

# Occupational employment growth through 1990

*Three alternative sets of occupational employment projections for the 1978-90 period all show high growth for white-collar and service categories, but slow growth for blue-collar workers and decreases among farmworkers*

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The Bureau of Labor Statistics has developed three sets of occupational employment projections for 1978 to 1990 based on varying outlooks of the future economy.<sup>1</sup> Although the assumptions that differentiate these scenarios result in various rates of growth for most jobs, changes in the occupational composition of total employment during these years are similar for all versions and generally correspond to past trends. Employment continues to expand more rapidly in service occupations than it does in other categories, and the number of farmworkers still declines. White-collar jobs increase faster than total employment in each scenario, and the number of blue-collar jobs grows slower than the total. However, growth rates are expected to vary greatly within these broad categories, because demographic changes, technological developments, and shifts in the demand for products and services affect major occupational categories differently. For example, anticipated decreases in the teenage population and increases in the number of elderly persons in the 1980's will reduce the need for secondary schoolteachers while increasing it for nurses.

Although the occupational structure of total employment in 1990 is similar in each version of the economy,

some occupations are more sensitive than others to the differences in underlying assumptions. Generally, jobs which are concentrated in manufacturing industries that produce durable goods are most affected, as projected increases in the demand for these goods vary greatly among the scenarios. In contrast, occupations which are concentrated in government are relatively unaffected, because projections of its total employment change very little from one version to another. None of the scenarios attempts to forecast cyclical employment fluctuations.

This article summarizes projections from the first national industry-occupation matrix to be developed on the basis of staffing patterns from the Occupational Employment Statistics Surveys. Previous matrices were based on the decennial census.<sup>2</sup>

The matrix is a major input to the Bureau's occupational outlook program which conducts research on future occupational requirements and resources for use in planning education and training programs and for career guidance and counseling. The results of the research are published in the *Occupational Outlook Handbook* and the *Occupational Outlook Quarterly*, which also contain information on the nature of work in different occupations, educational and training needs, earnings and working conditions, and other subjects of interest to people who are planning careers. The projections described in this article will be used in the 1982-83 edition of the *Handbook*, scheduled for release in spring 1982.

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## Alternative scenarios

Three projections of economic growth for the 1980's have been developed by BLS. Referred to as the low-trend, high-trend I, and high-trend II scenarios, they are based on different assumptions concerning growth of the labor force, output, productivity, and other factors. The low-trend alternative assumes a decline in the rate of labor force expansion, continued high inflation, and modest increases in production and productivity. The two high-trend alternatives are more optimistic; both being based on large increases in the gross national product. Whereas scenario I assumes higher labor force growth, scenario II assumes greater productivity.

In all three alternatives, reductions in both personal income taxes and the effective corporate tax rate are expected to stimulate investment, and it is anticipated that expenditures for new equipment by the private sector will grow somewhat faster than other types of investment. Sharp increases in defense spending for materials and supplies are expected in the 1980's, but the nondefense portion of Federal purchases is foreseen to show no growth. Drastic cutbacks in imports of crude oil are assumed in each scenario. However, oil imports, as well as domestic output of crude oil and other fuels, are greater in the high-trend alternatives, reflecting the high overall levels of industrial production anticipated in these versions of the economy. More details about the assumptions and economic projections are given in other articles in this issue of the *Review*.

Total employment in the low-trend scenario increases by 22.5 percent between 1978 and 1990, from 97.6 to 119.6 million.<sup>3</sup> In high-trend I, employment is expected to rise by 31 percent during the same period, to 127.9 million in 1990; in high-trend II, it is projected at 121.4 million, or 24.4 percent above the 1978 level. The rate of employment growth in high-trend I is somewhat faster than during the previous two decades, while the rates for the other two scenarios are slower.

Employment in white-collar occupations is expected to expand faster than total employment in each version of the economy. In the low-trend scenario, white-collar jobs rise from 48.6 million in 1978 to 60.7 million in 1990. The 1990 high-trend projections range from 61.6 to 64.7 million. Employment in blue-collar occupations is projected to grow slower than total employment in each version. Blue-collar jobs increase from 31.8 million in 1978 to 37.7 million in 1990 in the low-trend projection, while high-trend projections for 1990 range from 38.3 to 40.7 million.

Despite the difference in these estimates among the alternatives, the proportions of total employment accounted for by white-collar and blue-collar jobs do not change substantially. The former increases from 49.8 percent in 1978 to between 50.6 and 50.9 percent in

1990, while the latter declines from 32.6 percent in 1978 to between 31.8 and 31.5 percent in 1990.

Service workers continue to be the fastest growing major occupational category. The number of service jobs rises from 14.4 million in 1978 to 18.9 million in 1990 in the low-trend version, while the high-trend projections range from 19.2 to 20.1 million. The share of total jobs accounted for by service occupations increases from 14.8 percent in 1978 to between 15.7 and 15.8 percent in 1990. On the other hand, the number of farmworkers, is expected to continue declining. Their share of total jobs is projected to decrease from 2.8 percent in 1978 to between 1.9 and 1.8 percent in 1990.

