The nature of occupational employment growth: 1983-93

Over the 1983–93 period, an increasing share of jobs was in high-paying occupations and required college training; but most jobs that were filled paid below-average wages and did not require a college education

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Employment growth between 1983 and 1993 was greater for occupations at the top and bottom of the earnings distribution than for those in the middle. This article presents additional data on occupational job openings resulting from the need to replace workers who permanently leave the labor force and the net movement of workers among occupations. The number of job openings for wage and salary workers resulting from both employment growth and replacement of workers leaving the labor force and changing occupations was greater in low-paying occupations[1].

These conclusions are derived from a recently-developed employment series based on industry-occupational employment matrices prepared by the Bureau of Labor Statistics since the early 1980's.

Changes in the demand for goods and services and in how work is performed have raised many concerns about the nature of job growth. Increasing use of computer technology, restructuring of businesses, and a growing global economy are among the factors economists cite as contributing to changes in the employment structure of the U.S. economy since the early 1980's. However, measuring the impact of these factors on the industrial and occupational composition of employment and on the quality of jobs in terms of their educational requirements and earnings is difficult.

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The need for data to analyze changes in the occupational structure of industries gave impetus to the development of the Occupational Employment Statistics survey in the early 1970's.[2] In developing the base year occupational employment for BLS projections, data on occupational staffing patterns of industries from the survey are applied to industry employment data derived from the Current Employment Statistics survey to develop estimates of occupational employment.[3] A time series of occupational employment by industry for the 1983–93 period was developed using those data.

This article discusses the nature of job growth over the 1983–93 period as measured by the time series. The discussion focuses on numerical change, rather than percent change. For example, subway and streetcar operators, which grew 189 percent, but increased in number by only 14,700, have less importance to the discussion than retail salespersons, which grew only 16 percent, but increased in number by nearly 500,000. In fact, the pattern of employment growth was influenced heavily by employment concentration and growth in relatively few (10) occupations that accounted for nearly 30 percent of total employment growth. (See table 1.)

To study the quality of job growth in terms of earnings, employment for detailed occupations in the industry-occupation matrix was matched with data on median earnings for comparable

occupations in the Current Population Survey. The data were analyzed in earnings quartiles, which were developed by ranking occupations according to median earnings in 1993, and dividing them into four groups that each accounted for about 25 percent of employment in 1993. (The quartiles do not account for exactly 25 percent of employment because an occupation falling on the dividing line of the quartiles was not split between quartiles, but was included in the quartile in which most of its employment fell.)

Issues concerned with the quality of jobs such as job satisfaction, the availability of full-time jobs, and job tenure are not discussed, although they are important and cannot be ignored in broad views of the quality of jobs.[4]

Major employment trends

Employment of wage and salary workers increased 19.7 million over the 1983–93 period, from 92.6 million to 112.3 million. All major occupational groups experienced increases, with the largest numerical growth in service, professional, and administrative support occupations, including clerical. (See table 2.) From an industry viewpoint, 80 percent of the increase was in two industry divisions—services and retail trade—although they accounted for little more than half of total employment. Employment decreased in two of the ten industry divisions—mining and manufacturing—both in the goods-producing sector. (See table 3.)

Occupational data by industry rather than by industry or by occupation alone offers a better understanding of the nature of job growth over time. For example, from an industry viewpoint, employment growth is concentrated in low-paying industries; from an occupational viewpoint, employment growth is concentrated in higher-paying jobs.[5] According to BLS, "the differences . . . can be reconciled by using a matrix of the major industry and occupation groups." As a result, much of this article's discussion of employment growth in major occupational groups is in terms of industrial concentration of growth.

Service occupations, with a growth of 4.1 million jobs, accounted for 21 percent of total job growth from 1983 to 1993. The growth was concentrated among two industry divisions, retail trade and services,[6] accounted for 90 percent of the growth, or about 3.7 million jobs. Food service worker jobs increased by nearly 1.5 million, primarily in eating and drinking places, and accounted for the majority of service worker growth in retail trade. Janitors and cleaners (604,000), home health aides (240,000), nursing aides (208,000), and child care workers (150,000) accounted for more than half of the growth of service occupations in the services industry. (See table 2.) All of these occupations are characterized by low median earnings.

Most of the remainder of the growth in service occupations occurred in government. With an increase of 389,000, service occupations accounted for a larger share (28 percent) of employment growth in government than any other major occupational group. (See table 3.) Of this growth, 305,000 were in protective service occupations; correction officers and police patrol officers accounted for more than 200,000 additional jobs. Median earnings in all protective service occupations were above average and most were in the top quartile.

