full-time-equivalent employee years, as reported in the U.S. Postal Service budget. Full-time-equivalent employee years are computed by dividing total hours of full-time, part-time, and intermittent workers by the number of hours in a standard work year. The output and hours indexes for SIC 431 reflect the Federal fiscal year.

NOTE: n.e.c. = not elsewhere classified.

For most industries, there is a positive relationship between output growth and productivity growth. In general, industries with expanding output were more likely to exhibit increasing labor productivity. Almost 92 percent of the three-digit industries with expanding output had labor productivity growth during the 1987–96 period, compared with about 55 percent of industries with declining output.

The overall upward trend in productivity during the period was reflected in the productivity performance of the largest industries. Table 3 shows the 1987–96 average annual change in output per hour and related measures for the three-digit industries with employment greater than 400,000, in order of employment size. Most of the largest industries are service-producing rather than goods-producing industries. Only 7 of the 27 industries listed in table 3 are manufacturing industries, and none are mining industries. The remaining 20 industries in table 3 come from the retail trade, transportation, utilities, and finance and services sectors.

Of the large industries shown in table 3, those with the fastest average annual growth in productivity for the period were radio, television, and computer stores (7.1 percent); telephone communications (5.5 percent); and commercial banks (3.1 percent). The manufacturing industry with the fastest productivity growth was miscellaneous plastics products, not elsewhere classified (2.5 percent).

While most large industries recorded rising labor productivity, 4 of the 27 suffered productivity losses. Among the four were the two largest industries, both in retail trade. Eating and drinking places (SIC 581, with 7.7 million employees in 1996) declined by 0.2 percent. Grocery stores (SIC 541, with 3.1 million employees in 1996) fell by 1.3 percent. The productivity performance of these two industries had a major effect on the overall productivity performance of retail trade.

THE PUBLISHED INDEXES and rates of change in productivity, output, and hours are available from the BLS Industry Productivity web site.[8] Underlying data for production workers, production worker hours, nonproduction workers, nonproduction worker hours, the number of employees, the number of all employee hours, and the value of net production are available upon request. Unpublished data, supplied in print or by e-mail or diskette, also are available upon request. □

Footnotes

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[1] These industries are defined in the *Standard Industrial Classification Manual: 1987* (Office of Management and Budget).

[2] See the most recent annual bulletin, *Productivity Measures for Selected Industries*, BLS Bulletin 2491 (Bureau of Labor Statistics, August 1997).

[3] The increase in the industries and products covered by the BLS Industrial Prices and Price Indexes program during the 1980s and early 1990s was particularly helpful. From 1980 to the early 1990s, the percentage of the value of shipments of manufactured products covered directly by Producer Price Indexes jumped from around 50 percent to well over 80 percent. Improvements in price coverage were made in nonmanufacturing industries as well.

[4] *Standard Industrial Classification Manual: 1987.*

[5] Productivity and related data through 1996 for all 20 two-digit manufacturing industries are available from the Bureau's Division of Productivity Research.

[6] Many conceptual problems exist in the development of productivity data for service producing industries. See Mark Sherwood, "Difficulties in the measurement of service outputs," *Monthly Labor Review*, March 1994, pp. 11–19.

[7] An industry was judged reliable if the standard deviation of its annual productivity changes was less than 10.0 and it had 10,000 or more employees for mining and manufacturing industries, or 50,000 or more employees for all other industries.

[8] The productivity Web site is <http://stats.bls.gov/iprhome.htm>. Also available are indexes and rates of change for output per employee and employees. The data in these files extend back to 1987. For industries with previously published series, additional files contain data that go back to earlier years, in many cases to 1958, and to 1947 in a few cases.

Appendix A: Methods and data underlying the series

The productivity series and the underlying indexes of output and labor input are constructed with methods consistent with modern economic theory. These series were compiled, using database software, to form a database designed to facilitate further research on productivity issues.

Labor productivity is calculated as output per employee hour or output per hour of all persons working in the industry. The indexes of output per hour are computed by dividing an index of output by an index of aggregate hours. "All persons" include self-employed and unpaid family workers as well as employees. For industries in which there are few self-employed and unpaid family workers, such as manufacturing industries, output per employee hour is measured.

Törnqvist indexes. Wherever possible, output is calculated with a formula that aggregates the growth rates of the various industry products between two periods with weights based on the products' shares in industry value of production. The weight for each product equals its average value share in the two periods. Specifically, output is calculated with the Törnqvist formula

$$\frac{Q_t}{Q_{t-1}} = \exp\left[\sum_{i=1}^{n} w_{i,t}\left(\ln\frac{q_{i,t}}{q_{i,t-1}}\right)\right],$$

where

$\frac{Q_t}{Q_{t-1}}$ = the ratio of output in the current year (t) to output in the previous year (t - 1),

$\ln\frac{q_{i,t}}{q_{i,t-1}}$ = logarithm of the ratio of the quantity of product i in the current year to that of the previous year,

n = number of products, and

$w_{i,t}$ = average value share weight for product i.