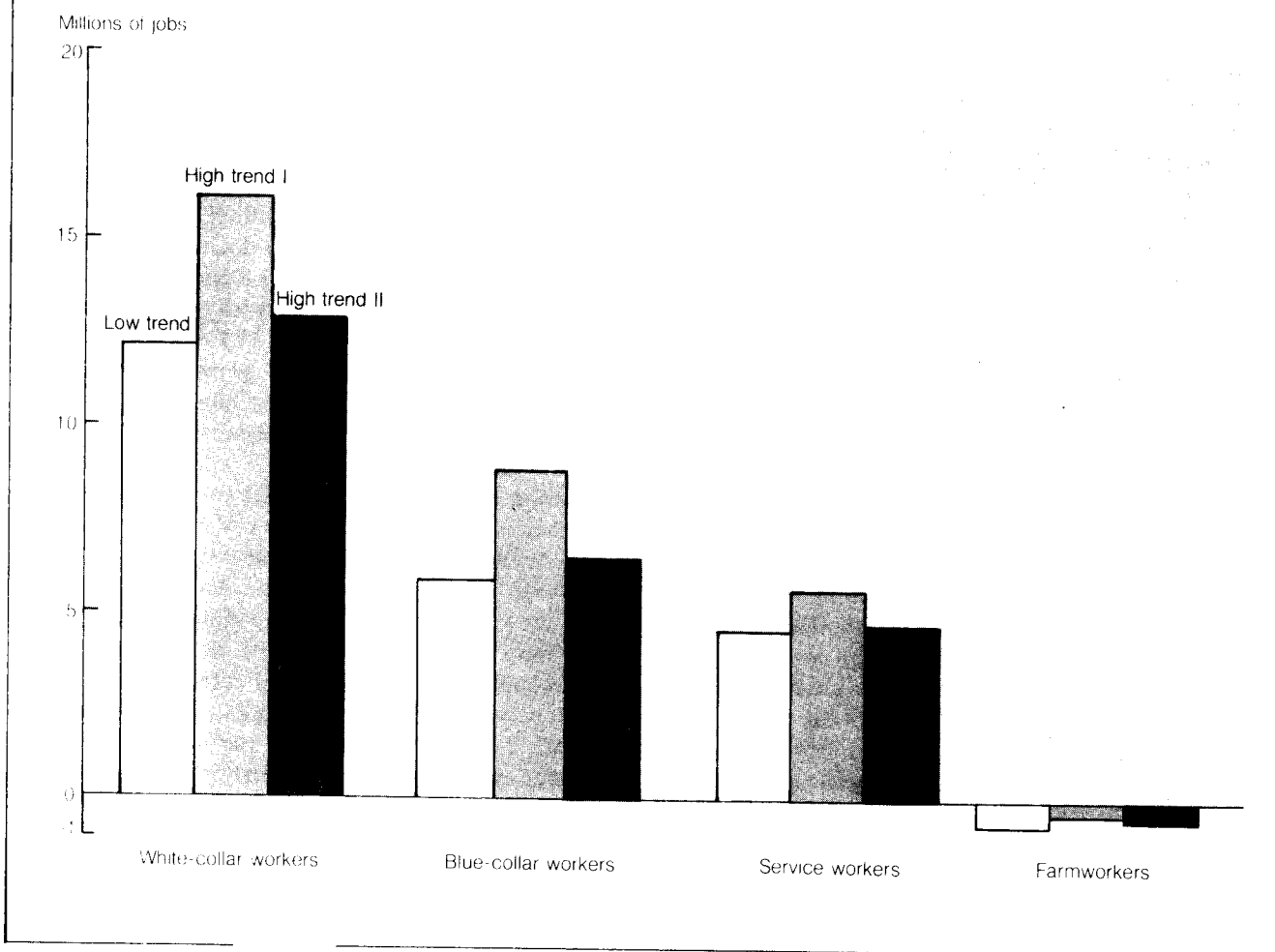
Although service occupations, with projected employment increases ranging between 31.4 and 39.3 percent, are expected to be the fastest growing occupational group during 1978-90, the largest number of new jobs will occur in the white- and blue-collar categories. (See chart 1.) The projected increase in white-collar jobs for this period ranges from about 12.1 to 16.1 million, and the corresponding range for blue-collar jobs is approximately 5.9 to 8.9 million. The number of new service jobs is expected to run between 4.5 and 5.7 million.

Job growth in blue-collar occupations is affected relatively more by differences among the three scenarios than in other major occupational categories. The number of new jobs projected for all occupations during 1978-90 is almost 22 million in the low-trend version, compared with 30.3 million in high-trend alternative I, a difference of 37.8 percent. However, the difference is 50.1 percent for blue-collar occupations alone. These occupations are sensitive to high-trend I because they are concentrated in manufacturing industries, and the demand for manufactured goods is relatively greater in this version of the economy. Demand for manufactured goods also is greater in the high-trend II scenario, but the need for additional blue-collar workers is moderated by the higher productivity gains assumed in this version. For all occupations, about 8.5 percent more new jobs are projected in high-trend II than in the low-trend scenario. The difference for blue-collar jobs is 10.3 percent. Job growth in the white-collar and service categories generally is less affected by differences in the scenarios than blue-collar job growth. However, among the major occupational groups and detailed occupations within these large categories, the sensitivity to these differences varies.

## Growth among white-collar groups

*Professional and technical workers.* Employment in professional and technical jobs was 15.6 million in 1978—about 15.9 percent of the national total. Although this group includes a wide variety of occupations, generally requiring postsecondary education, approximately two-thirds of the jobs were accounted for by teachers, medi-

**Chart 1. Job growth for major occupational categories under alternative economic projections, 1978-90**



cal professionals, health technologists and technicians, engineers, and engineering and science technicians.

Over the past two decades, the professional and technical group has been one of the fastest growing occupational categories. For example, between 1966 and 1978 employment in this group increased almost twice as fast as it did in all occupations. Between 1978 and 1990, employment is projected to continue to rise faster than employment in all occupations in each of the alternative scenarios, but the difference is anticipated to be less than in the past. In the low-trend version of the economy, employment of professional and technical workers is projected to increase by 28.7 percent over the same period. The growth in the high-trend I version is 35.7 percent and that for high-trend II is 30.4 percent. (See table 1.)

While employment in professional and technical jobs as a whole is expected to increase faster than the average rate for all occupations, there will be significant

differences among individual fields. For example, employment in most medical and health occupations is projected to expand very rapidly, while in many teaching occupations it is expected to decline. Rising incomes and greater health consciousness will boost demand for health care, as will population growth—especially the substantial increase in the number of older people, who have more need for health services. During the 1980's, the number of persons age 75 and over is expected to advance from 9.4 to 12.0 million. As a result of these factors, opportunities for professional and technical workers in hospitals, clinics, laboratories, nursing homes, and other settings are likely to increase rapidly. Demand may be very high in rural areas and inner cities, as job openings in less desirable locations have traditionally been difficult to fill. In contrast to the rapid employment growth projected in the health field, jobs for secondary, college, and university teachers are expected to decrease somewhat as a result of the decline

in births that occurred in the 1960's and 1970's. Demand for secondary schoolteachers could fall precipitously in the Northeast and North Central States, where the Bureau of the Census projects a drop of close to 25 percent in the number of 15- to 19-year-olds between 1980 and 1990. A growing number of adults have entered college in recent years, but their enrollment is not expected to completely offset the decline in traditional-age college students. In contrast, a small increase in the demand for preschool, kindergarten, and elementary teachers is anticipated, reflecting recent increases in births, as a growing number of women enter the prime childbearing ages. More opportunities for adult education teachers are also foreseen.

The demand for professional and technical workers as a group is less sensitive to differences among the scenarios than the demand for workers in all occupations. However, within the professional and technical group, sensitivity varies. The demand for teachers is not affected significantly by differences in the scenarios. But alternative versions of the economy do have an impact on the projections for engineers and engineering and science technicians because these occupations are concentrated in manufacturing industries. Because the high-trend alternatives assume lower corporate tax rates and other incentives designed to stimulate business investment in new equipment, employment requirements in manufacturing industries which produce this equipment are higher. For example, in high-trend I, engineering employment is expected to rise by 553,000 between 1978 and 1990, compared with an increase of only 433,000 in the low-trend projection, which would mean about 27.7 percent more new jobs for engineers during the period.

*Managers and administrators.* The 8.8 million workers in this broad group in 1978 included managers and administrators at all levels of business and government, from corporate executives and government officials to managers of small businesses such as restaurants and repair shops. A relatively large proportion of managers—nearly 1 of 5—were self-employed.

Employment in this group is projected to grow more slowly than the average during 1978–90 in each scenario. Projected increases range from 19.1 percent in the low-trend version to between 21.3 and 27.9 percent in the high-trend alternatives. The demand for managers is more sensitive to the differences in the three scenarios than that for all occupations.