Professional specialty occupations increased by nearly 4 million over the 1983–93 period. Increases occurred in all industry divisions, except mining and construction. About 80 percent of the occupation's growth, or 3.2 million jobs, was in the services industry. Teachers accounted for nearly 1.2 million, or roughly 30 percent, of the growth of professional workers. Other professional specialty jobs with growth of more than 100,000 included registered nurses (600,000), computer engineers, scientists, and systems analysts (361,000), social workers (158,000), lawyers (125,000), and human services workers (117,000). Virtually all of these occupations have above-average median earnings and the majority had earnings in the top quartile. Despite the popular view that service industry jobs are low-paying, profes-

Table 1. Employment change for wage and salary workers in selected occupations with large employment growth, 1983–93

[Numbers in thousands]

Occupation	Employment		Change, 1983–93		Percent of total change, 1983–93
	1983	1993	Number	Percent	
Teachers, preschool through college, except special and adult education	3,100	4,040	940	30	5.3
Cashiers	1,893	2,746	853	45	4.3
General office clerks	2,113	2,718	604	29	3.1
Janitors and cleaners	2,211	2,815	604	27	3.1
Registered nurses	1,287	1,887	600	47	3.0
Salespersons, retail	3,011	3,493	482	16	2.4
Food preparation workers	838	1,257	419	50	2.1
Truck drivers	1,799	2,196	397	22	2.0
Computer engineers, scientists, and systems analysts	278	639	361	130	1.8
Waiters and waitresses	1,461	1,805	344	24	1.7

sional specialty occupations with high earnings accounted for more of the job growth in services industries than low-paying service occupations.

Despite an overall decline of 627,000 jobs in manufacturing, employment in professional specialty occupations in this industry division increased by 145,000. Most of this growth was in jobs for computer engineers, scientists, and systems analysts, and writers and editors, with most of the latter in the printing industry.

Administrative support occupations, including clerical jobs, increased by 3.8 million and remained the largest major occupational group during the 1983–93 period, despite the widespread impact of labor-saving computer technology. Seventy percent of the growth (2.6 million) was in services, and accounted for 17 percent of the growth in service industries. Nearly one-half of the growth of administrative support occupations, including clerical, was in 5 occupations—general office clerks (604,000), secretaries (467,000), teacher aides and assistants (321,000), bookkeeping and accounting clerks (241,00), and bill and account collectors (133,000).

Workers in administrative support occupations, including clerical, accounted for 40 percent of the growth in the finance, insurance, and real estate industry division. Of the industry's 476,000 administrative support jobs, one-fourth were involved directly in processing insurance policies. This should not be a surprise because administrative support occupations, including clerical, accounted for more than half of total employment in that industry. In general, the median earnings of these occupations were below average and in the third quartile, but about one-third had earnings in the second quartile. Many of those with the highest earnings were concentrated in the insurance industry or in government.

Marketing and salesworker employment increased by 2.7 million over the

Employment change for major occupational groups of wage and salary workers in occupations with growth of 100,000 or more, 1983–93

[Numbers in thousands]