The average value share weight for product j is computed as

$$w_{j,t} = \left(s_{j,t} + s_{j,t-1}\right) \div 2 ,$$

where

$$s_{j,t} = p_{j,t}\, q_{j,t} \div \left(\sum_{i=1}^{n} p_{i,t}\, q_{i,t}\right) \quad \text{and}$$

$p_{i,t}$ = price of product i at time t.

The Törnqvist formula yields the ratio of output in a given year to that in the previous year. The ratios for successive years must be chained together to form a time series. If $t = 3$ and the base year is denoted by the subscript 0, then,

$$\frac{Q_t}{Q_0} = \frac{Q_3}{Q_0} = \left(\frac{Q_3}{Q_2}\right) \times \left(\frac{Q_2}{Q_1}\right) \times \left(\frac{Q_1}{Q_0}\right).$$

The resulting chained output index $\frac{Q_t}{Q_{t-1}}$ is used as the numerator in the productivity formula.

The quantities of products used in the output index (the q_i's) are measured either with deflated values of production or with actual physical quantities. For most industries in manufacturing, communications, retail trade, and services, output indexes are derived from data on the value of industry output or sales, adjusted for price change (that is, the deflated value of production). Törnqvist aggregations of these deflated values are then calculated to derive output indexes. For industries in mining, utilities, and wholesale trade, and for most transportation industries, physical quantity output indexes are derived as Törnqvist aggregations of quantities of component products. The

Törnqvist aggregation method is used in calculating the output index for most industries; one notable exception is commercial banking, in which the annual changes in different outputs are combined using employment weights that are changed every 5 years.

Annual output indexes based on deflated values of production. For manufacturing industries, value of shipments data are divided by price indexes for each five-digit product class in the industry. The price indexes are mostly BLS Producer Price Indexes. After aggregation of the product class data, adjustments are made to include the value of secondary products, exclude the value of primary products made in other industries, and include the value of inventory change. In the benchmark indexes, an adjustment also is made to remove double counting of intraindustry shipments, that is, shipments between plants in the same industry.

For industries in communications, retail trade, and services (and for a few transportation industries), data on the value of sales for each year are divided by price indexes to derive measures of changes in the industries' real output. These price indexes are, for the most part, Producer and Consumer Price Indexes developed by BLS.

Annual output indexes based on physical quantities of production. Physical quantity output indexes are, in all possible cases, a Törnqvist aggregation of quantities of component products. Examples of such products include tons of steel, BTU's of electricity, or revenue passenger miles and freight-ton miles. The finest level of detail available is used. The output measure for utilities, wholesale trade, and most transportation industries are physical quantity measures. The output measures for a few industries in manufacturing also are based on physical quantities.

Benchmark indexes. To make maximum use of the comprehensive data from the economic censuses, output indexes were also derived, where possible, from data for two consecutive quinquennial censuses; these indexes are referred to as benchmark indexes. Annual indexes for intercensal years are adjusted to the benchmark levels for the census years. For years following the most recent census year (1992), annual indexes are linked to the benchmark index.

For manufacturing industries, benchmark indexes are computed from value of shipments and inventory data reported in the Census of Manufactures. For retail trade industries, the indexes are computed from sales data reported in the Census of Retail Trade. Benchmark indexes for the service industries are computed from data reported in the Census of Service Industries. The output indexes for industries in transportation, communications, utilities, and wholesale trade are not benchmarked.

Indexes of labor input. The indexes of labor input, used as the denominator in the productivity formula, are employee-hour indexes or all-person-hour indexes. These are developed primarily from basic data compiled by BLS and the Bureau of the Census. BLS data are from the Current Employment Statistics survey (a monthly establishment survey in which 390,000 representative establishments report employment, hours, and earnings data to BLS and supportive State agencies) and the Current Population Survey (a monthly household survey conducted by the Bureau of the Census for BLS). Bureau of the Census data are from the economic censuses and the Census of Population. The hours indexes are developed by dividing the aggregate hours for each year by the base-period aggregate. Because of data limitations, employee hours are treated as homogeneous and additive with no distinction made between hours of different groups of employees.