Despite an overall increase in the managerial group, the number of self-employed managers has been declining, and this trend is expected to continue in the low-trend and high-trend II scenarios. However, in high-trend I a small increase in self-employed managers is projected.

*Salesworkers.* Employment in sales occupations totaled approximately 6.4 million in 1978, or about 6.6 percent of employment in all occupations. Nearly half of these workers were concentrated in retail trade, and most of the remainder worked in manufacturing and in service industries such as finance, insurance, and real estate. Employment in sales jobs is projected to grow faster than the average for all occupations during 1978–90 in each version of the economy.

Employment of salesworkers rises from 6.4 to 8.0 million between 1978 and 1990 in the low-trend version, or 24.4 percent. Projected increases range from 25.8 to 34.5 percent in the high-trend versions. The demand for

**Table 1. Employment by major occupational group, actual 1978, and alternative projections for 1990**

[Numbers in thousands]

Occupational group	1978		1990						Percentage change in employment, 1978-90		
			Low-trend		High-trend I		High-trend II		Low-trend	High-trend I	High-trend II
	Number	Percent	Number	Percent	Number	Percent	Number	Percent			
Total .....	97,610	100.0	119,590	100.0	127,907	100.0	121,447	100.0	22.5	31.0	24.4
White-collar workers .....	48,608	49.8	60,730	50.9	64,712	50.6	61,570	50.7	24.9	33.1	26.7
Professional and technical workers .....	15,568	15.9	20,038	16.8	21,119	16.5	20,295	16.7	28.7	35.7	30.4
Managers and administrators .....	8,802	9.0	10,484	8.8	11,257	8.8	10,677	8.8	19.1	27.9	21.3
Salesworkers .....	6,420	6.6	7,989	6.7	8,632	6.8	8,079	6.7	24.4	34.5	25.8
Clerical workers .....	17,818	18.3	22,219	18.6	23,705	18.5	22,519	18.5	24.7	33.0	26.4
Blue-collar workers .....	31,812	32.6	37,720	31.5	40,694	31.8	38,330	31.6	18.6	27.9	20.5
Craft and kindred workers .....	11,705	12.0	14,366	12.0	15,555	12.2	14,668	12.1	22.7	32.9	25.3
Operatives .....	14,205	14.6	16,399	13.7	17,697	13.8	16,584	13.7	15.4	24.6	16.8
Nonfarm laborers .....	5,902	6.0	6,955	5.8	7,441	5.8	7,078	5.8	17.8	26.1	19.9
Service workers .....	14,414	14.8	18,946	15.8	20,074	15.7	19,220	15.8	31.4	39.3	33.3
Private household workers .....	1,160	1.2	982	0.8	993	0.8	988	0.8	-15.4	-14.4	-14.9
Other service workers .....	13,254	13.6	17,965	15.0	19,081	14.9	18,232	15.0	35.5	44.0	37.6
Farmworkers .....	2,775	2.8	2,193	1.8	2,426	1.9	2,327	1.9	-21.0	-12.6	-16.3

NOTE: Due to rounding, sums of individual items may not equal totals.

salespersons is slightly more sensitive to the differences in the low-trend and high-trend I scenarios than it is for workers in all occupations. However, differences between the low-trend and high-trend II scenarios have relatively little effect on the demand for salesworkers.

*Clerical workers.* Clerical occupations account for more jobs than any other occupational group. About 17.8 million persons or 18.3 percent of all workers, were in clerical occupations in 1978; nearly 1 of 5 clericals was either a secretary or a typist. Some other large occupations within this group were general office clerks, cashiers, bookkeepers, and stock clerks.

Employment of clerical workers is projected to grow faster than the average rate of employment growth in each version of the economy. Although office automation will enable clerical personnel to do more work in less time and change skill requirements for some jobs, continued increases in the demand for new workers are anticipated in most occupations. Demand should be particularly strong in the private sector, in industries such as retail trade, finance, insurance, real estate, legal services, and health services. At the same time, little increase in government employment of clericals is projected.

Employment in clerical occupations increased 24.7 percent between 1978 and 1990 in the low-trend version of the economy. In high-trend I, the projected increase is 33 percent, and in high-trend II, 26.4 percent. For clerical workers, demand is slightly less sensitive to the differences in the low-trend and high-trend I scenarios than it is for workers in all occupations. For example, the number of new clerical jobs in high-trend I is 33.8 percent greater than that projected in the low-trend version, compared with a difference of 37.8 percent for all occupations.

### **Growth among blue-collar groups**

*Craft and kindred workers.* The 11.7 million craftworkers employed in 1978 represented about 12 percent of total employment. Construction trade workers and mechanics, the two largest occupational categories in the craft group, accounted for more than half of the group's employment. Other blue-collar categories are supervisors, metalworking craftworkers, and printing trades workers. Employment in the craft group is projected to increase slightly faster than the average rate for all occupations in each of the scenarios.

In the low-trend version of the economy, employment in the construction crafts grows from almost 3 million in 1978 to about 3.7 million in 1990, an increase of 27 percent. However, most of this growth is expected before 1985. Demand for homeownership that was thwarted during the recession years of 1975 and 1980 should

spur residential investment expenditures in the first half of the 1980's. However, after 1985 it is anticipated that the rate of new household formation will decline, reflecting the decrease in births that began in the 1960's. Business investment in construction of new plants and buildings is expected to offset some of the slack in residential construction during the late 1980's.

Employment of mechanics in the low-trend version is projected to rise from almost 3.8 to 4.8 million between 1978 and 1990, or 26.8 percent. However, rates of change vary considerably among the individual occupations. For example, the number of data processing machine mechanics is projected to increase 147.6 percent, while that of railroad car repairers is expected to decline. The number of workers in the metalworking crafts expands almost as fast as the average rate for all occupations in the low-trend version, but printing trades workers are projected to increase much more slowly than average. Improvements in printing technology have increased productivity and this trend should continue.

The demand for craftworkers is more sensitive to differences in the alternative scenarios than the demand for workers in all occupations. The projected number of new jobs for craftworkers in the high-trend alternatives is 11.3 to 44.7 percent higher than in the low-trend version. In comparison, the projected number of new jobs in all occupations in the high-trend alternatives ranged from 8.5 to 37.8 percent greater than those in the low-trend version of the economy.

Craft occupations that are concentrated in manufacturing industries, such as the metalworking crafts and printing trades, are particularly sensitive to differences in the scenarios. For example, employment in metalworking crafts increases by 283,000 in the high-trend I projection, which is 65 percent greater than the projected increase of 172,000 in the low-trend version. A large proportion of metalworking craft employment is found in factories that produce equipment for business and industrial use. Because growth in investment for equipment is much faster in high-trend I, employment requirements will be greater in most industries that manufacture fabricated metal products, machinery, electrical equipment, and transportation equipment. In some industries, the number of new metalworking craft jobs in high-trend I is more than twice the number in the low-trend version.