Occupation	Employment		Change, 1983–93	
	1983	1993	Number	Percent
Total, all occupations	92,586	112,312	19,726	21.3
Service occupations	14,638	18,767	4,129	28.2
Food preparation and service occupations	4,828	6,279	1,451	30.1
Food preparation workers	838	1,257	419	49.9
Waiters and waitresses	1,461	1,805	344	23.6
Food counter, fountain, and related workers	1,298	1,615	317	24.4
Cooks, restaurant	408	586	178	43.7
Janitors and cleaners	2,211	2,815	604	27.3
Home health aides	123	363	240	195.8
Nursing aides, orderlies, and attendants	1,116	1,324	208	18.6
Child care workers	150	300	150	100.0
Corrections officers	165	286	121	73.5
Professional specialty occupations	11,387	15,337	3,950	34.7
Teachers, preschool-college, special and adult education	3,550	4,837	1,198	32.9
Teachers, preschool-college, except special education and adult and vocational education	3,100	4,040	940	30.3
Teachers, adult and vocational education	298	431	133	44.7
Teachers, special education	241	366	125	52.0
Registered nurses	1,287	1,887	600	46.6
Computer engineers, scientists, and systems analysts	278	639	361	130.0
Social workers	330	488	158	48.0
Lawyers	288	414	125	43.5
Human services workers	80	197	117	147.5
Administrative support occupations, including clerical	18,427	22,233	3,806	20.7
General office clerks	2,113	2,718	604	28.6
Secretaries	2,845	3,312	467	14.6
Teacher aides and assistants	584	904	321	54.9
Bookkeeping and accounting clerks	1,709	1,950	241	14.1
Bill and account collectors	103	236	133	123.4
Marketing and sales occupations	8,619	11,301	2,682	31.1
Cashiers	1,893	2,746	853	45.0
Salespersons, retail	3,011	3,493	482	16.0
Executive, administrative, and managerial occupations	8,358	10,769	2,411	28.8
Financial managers	559	704	145	25.8
Operators, fabricators, and laborers	14,725	15,793	1,068	7.2
Truck drivers	1,799	2,196	397	22.1
Hand packers and packagers	522	690	169	32.3
Bus drivers	431	567	136	31.5
Technicians and related support occupations	3,341	4,267	926	27.7
Health technicians and technologists	1,452	2,067	615	42.4
Licensed practical nurses	576	679	103	17.8
Computer programmers	403	551	148	36.8
Precision production, craft, and repair occupations	11,187	11,843	656	5.9
Mechanics, installers, and repairers	3,895	4,402	507	13.0
Maintenance repairers, general utility	912	1,117	205	22.5
Agriculture, forestry, fishing, and related occupations	1,904	2,001	97	5.1

1983–93 period and accounted for 14 percent of total employment growth. As expected, the largest proportion of growth was in retail trade. Significant growth also occurred in services, primarily in miscellaneous business services, video rental, and amusement services industries. Salesworker employment also increased in manufacturing. Despite a decline in total manufacturing employment, manufacturing output increased and salesworkers were increasingly needed to sell the goods that were produced.

Two sales occupations with earnings in the lowest quartile, cashiers and retail trade sales workers, accounted for half of total sales worker employment growth. In contrast, the earnings for all other sales and related workers, composed largely of sales workers in wholesale trade and manufacturing, had earnings in the second quartile.

Executive, administrative, and managerial jobs increased by 2.4 million, and accounted for 12 percent of total employment growth from 1983 to 1993. One-half of the growth was in the services industry. Despite wide publicity about the loss of managerial jobs due to business downsizing and restructuring, employment of managerial workers grew faster than total employment in all divisions, except retail trade and mining, both of which experienced a decline in managerial employment. Retail trade was the only major occupational group to experience an employment decline over the 1983–93 period. Within finance, insurance, and real estate, managers accounted for nearly 40 percent of the job growth. The number of managers increased in manufacturing despite a decline in total manufacturing employment. In general, median earnings of nearly all managerial occupations were in the top quartile.

Operator, fabricator, and laborer jobs increased by nearly 1.1 million over the 1983–93 period. Employment growth was concentrated in the driving occupations, led by truck drivers (397,000) and bus drivers (136,000). Helpers, laborers, and material movers also increased (339,000), led by hand packers and packagers (169,000).

Many occupations in this group are concentrated in manufacturing and were part of the net loss of 413,000 manufacturing jobs from 1983 to 1993. Nevertheless, operators, fabricators, and laborers remained the dominant occupation in manufacturing, accounting for 44 percent of wage and salary employment in this industry division in 1993. Only administrative support occupations, including clerical, accounted for a greater percent of wage and salary workers in the economy as a whole.

In general, median earnings of operator, fabricator, and laborer occupations are close to the average for all occupations. Median earnings are much less in some occupations, such as sewing machine operators, shoe sewing machine

Table 3. **Employment change for major occupational groups of wage and salary workers by industry division, 1983–93**

[In thousands]

Occupation	Total, all industries	Agriculture, forestry, and fishing	Mining	Construction	Manufacturing	Transportation, communications, and public utilities	Wholesale trade	Retail trade	Finance, insurance and real estate	Services	Government
Total, all occupations	19,726	81	–353	628	–627	750	830	4,156	1,138	11,737	1,385
Executive, adminitrative, and managerial occupations	2,411	6	–38	165	137	83	126	-20	436	1,231	287
Professional specialty occupations	3,951	3	–31	–11	145	22	55	83	88	3,217	378
Technicians and related support occupations	926	1	–7	–1	–41	43	30	78	30	741	52
Marketing and sales occupations	2,683	3	–9	11	52	61	197	1,742	9	601	17
Administrative support occupations, including clerical	3,805	11	–46	69	–178	124	146	378	476	2,619	208
Service occupations	4,129	5	–5	–10	–80	49	15	1,542	49	2,174	389
Agriculture, forestry, fishing, and related occupations	97	23	–1	0	–10	1	40	15	3	8	17
Precision production, craft, and repair occupations	656	8	–139	349	–239	6	25	132	52	388	74
Operators, fabricators, and laborers	1,068	21	–76	55	–413	360	196	207	–4	756	–36