Appendix B: Changes in output per hour, output, and employee hours for selected industries, 1987–96

Table B–1. Productivity and related measures for four-digit industries, 1987–96

SIC code	Industry	1996 employment (thousands)[1]	Average annual percent change, 1987–96		
			Output per hour[2]	Output	Employee hours
1021	Copper mining, recoverable metal	16	1.6	4.6	2.9
1041	Gold ores	18	2.5	8.0	5.4
1311	Crude petroleum and natural gas production	143	2.6	–.9	–3.5
	Manufacturing				
2011	Meat packing plants	147	–.5	.6	1.1
2013	Sausages and other prepared meats	96	–.4	2.0	2.4
2015	Poultry slaughtering and processing	238	2.1	6.0	3.8
2022	Cheese, natural and processed	41	1.9	2.1	.2
2023	Dry, condensed, and evaporated dairy products	17	–.9	–.4	.5
2024	Ice cream and frozen desserts	22	3.3	3.7	.4
2026	Fluid milk	62	1.3	–1.4	–2.6
2032	Canned specialties	20	2.5	1.4	–1.0
2033	Canned fruits and vegetables	77	.6	.6	.0
2037	Frozen fruits and vegetables	48	2.4	2.3	–.1
2038	Frozen specialties, n.e.c.	52	.3	4.2	3.9
2041	Flour and other grain mill products	19	2.3	.4	–1.9
2043	Cereal breakfast foods	20	–1.7	–.6	1.1
2045	Prepared flour mixes and doughs	13	1.4	5.4	3.9
2047	Dog and cat food	19	–2.7	1.8	4.7
2048	Prepared feeds, n.e.c.	41	1.8	.8	–1.0
2051	Bread, cake, and related products	149	–1.8	–2.5	–.7
2052	Cookies and crackers	51	.5	1.5	1.0
2064	Candy and other confectionery products	59	1.6	2.6	.9
2066	Chocolate and cocoa products	13	.0	–.9	–.9
2082	Malt beverages	37	1.9	1.3	–.5
2084	Wines, brandy, and brandy spirits	20	1.1	4.0	2.9
2086	Bottled and canned soft drinks	93	5.6	2.9	–2.5
2087	Flavoring extracts and syrups, n.e.c.	20	.1	3.4	3.3
2092	Fresh or frozen prepared fish	47	–2.2	.8	3.1
2096	Potato chips and similar snacks	33	4.8	4.8	–.1
2099	Food preparations, n.e.c.	72	–.1	2.8	2.9
2111	Cigarettes	28	4.4	.7	–3.6
2211	Broadwoven fabrics mills, cotton	75	3.6	–.1	–3.6
2221	Broadwoven fabrics mills, manmade fiber and silk	66	4.7	1.2	–3.4
2241	Narrow fabrics mills	21	2.7	1.3	–1.4
2251	Women's hosiery, except socks	21	4.7	–1.3	–5.7
2252	Hosiery, n.e.c.	40	3.4	4.0	.5
2253	Knit outerwear mills	54	9.0	5.9	–2.9
2261	Finishing plants, cotton	32	.3	3.7	3.3
2262	Finishing plants, manmade	22	–1.8	–2.3	–.5
2273	Carpets and rugs	61	.1	.3	.2
2281	Yarn spinning mills	65	4.7	.9	–3.6
2282	Throwing and winding mills	16	3.2	2.6	–.6
2297	Nonwoven fabrics	12	.4	4.1	3.7
2311	Men's and boys' suits and coats	33	–.4	–6.5	–6.1
2321	Men's and boys' shirts	47	6.1	–.3	–6.0
2325	Men's and boys' trousers and slacks	76	2.6	.4	–2.1
2326	Men's and boys' work clothing	33	5.1	.1	–4.8
2329	Men's and boys' clothing, n.e.c.	44	1.0	–.2	–1.3
2331	Women's, misses', and juniors' blouses and shirts	26	3.9	–2.6	–6.3
2337	Women's, misses', and juniors' suits and coats	25	2.6	–2.3	–4.7
2341	Women's and children's underwear	30	4.6	–3.4	–7.6
2353	Hats, caps, and millinery	19	–2.3	.7	3.1
2391	Curtains and draperies	20	–3.2	–5.8	–2.7
2392	Housefurnishings, n.e.c.	55	1.5	2.1	.6
2394	Canvas and related products	19	–2.4	–1.1	1.3
2395	Pleating and stitching	19	–5.8	–3.3	2.7
2396	Automotive and apparel trimmings	62	–.3	4.2	4.5
2399	Fabricated textile products, n.e.c.	30	5.2	5.8	.5
2411	Logging	80	–1.7	–2.0	–.4
2421	Sawmills and planing mills, general	145	1.7	.3	–1.3

Table B-1. Continued—Productivity and related measures for four-digit industries, 1987–96