*Operatives.* Included in this group are many of the blue-collar workers associated with manufacturing and transportation operations. About 14.2 million operatives were employed in 1978. More than 80 percent worked at manufacturing jobs such as assembler, machine tool operator, welder, and inspector. Outside of manufactur-

ing, operatives were concentrated in transportation and trade. Many were transport equipment operators, such as truck or bus drivers.

Employment of operatives is projected to grow slower than the average for all occupations in the 1978-90 period. More efficient production as a result of greater investment in new plants and equipment should limit increases in the demand for operatives in factories. However, growth rates for individual occupations will vary, depending on the particular industries in which they are employed. Generally, occupations that are concentrated in the durable goods sector are projected to grow faster than those in industries that make nondurable goods. As family incomes rise, consumers are expected to spend an increasing proportion of income on automobiles, furniture, and other durable goods, and a decreasing proportion on nondurables, such as food and basic clothing.

High-trend alternative I affects the growth of operatives more than that of any other occupational group. In the low-trend version, operative employment is projected at 6.4 million in 1990, an increase of 2.2 million over the 1978 level. The anticipated operative growth in high-trend I is 3.5 million, or 59.2 percent greater than the low-trend number. By comparison, the gain in growth for all occupations is only 37.8 percent. On the other hand, high-trend alternative II results in only an 8.3-percent greater number of new jobs than the low-trend version, which is about the same as the percentage gain for all occupations under this alternative.

Manufacturing output is much greater in high-trend I than in the low-trend scenario, which results in a higher demand for operatives, although the difference in the employment projections is moderated by the assumption that productivity will also be greater. In contrast, the dissimilarity in the two high-trend employment projections for operatives is largely a result of different projected increases in manufacturing productivity. Between 1978 and 1990, productivity in manufacturing industries rises 33.7 percent in alternative II compared with 26.3 percent in alternative I. A slightly higher rate of increase in manufacturing output in alternative I also contributes to the difference in the employment projections.

### Service workers

*Service workers, except private household.* Numbering 13.2 million in 1978, these service jobs accounted for about 13.6 percent of total employment. Employment in this group is expected to increase faster than in any other occupational group through the 1980's in each scenario of the economy. Projected 1978-90 increases range from 35.5 percent in the low-trend version to 44 percent in high-trend I. Employment growth is expected to be particularly rapid in food service occupations,

to be such as waiters' assistants and in health service occupations, such as nurses' aides and medical assistants. The greater health care needs of a growing elderly population will spur demand for service workers in hospitals and nursing homes. The demand for food service workers should also grow as incomes rise and more families have both husbands and wives working. Employment of police officers, firefighters, and most other protective service workers is projected to grow slower than the average for service occupations, but faster than that for all occupations. Projected growth rates are mixed among personal service occupations. For example, rapid increases in the demand for childcare workers and welfare service aides are anticipated, but only moderate increases in employment are expected for barbers and cosmetologists.

Demand for this group of service workers is less sensitive to differences in the three scenarios than for most other occupational groups. For example, employment in the high-growth projection I is only 23.7-percent greater than employment in the low-growth projection, compared with the 37.8-percent difference for all occupations. It is assumed that the additional increases in personal income in the high-trend versions will be spent primarily on goods rather than on services.

*Private household workers.* In contrast to the rapid employment gain anticipated for other service workers, the number of private household workers is projected to decrease from almost 1.2 million in 1978 to between 993,000 and 982,000 in 1990. A continued decline is expected, despite an increase in job opportunities for private household workers. The demand for maids and other private household workers should rise as more women work outside the home and personal incomes rise, but fewer people will seek employment in private households because of low wages, lack of advancement opportunities, and low social status associated with these jobs.

### Farmworkers

More than half of the almost 2.8 million farmworkers employed in 1978 were farmers, including both owners and tenant farmers; most of the remainder were farm laborers. A small proportion were managers and supervisors. Employment of farmworkers has declined for decades as farm productivity has risen as a result of larger, more efficient farms, improvements in mechanized equipment, and technological innovations in seed, feed, and fertilizer. Continued drops in the number of farmworkers are expected through the 1980's. In the low-trend version, employment falls, from almost 2.8 million in 1978 to 2.2 million in 1990, a decrease of 21 percent. The projected declines are more moderate in

the high-trend versions, 12.6 percent in I and 16.3 percent in II. The number of farmers is projected to fall less rapidly than the number of farm laborers in each alternative.

### Detailed occupations

Table 2 presents 1978-90 employment projections for all detailed occupations in the industry-occupation matrix with employment of 25,000 or more in 1978.<sup>4</sup> Approximately 340 occupations were in this category, and they accounted for about three-fourths of total employment in 1978. Projected rates of employment change for these selected occupations cover broad ranges in the three scenarios. For example, low-trend projections run from a 25.4-percent decline for farm laborers to a 147.6-percent increase for data processing machine mechanics. Rankings of occupations by projected growth rates are very similar for the three scenarios. The following list presents the 20 most rapidly growing detailed occupations among the low-trend projections:

Occupation	Percent growth in employment, 1978-90
Data processing machine mechanics . . . . .	147.6
Paralegal personnel . . . . .	132.4
Computer systems analysts . . . . .	107.8
Computer operators . . . . .	87.9
Office machine and cash register servicers . . . . .	80.8
Computer programmers . . . . .	73.6
Aero-astronautic engineers . . . . .	70.4
Food preparation and service workers, fast food restaurants . . . . .	68.8
Employment interviewers . . . . .	66.6
Tax preparers . . . . .	64.5
Correction officials and jailers . . . . .	60.3
Architects . . . . .	60.2
Dental hygienists . . . . .	57.9
Physical therapists . . . . .	57.6
Dental assistants . . . . .	57.5
Peripheral EDP equipment operators . . . . .	57.3
Child-care attendants . . . . .	56.3
Veterinarians . . . . .	56.1
Travel agents and accommodations appraisers . . . . .	55.6
Nurses' aides and orderlies . . . . .	54.6

In high-trend alternative I, correction officials and jailers, dental hygienists, and dental assistants drop off the list of the 20 fastest growing occupations, and are replaced by real estate sales agents and representatives, dental lab technicians, and security sales agents and representatives. In high-trend II, dental assistants and travel agents drop off the list and are replaced by real estate sales agents and representatives, and economists. However, in both high-trend alternatives the displaced occupations remain among the 30 fastest growing.