NOTE: State and local Government hospitals and education are included in the services industry division

operators and tenders, and hand sewers, all of which declined in employment over the 1983–93 period. Thus, in addition to the employment loss in some occupations with relatively high earnings in manufacturing, such as lathe machine operators, drill press operators, and other machine tool cutting and forming occupations, many of the jobs lost were in low-paying occupations.

Technicians and related support occupations increased in employment by 900,000 between 1983 and 1993. About 80 percent of the growth (741,000) was in services. Growth of 615,000 health technicians, led by the growth of licensed practical nurses (103,000), and 148,000 computer programmers accounted for a sizable proportion of the employment gains of technicians. Earnings for technicians generally are above average and earnings for a few occupations in this group, including airplane pilots, air traffic controllers, and computer programmers, are in the top quartile.

Precision production, craft, and repair occupations increased by 656,000 jobs. Significant losses in mining (139,000) and manufacturing (239,000) offset much of the gains in other industries, primarily in construction (349,000) and services (388,000). Construction crafts led the growth in construction. Mechanics and repairers increased in services, including automotive mechanics and automobile body and related repairers; heating, air conditioning and refrigeration mechanics and installers; and data processing equipment repairers. Maintenance repairers, general utility, accounted for growth of 205,000, or nearly one-third of the total growth in this major occupational group, as increasing numbers were employed to service buildings in education services and real estate.

Median earnings in most occupations in this major group are above average. A few occupations have earnings in the top quartile, including data processing machine repairers, aircraft mechanics, electricians, and tool and die makers.

Agriculture, forestry, fishing, and related occupations increased in employment by 97,000 in the 1983–93 period. Nursery workers, gardeners and groundskeepers, and animal caretakers, except farm, all of which are low-paying occupations, accounted for most of the growth.

Quality of job growth

The above discussion of employment growth by major occupation group is a traditional way of presenting an overview of occupational employment trends. But employment change in terms of the quality of job growth may not be clear from such an approach. Although the common view that workers in professional occupations earn high wages and workers in service jobs earn low wages generally holds true, median earnings for detailed occupations in each major occupational group vary widely. For example, in the professional group, 1993 median weekly earnings were $1,131 for lawyers, $891 for engineers, $390 for adult and vocational education teachers, and $356 for photographers and camera operators.

Detailed occupations in other occupational groups tend not to be as varied because few occupations earn as much as lawyers and engineers, but the ranges are still wide. Similarly, information on job growth by usual education and training needs is not clear from data by major occupation group because of the wide range of education and training requirements within most major occupational groups. Consequently, the employment change for detailed occupations without regard to major occupational group was used to analyze the net employment change in earnings quartiles over the 1983–93 period.

Median weekly earnings of all wage and salary workers in 1993 by occupation as measured by the CPS were used to construct the earnings quartiles. Each of the 278 occupations in the industry-occupation employment matrix 1983–93 time series was matched with a specific CPS occupation or occupation group and the CPS earnings were assigned to that occupation. Median weekly earnings ranged from $111 to $1,131 for the occupations included in the time series. The range of earnings varied among the quartiles; the top quartile had the widest range, as would be expected. (See table 4.)

Employment size significantly affected the distribution of occupations by quartile. Of the 278 occupations in the distribution of employment, the first quartile counted 93 and the second quartile included 91. Only 58 were in the third quartile and 36 in the fourth. Many of the occupations in the lowest quartile are large occupations, such as janitors and cleaners, retail salespersons, cashiers, and waiters and waitresses. In contrast, the top two quartiles had many professional and technical occupations that are separately identified in the occupational classification system, but tend to be relatively small.