SIC code	Industry	1996 employment (thousands)[1]	Average annual percent change, 1987–96		
			Output per hour[2]	Output	Employee hours
2426	Hardwood dimension and flooring mills	36	1.6	1.9	0.3
2431	Millwork	114	–1.6	–1.1	.5
2434	Wood kitchen cabinets	79	.0	1.0	1.0
2435	Hardwood veneer and plywood	28	–2.1	–.3	1.9
2436	Softwood veneer and plywood	31	–.7	–2.5	–1.8
2439	Structural wood members, n.e.c.	37	2.4	5.7	3.3
2448	Wood pallets and skids	41	–.4	3.8	4.2
2451	Mobile homes	68	.0	4.8	4.8
2452	Prefabricated wood buildings	21	–.8	–2.4	–1.6
2491	Wood preserving	12	1.7	.7	–1.0
2493	Reconstituted wood products	21	1.2	4.0	2.8
2499	Wood products, n.e.c.	56	.7	.2	–.5
2511	Wood household furniture	124	1.1	–.4	–1.5
2512	Upholstered household furniture	86	4.4	2.4	–1.9
2514	Metal household furniture	21	–.3	–2.8	–2.5
2515	Mattresses and bedsprings	33	1.4	2.8	1.4
2521	Wood office furniture	29	.3	–1.4	–1.7
2522	Office furniture, except wood	33	.7	–.3	–1.0
2531	Public building and related furniture	43	6.7	11.8	4.7
2541	Wood partitions and fixtures	49	–1.7	.5	2.2
2542	Partitions and fixtures, except wood	37	1.2	2.2	1.0
2591	Drapery hardware and blinds and shades	21	.2	–.6	–.8
2599	Furniture and fixtures, n.e.c.	17	1.7	3.4	1.7
2611	Pulp mills	13	3.2	1.3	–1.8
2621	Paper mills	161	1.3	.5	–.8
2631	Paperboard mills	50	1.9	1.2	–.7
2653	Corrugated and solid fiber boxes	130	.2	2.2	2.0
2655	Fiber cans, drums, and similar products	15	–.3	–.9	–.6
2656	Sanitary food containers	18	–3.2	–1.8	1.5
2657	Folding paperboard boxes	48	2.7	2.0	–.6
2671	Paper coated and laminated, packaging	22	3.0	4.4	1.3
2672	Paper coated and laminated, n.e.c.	47	1.3	2.9	1.5
2673	Bags: plastics, laminated, and coated	38	.2	2.0	1.8
2674	Bags: uncoated paper and multiwall	18	–1.3	–2.0	–.7
2675	Die-cut paper and board	20	–1.5	.7	2.3
2676	Sanitary paper products	30	2.2	1.7	–.5
2677	Envelopes	24	1.8	.4	–1.3
2679	Converted paper products, n.e.c.	35	4.7	2.9	–1.7
2711	Newspapers	442	–2.8	–3.5	–.7
2721	Periodicals	132	–1.1	–.4	.7
2731	Book publishing	86	.8	1.2	.4
2732	Book printing	39	–1.2	2.5	3.7
2741	Miscellaneous publishing	86	–.8	.5	1.2
2752	Commercial printing, lithographic	367	.9	1.9	1.0
2754	Commercial printing, gravure	20	–1.2	3.0	4.2
2759	Commercial printing, n.e.c.	177	.9	1.4	.5
2761	Manifold business forms	44	–3.2	–4.4	–1.2
2771	Greeting cards	27	–.9	.9	1.9
2782	Blankbooks and looseleaf binders	38	2.1	.6	–1.5
2789	Bookbinding and related work	28	.9	1.4	.4
2791	Typesetting	19	5.3	–1.5	–6.4
2796	Platemaking services	32	–.3	3.1	3.4
2813	Industrial gases	24	–1.7	.1	1.8
2816	Inorganic pigments	12	.5	2.0	1.5
2819	Industrial inorganic chemicals, n.e.c.	37	2.6	.5	–2.1
2821	Plastics materials and resins	76	2.4	2.6	.2
2822	Synthetic rubber	17	.7	2.7	1.9
2824	Organic fibers, noncellulosic	49	3.4	.8	–2.5
2834	Pharmaceutical preparations	206	–.4	1.6	2.0
2841	Soap and other detergents	41	2.5	1.3	–1.1
2842	Polishes and sanitation goods	34	2.3	1.9	–.5
2844	Toilet preparations	72	2.4	3.3	.9
2851	Paints and allied products	53	2.4	.6	–1.8
2865	Cyclic crudes and intermediates	26	2.4	1.4	–1.0

Table B-1. Continued—Productivity and related measures for four-digit industries, 1987–96