The rank of occupations by growth in numbers of jobs also changes little from one scenario to another. The 20 occupations with the largest numbers of new

jobs in the low-trend version are presented in the list which follows. In both high-trend alternatives, licensed practical nurses drop from this list (but remain in the top 25), and are replaced by carpenters:

Occupation	Growth in employment (in thousands), 1978-90
Janitors and sextons . . . . .	671.2
Nurses' aides and orderlies . . . . .	594.0
Sales clerks . . . . .	590.7
Cashiers . . . . .	545.5
Waiters/waitresses . . . . .	531.9
General clerks, office . . . . .	529.8
Professional nurses . . . . .	515.8
Food preparation and service workers, fast food restaurants . . . . .	491.9
Secretaries . . . . .	487.8
Truckdrivers . . . . .	437.6
Kitchen helpers . . . . .	300.6
Elementary schoolteachers . . . . .	272.8
Typists . . . . .	262.1
Accountants and auditors . . . . .	254.2
Helpers, trades . . . . .	232.5
Blue-collar worker supervisors . . . . .	221.1
Bookkeepers, hand . . . . .	219.7
Licensed practical nurses . . . . .	215.6
Guards and doorkeepers . . . . .	209.9
Automotive mechanics . . . . .	205.3

The low-trend version projects employment declines for 22 of the detailed occupations and high-trend II projects drops for 21; the rankings by rates of decline are similar for both scenarios. The number of occupations with projected employment decreases falls to 18 in high-trend I. However, the reversals in the direction of change are not dramatic, and usually make relatively little difference in the projected employment levels.

### New data base

The method used by BLS to develop occupational projections requires two basic inputs—projected employment by industry at a detailed industry level and projected occupational staffing patterns at the same industry detail. The occupational projections prepared by BLS are obtained by applying the projected occupational staffing patterns to the related industry employment projections and summing across the detailed industries.<sup>5</sup> The Bureau has used this procedure to develop national occupational projections since the mid-1960's.<sup>6</sup>

During the 1960's and 1970's, decennial census data were the primary data source for developing occupational staffing patterns of industries. These patterns were based largely on trends in the census data from decade to decade. However, because census data are collected only every 10 years, they were considered inadequate for analyzing trends in industry staffing patterns. In the 1970's, the Bureau initiated the Occupa-

**Table 2. Civilian employment in occupations with 25,000 workers or more, actual 1978 and projected 1990**

Occupation	Employment (in thousands)				Percent change, 1978-90		
	1978	1990 Low-trend	1990 High-trend I	1990 High-trend II	Low-trend	High-trend I	High-trend II
Total, all occupations	97,610	119,590	127,907	121,447	22.52	31.04	24.42
Professional, technical, and related workers	15,570	20,038	21,119	20,295	28.70	35.64	30.34
Engineers	1,071	1,504	1,624	1,531	40.41	51.61	42.92
Aero-astronautic engineers	57	98	104	100	70.35	80.86	74.81
Chemical engineers	53	68	73	70	28.92	37.70	31.80
Civil engineers	149	208	218	211	39.38	45.59	40.97
Electrical engineers	291	441	479	448	51.18	64.41	53.90
Industrial engineers	109	146	159	148	34.03	46.49	36.37
Mechanical engineers	199	274	300	279	37.56	50.67	40.18
Life and physical scientists	236	299	316	304	26.44	33.63	28.70
Biological scientists	42	51	54	53	21.82	28.86	24.98
Chemists	90	113	120	115	24.95	32.19	27.23
Geologists	33	50	53	51	52.08	61.36	52.69
Engineering and science technicians	1,160	1,577	1,700	1,609	35.97	46.54	38.73
Drafters	293	412	446	419	40.59	52.25	43.20
Electrical and electronic technicians	319	464	512	478	45.42	60.24	49.79
Industrial engineering technicians	31	40	44	41	30.37	41.33	32.09
Mechanical engineering technicians	45	61	67	62	35.96	49.67	38.75
Surveyors	54	73	78	76	35.19	44.73	39.91
Medical workers, except technicians	2,026	2,928	3,094	2,954	44.55	52.77	45.83
Dentists	149	208	223	212	39.59	49.24	42.37
Dietitians	41	61	65	62	49.69	58.61	53.43
Nurses, professional	1,026	1,542	1,618	1,551	50.28	57.69	51.20
Optometrists	25	33	36	33	29.66	40.65	31.20
Pharmacists	140	159	171	157	13.36	22.36	12.10
Physicians, medical and osteopathic	447	626	665	631	39.98	48.70	41.23
Therapists	139	210	220	213	51.51	58.67	53.19
Physical therapists	31	49	52	50	57.63	66.46	59.73
Speech and hearing clinicians	34	52	53	52	54.50	58.29	55.33
Veterinarians	30	47	51	50	56.13	70.27	66.11
Health technologists and technicians	1,246	1,811	1,906	1,820	45.34	52.93	46.03
Dental assistants	123	193	198	191	57.48	60.95	55.91
Dental hygienists	53	84	86	84	57.92	61.42	56.38
Health records technologists	30	44	46	44	47.10	53.57	47.26
Licensed practical nurses	491	707	752	717	43.89	52.98	45.96
Medical technicians	82	119	127	119	46.04	55.31	46.36
Medical lab technologists	98	141	149	141	43.90	52.70	44.32
Surgical technicians	30	44	46	44	48.13	54.63	48.00
X-ray technicians	86	126	133	126	47.44	54.71	47.21
Technicians, excluding health, science, and engineering	271	343	362	347	26.82	33.78	28.11
Airplane pilots	74	94	101	96	27.00	35.47	28.81
Air traffic controllers	28	34	34	34	21.67	24.18	21.93
Technical assistants, library	34	48	49	48	42.07	42.78	41.71
Computer specialists	389	738	793	754	89.83	104.05	93.94
Computer programmers	204	354	381	361	73.57	86.90	77.22
Computer systems analysts	185	384	412	392	107.75	122.97	112.38
Social scientists	176	243	256	248	38.12	45.51	41.26
Economists	27	41	43	42	54.17	62.93	56.30
Psychologists	78	107	111	109	36.79	42.69	39.31
Teachers	3,877	4,079	4,113	4,074	5.22	6.09	5.08
Adult education teachers	105	123	126	124	18.02	20.75	18.31
College and university teachers	618	557	560	556	-9.78	-9.30	-9.97
Teachers, vocational education and training	26	33	34	33	26.49	30.29	26.85
Teachers, college	454	409	410	408	-10.06	-9.72	-10.28
Graduate assistants	131	110	110	109	-16.45	-16.13	-16.65
Elementary schoolteachers	1,277	1,550	1,556	1,546	21.37	21.82	21.08
Preschool and kindergarten teachers	455	574	579	572	26.16	27.31	25.75
Secondary schoolteachers	1,229	1,071	1,075	1,068	-12.87	-12.54	-13.08
Selected writers, artists, and entertainers	888	1,117	1,198	1,134	25.78	34.93	27.75
Commercial artists	100	122	134	126	22.25	33.97	26.58
Designers	169	194	212	190	15.22	25.49	12.87
Musicians, instrumental	126	160	166	166	27.15	31.73	31.67
Photographers	77	104	113	104	35.95	47.21	35.30
Public relations specialists	81	102	109	104	26.06	34.81	29.15
Radio and TV announcers	46	66	68	66	43.02	48.74	43.35
Reporters and correspondents	54	68	74	70	27.59	37.44	31.25
Sports instructors	34	41	43	41	20.16	26.64	20.56
Writers and editors	109	142	155	146	30.33	41.59	34.03
Other professional and technical workers	4,183	5,338	5,692	5,457	27.61	36.07	30.46
Accountants and auditors	777	1,031	1,107	1,055	32.72	42.50	35.83
Appraisers, real estate	32	47	50	48	46.38	56.88	49.79
Architects	66	106	112	109	60.20	70.18	64.53
Assessors	30	38	38	38	28.03	30.27	28.26
Buyers, retail and wholesale trade	238	296	320	298	24.37	34.15	25.13
Caseworkers	236	338	350	346	43.32	48.42	46.57
Clergy	287	292	313	301	1.67	9.19	5.12
Community organization workers	49	71	74	73	46.74	51.38	49.76
Cost estimators	80	105	112	108	31.60	40.84	34.94
Directors, religious education and activities	36	37	40	38	3.29	11.13	6.96
Employment interviews	51	86	95	88	66.59	85.55	72.02