Earnings quartile. Employment growth of 19.7 million was not distributed by earnings quartile in the same manner as employment in 1993. The highest earnings quartile's share of growth was disproportionately high, at 29 percent; the lowest quartile's share was 28 percent. Employment growth of the third quartile had the widest deviation from its share of employment, with only 18 percent of employment growth from 1983 to 1993. The distribution of employment, however, changed slightly from 1983 to 1993 with only the third quartile changing by more than 1 percent in the 10-year period. (See table 4.)

The distribution of employment growth by quartile was affected significantly by the concentration of occupational

Table 4. Employment change and net replacement openings for wage and salary workers by earnings quartile, 1983–93

[Employment in thousands]

Earnings quartile	Earnings range	Number of occupations	Employment, 1983		Employment, 1993		Employment change, 1983		Net replacement opening, 1983–93		Total job openings, 1983–93	
			Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total	$111-1,131	278	92,586	100.0	112312	100.0	19,726	100.0	20,913	100.0	41,645	100.0
1	$551-1,131	93	22,534	24.3	28,282	25.2	5,748	29.1	4,285	20.5	10,235	24.6
2	378-540	91	21,177	22.9	26,012	23.2	4,834	24.5	4,104	19.6	9,152	22.0
3	259-374	58	26,227	28.3	29,839	26.6	3,612	18.3	5,865	28.0	9,668	23.2
4	111-249	36	22,648	24.5	28,179	25.1	5,531	28.0	6,659	31.8	12,590	30.2

growth. Of the 278 occupations, ten accounted for 45 percent of the change in employment from 1983 to 1993. Four of these occupations were in the top earnings quartile, three were in the fourth quartile, two were in the third and one was in the second.[7]

In addition to employment growth, job openings also stem from the need to replace workers. The earnings of these jobs as measured by earnings based on replacement needs differ from those originating from by employment growth. An estimated 20.9 million job openings were created during the 1983–93 period with the permanent exit of workers from the labor force and the net movement of workers among occupations.[8] In contrast to the openings from employment growth, the bottom half of the earnings distribution (the third and fourth quartiles) accounted for 60 percent of the job openings that resulted from replacement needs. Lower-paying occupations tend to have a greater proportion of workers leaving their job than higher-paying occupations. Also, a disproportionate share of workers in low-paying occupations are generally young workers who change their occupation more than older workers.

Total job openings stemming from growth and replacement needs show that the fourth quartile accounted for 30 percent of jobs filled during the 1983–93 period. The top quartile, which accounted for 29 percent of employment growth, only accounted for roughly the same share of total openings as its share of total employment. The bottom half of the earnings distribution accounted for only 46 percent of employment growth, but 53 percent of openings from growth and net replacement needs combined.

Education. Another view of the nature of occupational employment growth is by level of education and training generally required. Each occupation in the data series was assigned to an educational category.[9]

Employment change and net replacement openings for wage and salary workers by educational category, in percent, 1983–93 are shown below:

	Bachelor's degree	*Post-secondary*	*Work-related*	*On-the-job training*
Number of occupations	57	27	79	115
Employment, 1983	19.6	10.1	23.0	47.3
Employment, 1993	21.1	11.3	22.2	45.4
Employment change, 1983–93	28.3	17.0	18.3	36.5
Net replacement openings, 1983–93	14.5	8.2	22.0	55.3
Total jobs openings, 1983–93	20.7	12.2	20.0	47.1

In 1993, the distribution of employment by these categories showed that the largest proportion, 45 percent, fell into the last category Employment growth from 1983 to 1993 indicated that occupations requiring the most education had a larger share of growth than their share of employment. But in terms of job openings from replacement needs, jobs that require the least amount of training account for a greater share of replacement needs than their share of employment. Nearly half of all job openings in the 1983–93 period were in occupations falling in the educational category requiring the least amount of education and training.

Comparison with CPS data

Trends in 1983–93 employment of wage and salary workers from the CPS, which is based on data reported by individuals, are very similar for the major occupational groups, despite

differences in the way employment is measured in the two series.[10] The four occupational groups with the slowest 1983–93 growth in the matrix also showed the slowest growth in the CPS. (See table 5.) However, one group—agriculture, forestry, fishing and related workers—declined in the CPS in contrast to the 5-percent growth in the matrix. The employment growth of professional specialty occupations and technicians was very similar from both measures, with both series showing greater-than-average growth. But the growth of managers was faster in the CPS than in the matrix, and the growth of marketing and sales occupations and service occupations was faster in the matrix than the CPS. The faster matrix growth of sales and service workers is consistent with the trend toward increasing dual job holders in the 1980's.