SIC code	Industry	1996 employment (thousands)[1]	Average annual percent change, 1987–96		
			Output per hour[2]	Output	Employee hours
2869	Industrial organic chemicals, n.e.c.	116	–0.8	–0.6	0.2
2879	Agricultural chemicals, n.e.c.	24	–.3	2.3	2.5
2891	Adhesives and sealants	25	–.9	.0	1.0
2893	Printing ink	16	.7	3.1	2.4
2899	Chemical preparations, n.e.c.	42	.9	1.4	.6
2911	Petroleum refining	100	4.0	1.3	–2.5
2951	Asphalt paving mixtures and blocks	14	.2	1.2	1.0
2952	Asphalt felts and coatings	13	2.9	2.3	–.6
2992	Lubricating oils and greases	12	–1.3	.6	1.9
3011	Tires and inner tubes	80	3.7	2.8	–.9
3052	Rubber and plastics hose and belting	28	.1	1.3	1.2
3053	Gaskets, packing, and sealing devices	40	1.4	5.0	3.6
3061	Mechanical rubber goods	50	3.2	3.5	.3
3069	Fabricated rubber products, n.e.c.	63	1.4	2.7	1.3
3081	Unsupported plastics film and sheet	63	1.4	3.9	2.5
3082	Unsupported plastics profile shapes	24	7.0	5.2	–1.7
3083	Laminated plastics plate, sheet, and profile shapes	24	–3.6	–1.0	2.7
3084	Plastics pipe	17	3.0	5.1	2.0
3085	Plastics bottles	32	5.4	7.1	1.6
3086	Plastics foam products	56	2.9	4.2	1.3
3087	Custom compounding of purchased plastics resins	26	7.8	8.2	.3
3088	Plastics plumbing fixtures	18	4.5	11.3	6.5
3089	Plastics products, n.e.c.	454	2.1	4.7	2.6
3143	Men's footwear, except athletic	23	2.9	–2.4	–5.1
3144	Women's footwear, except athletic	13	–2.4	–11.2	–9.1
3161	Luggage	11	.9	.6	–.3
3211	Flat glass	16	.5	.8	.4
3221	Glass containers	28	1.9	–2.7	–4.5
3229	Pressed and blown glass, n.e.c.	44	3.1	3.8	.6
3231	Products of purchased glass	60	2.5	4.4	1.8
3241	Cement, hydraulic	17	2.8	1.4	–1.4
3251	Brick and structural clay tile	14	2.4	–.5	–2.8
3269	Pottery products, n.e.c.	14	–1.1	1.5	2.6
3271	Concrete block and brick	18	2.6	1.2	–1.4
3272	Concrete products, n.e.c.	70	2.5	2.5	.1
3273	Ready-mixed concrete	106	–.7	.1	.8
3275	Gypsum products	13	3.1	1.8	–1.2
3291	Abrasive products	20	1.4	.5	–.9
3295	Minerals, ground or treated	13	.9	1.7	.8
3296	Mineral wool	24	1.9	1.3	–.6
3312	Blast furnaces and steel mills	169	5.8	3.9	–1.8
3315	Steel wire and related products	21	1.7	3.0	1.3
3316	Cold finishing of steel shapes	17	1.5	2.0	.6
3317	Steel pipe and tubes	27	3.2	4.7	1.5
3321	Gray and ductile iron foundries	82	1.7	2.3	.6
3324	Steel investment foundries	16	–1.5	.2	1.7
3325	Steel foundries, n.e.c.	27	1.9	2.4	.6
3334	Primary aluminum	23	.7	.8	.1
3351	Copper rolling and drawing	22	.4	.4	.0
3353	Aluminum sheet, plate, and foil	22	1.2	–1.3	–2.5
3354	Aluminum extruded products	32	–.8	–1.0	–.2
3356	Nonferrous rolling and drawing, n.e.c.	14	1.7	1.0	–.7
3357	Nonferrous wiredrawing and insulating	73	2.0	1.5	–.5
3363	Aluminum die-castings	37	–1.1	3.5	4.7
3365	Aluminum foundries	24	4.9	3.4	–1.4
3398	Metal heat treating	18	6.1	8.9	2.6
3399	Primary metal products, n.e.c.	11	3.4	3.3	–.1
3411	Metal cans	32	5.3	1.0	–4.1
3421	Cutlery	12	2.1	3.5	1.4
3423	Hand and edge tools, n.e.c.	36	.7	.5	–.2
3429	Hardware, n.e.c.	69	1.6	.4	–1.2
3432	Plumbing fixture fittings and trim	23	3.0	1.1	–1.8
3433	Heating equipment, except electric	20	2.8	1.7	–1.1
3441	Fabricated structural metal	75	1.4	1.3	.0

Table B-1. Continued—Productivity and related measures for four-digit industries, 1987–96