Table 2. Continued—Civilian employment in occupations with 25,000 workers or more, actual 1978 and projected 1990

Occupation	Employment (in thousands)				Percent change, 1978-90		
	1978	1990 Low-trend	1990 High-trend I	1990 High-trend II	Low-trend	High-trend I	High-trend II
Foresters	26	32	34	33	22.15	27.33	25.25
Law clerks	30	43	48	44	44.04	62.47	49.85
Lawyers	380	524	580	543	37.85	52.71	43.05
Paralegal personnel	28	66	75	69	132.35	165.68	142.99
Librarians	130	139	142	140	6.78	8.76	7.12
Personnel and labor relations specialists	169	205	217	208	21.06	28.21	22.86
Purchasing agents and buyers	164	200	214	202	21.96	30.69	23.69
Recreation workers, group	121	152	160	157	26.41	32.63	29.99
Tax examiners, collectors, and revenue agents	50	60	61	60	19.39	21.65	19.61
Tax preparers	29	47	54	51	64.52	87.75	77.93
Travel agents and accommodations appraisers	45	70	74	70	55.64	65.46	56.06
Underwriters	70	90	93	90	28.40	33.86	28.98
Vocational and educational counselors	202	212	215	213	4.66	6.29	5.27
Managers, officials, and proprietors	8,802	10,484	11,257	10,677	19.10	27.89	21.31
Auto parts department managers	48	54	59	59	13.20	23.01	23.28
Auto service department managers	60	69	75	75	15.02	24.97	25.46
Construction inspectors, public administration	44	61	62	61	37.37	39.81	37.62
Inspectors, excluding construction, public administration	104	125	128	125	20.58	22.88	20.82
Postmasters and mail superintendents	28	29	30	29	4.07	7.92	4.84
Railroad conductors	33	31	34	32	-6.63	2.93	-5.52
Restaurant, cafe, and bar managers	499	642	680	650	28.65	36.25	30.27
Sales managers, retail trade	261	323	351	323	24.14	34.83	23.93
Store managers	926	1,102	1,183	1,107	18.95	27.76	19.52
Wholesalers	234	279	307	284	19.60	31.35	21.42
Salesworkers	6,443	7,989	8,632	8,079	23.99	33.97	25.40
Real estate brokers	34	48	52	49	42.34	55.92	44.47
Sales agents and representatives, real estate	255	394	430	400	54.09	68.42	56.74
Sales agents and representatives, insurance	310	399	420	405	28.61	35.66	30.81
Sales agents and representatives, security	55	80	92	88	45.79	66.81	60.70
Sales clerks	2,771	3,362	3,601	3,362	21.32	29.96	21.32
Clerical workers	17,820	22,219	23,705	22,519	24.69	33.03	26.37
Adjustment clerks	37	45	48	46	23.89	29.83	24.57
Bank tellers	440	601	619	606	36.40	40.61	37.51
New accounts tellers	48	65	67	66	34.65	39.23	36.57
Tellers	392	536	552	540	36.62	40.78	37.62
Bookkeepers and accounting clerks	1,628	1,982	2,131	2,014	21.79	30.95	23.72
Accounting clerks	700	835	895	845	19.27	27.82	20.74
Bookkeepers, hand	927	1,147	1,236	1,168	23.69	33.32	25.96
Cashiers	1,501	2,046	2,165	2,070	36.35	44.27	37.96
Claims adjusters	65	95	98	95	46.63	51.65	47.21
Claims clerks	63	92	96	93	47.26	52.78	48.06
Claims examiners, insurance	38	58	59	58	51.53	54.74	52.29
Clerical supervisors	402	518	552	526	29.01	37.45	30.81
Collectors, bill and account	85	108	119	113	26.52	39.53	32.26
Credit clerks, banking and insurance	47	62	68	66	31.00	43.91	39.79
Desk clerks, except bowling floor	75	97	109	98	29.27	46.09	30.91
Dispatchers, police, fire, and ambulance	46	60	61	60	28.22	30.47	28.45
Dispatchers, vehicle service or work	89	108	116	107	21.58	29.62	20.55
Eligibility workers, welfare	30	38	39	39	29.67	32.16	30.28
File clerks	251	328	349	332	30.77	39.31	32.42
General clerks, office	2,269	2,799	3,002	2,839	23.35	32.28	25.11
Insurance clerks, medical	63	93	97	92	46.69	53.95	45.77
Library assistants	117	128	129	128	8.77	9.98	8.74
Mail carriers, postal service	237	260	270	262	9.77	13.83	10.58
Mail clerks	75	94	99	96	25.19	31.61	27.50
Marking clerks, trade	44	54	57	55	21.24	27.88	23.46
Messengers	47	60	64	61	28.24	37.38	31.97
Meter readers, utilities	28	32	38	32	14.64	33.57	15.04
Office machine operators	842	1,133	1,211	1,147	34.52	43.85	36.21
Bookkeeping and billing operators	218	283	301	283	29.84	37.92	29.41
Bookkeeping, billing machine operators	166	212	228	212	27.72	37.57	27.63
Proof machine operators	44	60	61	59	37.07	39.56	35.56
Computer, peripheral equipment operators	215	389	415	397	81.32	93.19	84.73
Computer operators	169	317	338	323	87.90	100.74	91.71
Peripheral EDP equipment operators	46	72	76	73	57.26	65.55	59.15
Duplicating machine operators	31	38	41	39	22.46	31.01	24.56
Keypunch operators	295	316	341	321	7.03	15.56	8.78
Order clerks	240	289	316	288	20.25	31.49	19.88
Payroll and timekeeping clerks	172	211	226	214	22.13	31.01	24.08
Personnel clerks	90	111	118	113	23.40	30.14	24.79
Postal clerks	310	309	321	312	-28	3.41	.46
Procurement clerks	39	46	50	47	19.53	28.38	20.72
Production clerks	192	234	257	238	22.33	34.03	24.48
Raters	51	63	66	64	23.56	28.73	24.14
Receptionists	369	505	540	511	37.00	46.36	38.57
Reservation agents	52	55	59	56	6.64	13.57	7.48
Secretaries, stenographers, and typists	3,574	4,383	4,678	4,458	22.65	30.89	24.72
Secretaries	2,319	2,807	3,007	2,860	21.03	29.64	23.31
Stenographers	262	322	341	326	22.76	30.20	24.46
Typists	993	1,255	1,330	1,271	26.40	33.98	28.09
Shipping and receiving clerks	378	448	488	452	18.52	28.92	19.38