Another way to compare matrix and CPS employment trends is to examine changes in major occupational group employment by major industry division. Instead of analyzing percentage changes, the comparison was made by looking at the percentage distribution of the total change in each of 90 industry-occupation cells (9 major occupations in 10 industry divisions). In this way, large changes for small cells would not distort the broad view of the differences.

In general, distributions of the employment change in each series were remarkably consistent. Professional specialty occupations in the services division accounted for the largest share of the employment growth in the matrix (16.3 percent) and CPS (16.9 percent). Executive, managerial, and administrative occupations accounted for a larger share of the growth in the CPS than in the matrix in every major industry, except wholesale trade. In manufacturing, which declined overall by about 3 percent in both series, managers and professional specialty workers increased and all other occupational groups declined in both series. Services accounted for more than half of the growth in both series, with most of the increase in each in managerial, professional, administrative support, and service occupations. (See table 6.)

CHANGES IN THE DISTRIBUTION OF EMPLOYMENT from 1983 to 1993 resulted in a greater share of jobs at the top and bottom of the earnings distribution in 1993 than in 1983. But from the viewpoint of job openings stemming from replacement needs over the 1983–93 period, low paying occupations accounted for a greater proportion of jobs than their share of employment. Similarly, jobs that require the most education and training increased as a share of employment, but jobs that can be learned quickly and that generally do not require post-secondary education accounted for the largest share of wage and salary jobs that became available in the 1983–93 period.

Employment change of wage and salary workers by major occupational group in the industry-occupation matrix and the Current Population Survey, 1983–93

[Numbers in thousands]

Occupation	Employment, 1983, number		Employment, 1993, number		Change, 1983–93			
					Number		Percent	
	Matrix	CPS	Matrix	CPS	Matrix	CPS	Matrix	CPS
Total, all occupations	92,586	90,601	112,312	108,764	19,726	18,163	21.3	20.0
Executive, administrative, and managerial occupations	8,358	9,536	10,769	13,857	2,411	4,321	28.8	45.3
Professional specialty occupations	11,387	11,517	15,337	15,407	3,951	3,890	34.7	33.8
Technicians and related support occupations	3,341	2,944	4,267	3,929	926	985	27.7	33.5
Marketing and sales occupations	8,619	9,974	11,301	12,324	2,683	2,350	31.1	23.6
Administrative support occupations, including clerical	18,427	15,657	22,233	18,031	3,805	2,374	20.7	15.2
Service occupations	14,638	12,970	18,767	15,473	4,129	2,505	28.2	17.8
Agriculture, forestry, fishing, and related occupations	1,904	1,938	2,001	1,916	97	-22	5.1	-.1
Precision production, craft, and repair occupations	11,187	10,651	11,843	11,450	656	799	5.9	7.5
Operators, fabricators, and laborers	14,725	15,414	15,793	16,377	1,068	963	7.2	6.2

Table 6 **Percent distribution of 1983–93 employment change of major occupational groups by industry division in the industry-occupation matrix and the Current Population Survey**