SIC code	Industry	1996 employment (thousands)[1]	Average annual percent change, 1987–96		
			Output per hour[2]	Output	Employee hours
3442	Metal doors, sash, and trim	76	–0.1	–0.4	–0.3
3443	Fabricated plate work (boiler shops)	101	1.0	2.6	1.6
3444	Sheet metal work	116	–.5	1.9	2.4
3446	Architectural metal work	30	1.1	.7	–.4
3448	Prefabricated metal buildings	28	.1	1.1	1.0
3449	Miscellaneous metal work	13	6.2	2.8	–3.2
3451	Screw machine products	52	3.1	4.8	1.6
3452	Bolts, nuts, rivets, and washers	49	–.1	.4	.5
3462	Iron and steel forgings	30	1.8	2.1	.4
3465	Automotive stampings	117	1.2	3.4	2.1
3469	Metal stampings, n.e.c.	93	2.1	2.9	.8
3471	Plating and polishing	81	.7	1.9	1.2
3479	Metal coating and allied services	52	3.9	7.4	3.3
3483	Ammunition, except for small arms, n.e.c.	24	–7.7	–13.2	–6.0
3484	Small arms	11	1.4	–1.7	–3.1
3491	Industrial valves	26	3.1	3.5	.4
3492	Fluid power valves and hose fittings	33	2.6	4.8	2.2
3495	Wire springs	14	1.7	2.4	.7
3496	Miscellaneous fabricated wire products	55	3.3	3.9	.6
3498	Fabricated pipe and fittings	29	2.7	6.6	3.8
3499	Fabricated metal products, n.e.c.	61	–2.5	1.7	4.3
3511	Turbines and turbine generator sets	25	3.5	3.1	–.3
3519	Internal combustion engines, n.e.c.	59	3.6	2.4	–1.1
3523	Farm machinery and equipment	73	4.5	5.5	1.0
3524	Lawn and garden equipment	26	2.1	2.2	.1
3531	Construction machinery	86	2.6	3.5	.9
3535	Conveyors and conveying equipment	40	.5	2.9	2.4
3537	Industrial trucks and tractors	30	3.3	5.5	2.2
3541	Machine tools, metal cutting types	41	.7	–.2	–.8
3544	Special dies, tools, jigs, and fixtures	165	1.7	3.8	2.1
3545	Machine tool accessories	53	2.8	3.2	.4
3546	Power-driven handtools	23	2.1	3.1	1.0
3548	Welding apparatus	21	–1.3	1.5	2.8
3552	Textile machinery	15	4.8	1.4	–3.2
3554	Paper industries machinery	22	.4	3.6	3.2
3556	Food products machinery	25	.2	–.1	–.3
3559	Special industry machinery, n.e.c.	81	3.9	8.5	4.4
3561	Pumps and pumping equipment	30	–.1	1.4	1.5
3562	Ball and roller bearings	40	.5	.2	–.3
3563	Air and gas compressors	26	1.6	4.4	2.7
3564	Blowers and fans	35	1.9	4.0	2.1
3565	Packaging machinery	22	2.7	3.9	1.1
3567	Industrial furnaces and ovens	19	3.7	5.1	1.3
3568	Power transmission equipment, n.e.c.	22	–2.1	.8	2.9
3569	General industrial machinery, n.e.c.	46	.9	3.2	2.3
3585	Refrigeration and heating equipment	143	1.6	3.6	2.0
3589	Service industry machinery, n.e.c.	43	1.2	4.8	3.6
3592	Carburetors, pistons, rings, and valves	23	4.3	.9	–3.3
3593	Fluid power cylinders and actuators	19	1.0	1.0	–.1
3599	Industrial machinery, n.e.c.	274	4.6	7.5	2.8
3612	Transformers, except electronic	40	4.6	2.1	–2.5
3613	Switchgear and switchboard apparatus	41	3.9	1.5	–2.3
3621	Motors and generators	76	4.7	3.2	–1.4
3624	Carbon and graphite products	10	2.7	2.9	.2
3625	Relays and industrial controls	60	5.0	3.3	–1.7
3632	Household refrigerators and freezers	30	3.8	4.3	.5
3634	Electric housewares and fans	28	2.6	.0	–2.5
3635	Household vacuum cleaners	11	4.0	4.8	.8
3641	Electric lamp bulbs and tubes	23	–.1	–1.5	–1.4
3643	Current-carrying wiring devices	62	3.9	1.6	–2.2
3644	Noncurrent-carrying wiring devices	17	–.9	.5	1.4
3645	Residential lighting fixtures	20	.2	–2.8	–3.0
3646	Commercial lighting fixtures	25	–1.3	1.6	2.9
3647	Vehicular lighting equipment	18	2.2	2.9	.8
3648	Lighting equipment, n.e.c.	13	2.4	4.9	2.4

Table B-1. Continued—Productivity and related measures for four-digit industries, 1987–96