**Table 2. Continued—Civilian employment in occupations with 25,000 workers or more, actual 1978 and projected 1990**

Occupation	Employment (in thousands)				Percent change, 1978-90		
	1978	1990 Low-trend	1990 High-trend I	1990 High-trend II	Low-trend	High-trend I	High-trend II
Shipping packers	340	398	431	401	17.10	26.90	17.99
Statement clerks	30	44	45	44	45.76	49.57	45.81
Statistical clerks	81	95	101	96	16.85	24.09	18.23
Stock clerks, stockroom and warehouse	787	964	1,043	977	22.44	32.47	24.16
Survey workers	40	48	52	49	17.84	27.72	21.46
Switchboard operators/receptionists	219	276	298	282	25.96	36.08	28.71
Teacher's aides, except monitors	404	497	500	495	23.00	23.79	22.59
Telephone operators	312	376	414	382	20.60	32.58	22.54
Switchboard operators	171	218	234	222	27.65	37.18	30.05
Central office operators	101	113	128	114	11.24	26.08	12.62
Directory assistance operators	35	40	45	40	13.47	28.59	14.85
Ticket agents	49	51	54	51	3.75	10.11	4.61
Town clerks	26	33	34	33	28.55	30.80	28.78
Weighers	35	42	45	42	17.92	26.90	19.15
<b>Crafts and related workers</b>	<b>11,679</b>	<b>14,366</b>	<b>15,555</b>	<b>14,668</b>	<b>23.01</b>	<b>33.19</b>	<b>25.60</b>
Construction craftworkers	2,950	3,747	4,037	3,841	27.04	36.85	30.24
Brickmasons	144	204	220	211	41.71	52.76	46.35
Carpenters	979	1,183	1,274	1,228	20.82	30.17	25.46
Carpet cutters and layers	50	65	72	67	29.41	43.35	33.48
Ceiling tile installers and floor layers	25	35	38	36	36.88	50.70	41.16
Concrete and terrazzo finishers	113	152	164	157	34.61	44.96	38.82
Dry wall installers and lathers	92	125	135	128	35.46	46.23	38.99
Dry wall applicators	51	70	76	72	39.20	50.46	43.19
Tapers	30	42	46	43	40.68	51.68	43.66
Electricians	516	678	726	693	31.44	40.77	34.33
Glaziers	35	48	51	49	35.53	44.62	40.02
Painters, construction and maintenance	363	436	477	429	20.02	31.27	18.25
Plumbers and pipefitters	375	492	526	504	31.06	40.04	34.40
Roofers	99	130	139	133	31.05	40.91	35.03
Structural steel workers	67	90	95	92	33.07	40.57	36.37
<b>Mechanics, repairers, and installers</b>	<b>3,758</b>	<b>4,764</b>	<b>5,157</b>	<b>4,863</b>	<b>26.77</b>	<b>37.24</b>	<b>29.40</b>
Air conditioning, heating, and refrigerator mechanics	165	213	230	216	29.04	39.10	30.65
Aircraft mechanics	97	125	133	126	28.32	36.20	29.47
Auto-body repairers	154	189	201	193	22.67	30.40	25.13
Automotive mechanics	847	1,052	1,124	1,082	24.25	32.71	27.77
Coin machine servicers and repairers	27	29	31	25	9.53	16.43	-7.79
Data processing machine mechanics	63	156	172	162	147.62	173.02	157.14
Diesel mechanics	166	214	227	214	29.29	37.24	29.36
Electric power line installers and repairers	157	189	215	192	20.33	36.48	22.12
Cable splicers	40	48	54	48	18.54	34.14	19.99
Line installers and repairers	110	133	151	136	21.30	37.45	23.24
Engineering equipment mechanics	86	104	112	107	20.83	30.45	24.90
Gas and electric appliance repairers	57	70	78	70	21.39	35.29	21.24
Instrument repairers	36	42	45	42	14.62	24.03	15.79
Maintenance mechanics	346	411	439	418	18.83	27.06	21.10
Maintenance repairers, general utility	626	785	846	795	25.52	35.18	27.01
Millwrights	93	108	114	109	15.47	22.39	16.79
Office machine and cash register servicers	49	89	96	91	80.78	96.24	86.69
Radio and television repairers	81	112	122	117	37.56	49.60	44.10
Railroad car repairers	30	24	27	25	-18.81	-10.47	-17.85
Telephone installers and repairers	228	273	310	277	20.21	36.29	21.85
Central office repairers	47	56	63	57	19.40	35.31	20.86
Installers, repairers, and section maintainers	69	83	94	84	20.36	36.34	22.01
Station installers	55	65	74	66	19.62	35.61	21.11
<b>Metalworking craftworkers, except mechanics</b>	<b>909</b>	<b>1,081</b>	<b>1,192</b>	<b>1,106</b>	<b>18.96</b>	<b>31.11</b>	<b>21.69</b>
Boilermakers	42	52	57	54	25.56	36.70	30.12
Heat treaters, annealers, and temperers	25	29	32	30	16.06	25.79	16.70
Machine tool setters, metalworking	57	66	74	67	16.10	29.85	18.52
Machinists	272	323	358	331	18.82	31.66	21.95
Sheet metal workers and tinsmiths	205	261	280	267	27.57	36.95	30.63
Tool and die makers	166	192	221	197	15.96	33.10	18.79
<b>Printing trades craftworkers</b>	<b>386</b>	<b>442</b>	<b>476</b>	<b>458</b>	<b>14.72</b>	<b>43.55</b>	<b>18.72</b>
Compositors and typesetters	123	121	130	124	-1.92	5.96	1.03
Press and plate printers	168	197	211	204	17.42	25.92	21.68
Letter press operators	36	39	42	40	8.99	17.88	13.64
Offset lithographic press operators	75	92	99	96	22.55	31.91	27.61
Press operators and plate printers	35	41	43	42	16.10	21.82	17.87
<b>Other crafts and related workers</b>	<b>3,677</b>	<b>4,332</b>	<b>4,693</b>	<b>4,400</b>	<b>17.82</b>	<b>27.64</b>	<b>19.67</b>
Bakers	60	72	76	74	20.11	27.22	22.97
Blue-collar worker supervisors	1,274	1,495	1,616	1,520	17.36	26.87	19.33
Cabinetmakers	72	89	95	88	22.96	31.00	21.36
Crane, derrick, and hoist operators	126	146	157	149	15.72	23.73	17.75
Dental lab technicians	48	69	79	71	44.91	67.04	48.65
Furniture upholsterers	30	38	43	39	27.31	41.84	31.43
Heavy equipment operators	431	546	598	560	26.57	38.65	29.83
Inspectors	475	544	595	554	14.70	25.43	16.73
Jewelers and silversmiths	29	32	35	31	10.74	21.54	7.24
Merchandise displays and window trimmers	26	31	33	32	17.84	26.30	20.68
Opticians	30	42	46	41	38.61	50.56	34.65
Sewage plant operators	38	43	45	43	15.01	18.28	15.26
Stationary engineers	60	68	72	68	13.48	19.89	14.40