Occupation	Total, all industries	Agriculture, forestry, and fishing	Mining	Construction	Manufacturing	Transportation, communications, and public utilities	Wholesale trade	Retail trade	Finance, insurance and real estate	Services	Public administration
Total, all occupations											
Industry-occupation matrix	100.0	0.4	−1.8	3.2	−3.2	3.8	4.2	21.1	5.8	59.5	7.0
Current Population Survey	100.0	.2	−1.3	4.0	−2.6	7.9	1.3	19.0	7.3	54.2	5.8
Executive, administrative, and managerial occupations											
Industry-occupation matrix	12.2	0	−.2	.8	.7	.4	.6	−.1	2.2	6.2	1.5
Current Population Survey	23.8	.2	−.2	1.1	2.1	1.5	.2	2.2	3.3	10.7	1.8
Professional specialty occupations											
Industry-occupation matrix	20.0	0	−.2	−.1	.7	.1	.3	.4	.4	16.3	1.9
Current Population Survey	21.4	.2	−.1	.1	.1	1.0	.6	.1	.5	16.9	1.3
Technicians and related support occupations											
Industry-occupation matrix	4.7	0	0	0	−.2	.2	.2	.4	.2	3.8	.3
Current Population Survey	5.4	.1	−.1	0	−.1	.6	.1	.5	.2	3.6	.4
Marketing and sales occupations											
Industry-occupation matrix	13.6	0	0	.1	.3	.3	1.0	8.8	0	3.0	.1
Current Population Survey	12.9	0	0	0	.5	0	.7	8.1	1.8	1.8	0
Administrative support occupations, including clerical											
Industry-occupation matrix	19.3	.1	−.2	.3	−.9	.6	.7	1.9	2.4	13.3	1.1
Current Population Survey	13.1	.1	−.3	0	−1.6	1.8	−.4	1.3	.9	9.2	.8
Service occupations											
Industry-occupation matrix	20.9	0	0	−.1	−.4	.2	.1	7.8	.2	11.0	2.0
Current Population Survey	13.8	0	0	0	−.4	.3	0	4.3	.1	7.6	1.8
Agriculture, forestry, fishing, and related occupations											
Industry-occupation matrix	5	.1	0	0	−.1	0	.2	.1	0	0	.1
Current Population Survey	−.1	−.4	0	0	−.1	0	.2	0	.1	.1	−.2
Precision production, craft, and repair occupations											
Industry-occupation matrix	3.3	0	−.7	1.8	−1.2	0	.1	.7	.3	2.0	.4
Current Population Survey	4.4	0	−.3	2.5	−.5	.1	−.1	0	.4	1.8	−.1
Operators, fabricators, and laborers											
Industry-occupation matrix	5.4	.1	−.4	.3	−2.1	1.8	1.0	1.0	0	3.8	−.2
Current Population Survey	5.3	.1	−.3	.3	−3.3	3.0	.6	2.2	.1	2.5	−.1

NOTE: State and local Government hospitals and education are included in the services industry division. Public administration in the Current Population Survey is very similar to Government in the industry-occupation matrix, which excludes State and local government hospitals and education.

Footnotes

[1] These conclusions are derived from a recently developed employment series based on industry-occupational employment prepared by BLS since the early 1980's.

[2] For a detailed description of the Occupational Employment Statistics survey, see *BLS Handbook of Methods*, Bulletin 2414 (Bureau of Labor Statistics, 1992), ch. 3.

[3] For a detailed description of the Current Employment Statistics survey, see *BLS Handbook of Methods*, Bulletin 2414 (Bureau of Labor Statistics, 1992), ch. 2.

[4] See Neal H. Rosenthal, "More than wages at issue in job quality debate," *Monthly Labor Review*, December 1989, pp. 4–8.

[5] See *Employment in Perspective: Earnings and Job Growth*, Bureau of Labor Statistics Report 877, August 1994.

[6] In the industry-occupation matrix, State and local government hospitals and education are included in services and not in government.

[7] It also should be noted that 4 of the 10 occupations were residual categories that include all detailed occupations not identified separately in the historical time series in the following major occupational groups, sales occupations, executive and managerial occupations, administrative support occupations, including clerical, and professional specialty occupations.

[8] For further information on the methodology used to determine replacement needs, see *Total and Net Occupational Separations: A Report on Recent Research*. (Bureau of Labor Statistics, August 1991). A summary of this report appeared in *Monthly Labor Review*, November 1991, pp. 95–102.

[9] Although most occupations have a range of entry requirements, each occupation was assigned to only one educational category based on the views of analysts working on the *Occupational Outlook Handbook* who are familiar with an occupation's education and training needs.

[10] One of the major differences is that, because the matrix counts jobs, a worker is counted in every job held. The CPS is a count of individuals and a worker is only counted once in a primary job.

Appendix: Developing the industry-occupation matrix

Procedures used to develop the industry occupation employment matrix historical 1983–93 time series.

BLS has been developing industry-occupation matrices on a 2-year cycle since the mid-1960's. However, a time series of these matrices was never developed because of concerns about the lack of comparability of the matrix data over time. Before 1980, the matrices used the occupational classification of the most recent decennial census. Since 1980, data from the OES surveys have been used to construct matrices. The OES survey classification changed significantly in 1983, however, and matrices constructed with OES survey data before that date were used are not comparable with those prepared using OES data collected since 1983.

In addition to the general changes in occupational classification systems, the occupations covered in the OES surveys have changed to facilitate improvements in quality, current use of occupational terms, and response to user needs. Changes to the Standard Industrial Classification instituted in 1972, 1977, and 1987 also created comparability problems.