SIC code	Industry	1996 employment (thousands)[1]	Average annual percent change, 1987–96		
			Output per hour[2]	Output	Employee hours
3652	Prerecorded records and tapes	28	–1.0	2.0	3.1
3663	Radio and television communications equipment	127	7.1	8.4	1.2
3675	Electronic capacitors	20	3.4	1.0	–2.3
3676	Electronic resistors	11	–2.9	–4.3	–1.5
3677	Electronic coils and transformers	19	1.2	–.6	–1.8
3678	Electronic connectors	19	–4.3	–.5	3.9
3679	Electronic components, n.e.c.	137	9.3	8.5	–.7
3691	Storage batteries	27	1.1	1.5	.4
3695	Magnetic and optical recording media	17	6.6	5.3	–1.2
3699	Electrical equipment and supplies, n.e.c.	28	4.5	.4	–3.9
3711	Motor vehicles and car bodies	342	2.0	1.5	–.4
3714	Motor vehicle parts and accessories	528	1.8	5.7	3.8
3715	Truck trailers	34	–.1	1.5	1.6
3721	Aircraft	244	4.0	–.3	–4.2
3724	Aircraft engines and engine parts	95	–1.4	–6.6	–5.3
3728	Aircraft parts and equipment, n.e.c.	121	.9	–2.2	–3.1
3731	Ship building and repairing	101	.5	–1.2	–1.8
3732	Boat building and repairing	56	–.7	–2.2	–1.5
3743	Railroad equipment	36	4.3	8.4	3.9
3751	Motorcycles, bicycles, and parts	22	2.4	9.7	7.2
3761	Guided missiles and space vehicles	63	3.0	–6.8	–9.5
3812	Search and navigation equipment	161	4.0	–4.1	–7.7
3821	Laboratory apparatus and furniture	10	–1.5	.4	2.0
3822	Environmental controls	42	3.0	3.0	.0
3823	Process control instruments	66	1.5	3.7	2.1
3825	Instruments to measure electricity	75	6.9	3.2	–3.5
3826	Analytical instruments	30	5.4	7.2	1.8
3827	Optical instruments and lenses	20	2.7	4.1	1.3
3829	Measuring and controlling devices, n.e.c.	41	3.4	2.4	–.9
3841	Surgical and medical instruments	104	6.1	7.4	1.2
3842	Surgical appliances and supplies	93	2.3	4.0	1.7
3843	Dental equipment and supplies	15	4.0	4.8	.8
3845	Electromedical equipment	43	.3	8.4	8.1
3851	Ophthalmic goods	36	7.3	6.7	–.6
3861	Photographic equipment and supplies	85	2.9	.2	–2.6
3911	Jewelry, precious metal	37	–.6	–.7	–.2
3931	Musical instruments	16	–2.6	–.4	2.3
3944	Games, toys, and children's vehicles	35	2.1	1.3	–.8
3949	Sporting and athletic goods, n.e.c.	73	2.0	5.7	3.6
3961	Costume jewelry	14	4.6	.1	–4.2
3965	Fasteners, buttons, needles, and pins	10	3.2	.6	–2.6
3991	Brooms and brushes	14	1.9	2.7	.8
3993	Signs and advertising specialties	66	1.7	3.2	1.5
3999	Manufacturing industries, n.e.c.	58	1.2	2.6	1.5
	Transportation				
4011	Railroad transportation	205	5.9	3.0	–2.7
4213	Trucking, except local	826	3.0	3.4	.4
4311	U.S. Postal Service [3]	856	.5	1.7	1.2
	Communications				
4832	Radio broadcasting stations	115	3.3	2.4	–.9
4833	Television broadcasting stations	128	–1.0	.8	1.8
4841	Cable and other pay television services	171	–2.3	3.2	5.7
	Trade				
5093	Scrap and waste materials	158	1.6	5.0	3.4
5211	Lumber and other building materials dealers	546	1.6	4.0	2.3
5231	Paint, glass, and wallpaper stores	70	2.1	1.0	–1.0
5251	Hardware stores	181	2.0	1.9	–.1
5261	Retail nurseries and garden stores	98	1.9	1.2	–.7
5311	Department stores	2,388	1.3	4.2	2.8
5331	Variety stores	140	6.4	–.6	–6.6
5399	Miscellaneous general merchandise stores	208	5.6	5.4	–.2
5411	Grocery stores	3,141	–1.3	.0	1.3

Table B-1. Continued—Productivity and related measures for four-digit industries, 1987–96

SIC code	Industry	1996 employment (thousands)[1]	Average annual percent change, 1987–96		
			Output per hour[2]	Output	Employee hours
5421	Meat and fish markets	59	–1.6	–3.4	–1.9
5461	Retail bakeries	213	–2.8	–1.8	1.0
5511	New and used car dealers	1,032	.8	1.9	1.1
5531	Auto and home supply stores	411	.6	2.3	1.7
5541	Gasoline service stations	698	1.5	1.1	–.4
5611	Men's and boys' clothing stores	85	2.9	–.6	–3.3
5621	Women's clothing stores	314	3.0	–.4	–3.3
5651	Family clothing stores	349	3.0	6.0	2.9
5661	Shoe stores	200	3.1	1.1	–2.0
5699	Miscellaneous apparel and accessory stores	102	1.6	5.1	3.4
5712	Furniture stores	324	1.5	2.3	.8
5713	Floor covering stores	103	–.2	–.2	.0
5719	Miscellaneous home furnishings stores	129	4.6	7.3	2.6
5722	Household appliance stores	87	2.8	1.3	–1.4
5731	Radio, television, and electronic stores	197	6.7	10.4	3.4
5734	Computer and computer software stores	119	18.9	26.2	6.1
5735	Record and prerecorded tape stores	93	1.1	7.3	6.2
5812	Eating places	7,349	–.1	1.9	2.0
5813	Drinking places	389	–2.1	–2.2	–.2
5912	Drug stores and proprietary stores	624	.6	1.2	.6
5921	Liquor stores	137	1.1	–1.6	–2.6
5932	Used merchandise stores	175	–.4	3.7	4.1
5941	Sporting goods stores and bicycle shops	224	3.3	5.9	2.5
5942	Book stores	130	1.3	5.5	4.1
5943	Stationery stores	88	–5.2	–3.7	1.5
5944	Jewelry stores	169	2.5	1.1	–1.3
5945	Hobby, toy, and game shops	151	1.5	5.4	3.9
5947	Gift, novelty, and souvenir shops	253	.3	4.7	4.4
5949	Sewing, needlework, and piece goods stores	57	1.2	–1.5	–2.7
5961	Catalog and mail-order houses	224	2.4	8.1	5.6
5962	Merchandising machine operators	82	–2.6	–3.6	–1.0
5983	Fuel oil dealers	54	–.8	–3.0	–2.3
5992	Florists	161	.8	.2	–.6
	Services				
7011	Hotels and motels	1,694	1.0	2.7	1.7
7213	Linen supply	68	–2.0	–1.1	.9
7215	Coin-operated laundries and drycleaning	59	3.3	2.4	–.9
7216	Drycleaning plants, except rug cleaning	190	–1.6	–.8	.9
7217	Carpet and upholstery cleaning	51	2.7	4.9	2.2
7218	Industrial launderers	54	.3	3.5	3.1
7221	Photographic studios, portrait	91	2.3	6.1	3.7
7231	Beauty shops	716	.5	1.9	1.4
7241	Barber shops	58	2.3	–1.6	–3.8
7261	Funeral service and crematories	104	–.3	1.4	1.7
	Combination industries				
2011,13	Red meat products	243	–.5	1.1	1.6
2041,45	Flour (including flour mixes) and other grains	33	1.8	1.8	.0
2047,48	Prepared feeds for animals and fowls	60	.6	1.1	.5
2061,62,63	Sugar	18	3.3	1.3	–1.9
2111,21,31	Tobacco products	34	4.0	.5	–3.3
2111,31	Cigarettes, chewing and smoking tobacco	31	4.1	.5	–3.4
2211,21	Cotton and synthetic broadwoven fabrics	141	4.3	.7	–3.5
2251,52	Hosiery	61	4.1	1.9	–2.2
2435,36	Veneer and plywood	58	–1.8	–2.0	–.3
2511,17	Wood household furniture	129	1.4	–.3	–1.7
2611,21,31	Pulp, paper, and paperboard mills	223	1.8	.9	–.8
2673,74	Paper and plastic bags	56	–.2	.7	.9
2823,24	Synthetic fibers	66	2.1	.5	–1.6
3251,53,59	Clay construction products	26	3.0	.5	–2.4
3271,72	Concrete products	88	2.5	2.2	–.2
3324,25	Steel foundries	43	.4	1.4	1.0
3353,54,55	Aluminum rolling and drawing	59	–.4	–1.1	–.7
3465,66,69	Metal stampings	215	1.5	3.0	1.5
3491,92,94	Valves and pipe fittings	85	1.8	2.3	.5

Table B-1. Continued—Productivity and related measures for four-digit industries, 1987–96

SIC code	Industry	1996 employment (thousands)[1]	Average annual percent change, 1987–96		
			Output per hour [2]	Output	Employee hours
3541,42	Machine tools	59	1.2	.7	–.5
3561,63,94	Pumps and compressors	83	1.5	2.3	.8
3561,94	Pumps and pumping equipment, including fluid power	57	1.0	1.1	.1
3631,32,33,39	Major household appliances	82	2.3	1.6	–.7
3645,46,47,48	Lighting fixtures and equipment	76	1.4	1.9	.5
4512,13,22(PTS)	Air transportation[4]	620	1.2	4.3	3.1
7231,41	Beauty and barber shops	774	.7	1.5	.8

[1] Employment figures are based primarily on data from the BLS Current Employment Statistics (CES) program and the Current Population Survey (CPS).

[2] Output per employee hour is measured in all cases except: (1) output per employee is used for SIC 4213 and SIC 4512,13,22 (PTS); and (2) output per hour of all persons is used for all trade and services industries except SIC 5311 and SIC 5511. "All persons" include self-employed as well as employees.

[3] Employee hours in SIC 4311 are based on the number of full-time-equivalent employee years, as reported in the U.S. Postal Service budget. Full-time-equivalent employee years are computed by dividing total hours of full-time, part-time, and intermittent workers by the number of hours in a standard work year. The output and hours for SIC 4311 reflect the Federal fiscal year.

[4] This measure excludes small and medium air carriers due to a lack of data.

NOTE: n.e.c. = not elsewhere classified.