In response to requests from the public, work was begun in 1994 to develop a national industry-occupation matrix time series. In developing the time series, several guidelines were established:

- The series would be as consistent as possible with the 1992 matrix. The most current was developed by BLS at the time the series was prepared;
- The OES survey's occupational classification used after 1983 would be used; it is consistent with the 1980 Standard Occupational Classification;
- Data that did not have a comparable definition in every year of the series would not be presented in the series for detailed occupations or detailed industries;
- A general review of the year-to-year total employment trend for an occupation must be consistent with logical year-to-year expectations;
- No cell in the series would have confidential data and no cell would have data suppressed because of confidentiality; in this way, the series could be used for statistical analyses without losing data;
- The time series would only cover wage and salary workers; self-employed workers and unpaid family workers are not covered in the OES survey and would not be covered in the time series;
- Data for industries having fewer than 50,000 workers in 1992 would be collapsed in all years except those having a distinct occupational staffing pattern that would distort other information with which it would be aggregated.

Data sources. The OES survey has been the primary source of data on the occupational structure of industries to construct matrices since 1983. The OES survey staffing patterns of industries collected over a 3-year period are applied to the wage and salary industry employment estimates obtained from the BLS Current Employment Statistics survey, to develop employment estimates for a particular year. Data on occupational staffing patterns for the Federal Government were based on data from the Office of Personnel Management; staffing patterns for the U.S. Postal Service were obtained from that agency. Data on staffing patterns and industry employment for other industries not covered by the OES survey—agriculture, forestry, fishing, and private households—are obtained primarily from the CPS.

A comprehensive methodological statement outlining the data sources and procedures used in the development of the 1992 matrix is published in *The American Work Force: 1992-2005*, BLS Bulletin 2452, April 1994.

Comparability of occupational data

When the industry-occupation matrices were constructed, occupations covered by the OES with a national total employment of less than 5,000 were generally aggregated with closely related occupations or into appropriate residuals. In addition, some closely related occupations such as typists and word processors were aggregated. Primarily because of these aggregations of OES survey occupations, the number of occupations in the matrices constructed from 1986 through 1992 varied from 480 in 1986 to 512 in 1992.

To achieve uniformity over time for the historical series, occupations that were aggregated in the 1986, 1988, and 1990 matrices, but were presented in the 1992 matrix, were disaggregated in the earlier matrices. However, if an occupation appeared in an earlier matrix but was collapsed in the 1992 matrix, that occupation was collapsed in the historical series.

Industry configuration

The industrial structure of the 1986 and 1988 matrices was on the 1972/1977 Standard Industrial Classification and 1987 SIC was used for the 1990 and 1992 matrices. The impact of the conversion to the new 1987 SIC caused the loss of some industries, the addition of others, and the split of an industry into one or more industries. A reconciliation of the data before the 1990 matrix to the 1987 SIC was made and resulted in a matrix having 190 industries that were comparable over the 1983-93 period.

Analytical review for reliability of trend data. At this point, the 1983 through 1993 year-by-year employment totals for each of 456 detailed occupations in the series were analyzed to identify apparent distortions in likely employment trends. If the data were suspect for an occupation, the employment was aggregated to a summary level or combined into an appropriate residual. For example, in reviewing the data, occupational therapist employment was shown to have increased from 22,000 to 30,000 from 1986 to 1987 although it only increased 1,000 between 1983 and 1986 and 5,000 between 1986 and 1993.

From this data, analysts can have little faith in the statistic showing growth of 15,000 in 1983-93. Similarly, a decrease of 15,000 physicians from 1990 to 1991 raised questions about the reliability of the time series for that occupation. Although this analytical procedure was subjective, a decision was made not to present data in the series that showed counter-intuitive trends in the judgment of analysts having knowledge about the occupation. As a result of this review, many occupations were deleted from the series as detailed occupations; the number declined to 277.

Confidentiality

Protecting confidential employment data in the matrices was another factor that had to be addressed in preparing the historical matrices for publication. Distributing matrices to data users with blank data for confidential cells causes problems in data manipulation. Upon examination, most of the industries that contained confidential cells had occupations that consisted of fewer than 50 workers and cells with occupations representing less than 1 percent of the industry's employment. In industries in which occupations represented more than 1 percent of the industry, these occupations were aggregated with appropriate residuals or the industry in which they appeared was aggregated.

To eliminate the confidential employment cells with fewer than 50 workers, the occupation cell was made zero in the industry in which they appeared and the industry was rescaled to its benchmark control. This process slightly changed the staffing pattern of the industries. To avoid the need to delete large confidential cells that distorted trends, some industries were aggregated; this reduced the number of industries in the series from 190 to 185.