Table 2. Continued—Civilian employment in occupations with 25,000 workers or more, actual 1978 and projected 1990

Occupation	Employment (in thousands)				Percent change, 1978-90		
	1978	1990 Low-trend	1990 High-trend I	1990 High-trend II	Low-trend	High-trend I	High-trend II
Tailors .....	66	75	83	77	14.34	25.05	16.75
Testers .....	105	120	130	122	14.55	23.83	16.48
Water treatment plant operators .....	27	32	33	32	15.98	21.15	16.30
<b>Operatives</b> .....	14,205	16,399	17,697	16,584	15.44	24.58	16.75
Assemblers .....	1,672	1,997	2,192	2,029	19.44	31.07	21.33
Electrical and electronic assemblers .....	207	278	305	281	34.24	47.30	36.07
Electro-mechanical equipment assemblers .....	53	69	78	71	29.89	46.37	32.13
Machine assemblers .....	100	124	144	127	24.76	44.67	27.48
Bindery operatives .....	81	86	94	90	6.57	15.63	10.72
Bindery workers, assembly .....	41	43	47	45	6.64	15.99	10.95
Laundering, drycleaning, and pressing machine operators .....	316	356	404	375	12.48	27.76	18.68
Laundry operators, small establishment .....	34	48	53	49	39.62	56.00	44.80
Pressers:							
Hand .....	30	32	36	33	7.18	19.30	10.79
Machine .....	54	56	65	59	2.41	18.80	8.76
Machine, laundry .....	66	74	84	78	11.76	26.65	18.08
Washers, machine and starchers .....	56	79	87	82	41.42	55.69	47.19
<b>Metalworking operatives</b> .....	1,650	1,970	2,211	2,025	19.38	33.97	22.71
Drill press and boring machine operators .....	123	148	167	151	19.57	35.39	22.60
Electroplaters .....	35	44	48	45	24.38	34.56	27.29
Grinding and abrading machine operators, metal .....	131	154	173	157	17.43	32.37	20.01
Lathe machine operators, metal .....	153	186	210	191	22.03	37.69	25.29
Machine tool operators:							
Combination .....	170	200	226	206	17.91	33.43	21.47
Numerical control .....	49	61	70	63	24.18	41.49	27.45
Tool room .....	40	46	52	47	15.31	31.63	17.99
Milling and planing machine operators .....	68	83	95	86	21.58	39.59	25.21
Power brake and bending machine operators, metal .....	41	48	54	49	19.01	32.29	21.31
Punch press operators, metal .....	195	217	240	222	11.25	23.05	13.80
Welders and flamecutters .....	570	696	784	720	22.14	37.60	26.45
<b>Mine operatives, not elsewhere classified</b> .....	170	239	259	243	41.00	52.69	43.44
Roustabouts .....	61	81	85	79	31.42	37.94	29.43
<b>Packing and inspecting operatives</b> .....	906	981	1,041	993	8.30	14.93	9.67
Baggers .....	215	238	250	242	10.64	16.32	12.75
Production packagers .....	612	661	704	669	7.94	15.08	9.35
Selectors, glasswares .....	32	35	35	33	8.84	10.93	3.75
<b>Painters, manufactured articles</b> .....	166	205	222	206	23.42	33.46	24.05
Painters, automotive .....	40	56	59	55	40.04	45.96	37.34
Painters, production .....	113	132	145	134	17.34	29.04	19.02
<b>Sewers and stitchers</b> .....	919	967	1,065	987	5.25	15.93	7.39
Sewing machine operators:							
Regular equipment, garment .....	616	634	702	647	2.96	14.02	5.15
Special equipment, garment .....	89	96	106	98	8.61	19.98	11.00
Regular equipment, nongarment .....	144	161	175	164	12.08	21.22	13.58
Special equipment, nongarment .....	40	45	49	46	13.10	21.74	14.41
<b>Textile operatives</b> .....	394	399	419	396	1.36	6.53	.58
Folders, hand .....	27	29	32	30	8.64	19.29	9.13
Spinners, frame .....	31	32	32	31	1.38	4.18	-.57
Weavers .....	37	33	33	32	-11.18	-8.85	-11.45
<b>Transport equipment operatives</b> .....	3,468	4,152	4,428	4,140	19.70	27.68	19.35
Ambulance drivers and attendants .....	28	41	42	40	45.30	48.79	40.86
Busdrivers .....	266	326	329	321	22.49	23.76	20.65
Chauffeurs .....	39	48	52	48	24.63	34.13	24.76
Delivery and route workers .....	802	916	991	901	14.28	23.52	12.33
Industrial truck operators .....	408	459	493	464	12.50	20.69	13.60
Parking attendants .....	37	44	51	58	21.56	40.23	58.07
Railroad brake operators .....	74	67	73	68	-10.27	-1.26	-9.06
Taxi drivers .....	79	69	78	72	-12.59	-.87	-8.98
Truckdrivers .....	1,672	2,110	2,246	2,102	26.16	34.30	25.69
<b>All other operatives</b> .....	4,311	4,882	5,189	4,936	13.25	20.38	14.52
Asbestos and insulation workers .....	42	58	62	60	37.75	47.32	41.52
Cutters, machine .....	29	32	34	32	9.86	16.86	11.83
Dressmakers, except factory .....	53	49	53	50	-8.33	-.54	-5.41
Files, grinders, buffers, and chippers .....	127	151	168	155	19.56	33.04	22.66
Fuel pump attendants and lubricators .....	434	475	492	481	9.51	13.40	10.96
Furnace operators and tenders, except metal .....	62	65	67	65	4.97	9.15	4.98
Stationary boiler firers .....	47	51	53	51	6.80	10.99	7.13
Miscellaneous machine operatives:							
Lumber and furniture .....	51	59	60	56	16.21	18.45	9.74
Chemicals and allied products .....	153	167	176	172	9.13	15.20	12.82
Rubber and miscellaneous plastics .....	229	284	292	282	23.99	27.67	23.40
Miscellaneous operatives, not elsewhere classified:							
Durable goods .....	103	123	128	123	19.27	24.60	18.90
Nondurable goods .....	249	257	275	258	3.11	10.46	3.69
Mixing operatives .....	53	51	55	52	-2.36	4.32	-1.31
Oilers .....	40	48	52	49	19.52	30.02	21.65
Photographic process workers .....	66	81	89	81	22.68	34.55	22.40
Rotary drill operator helpers .....	31	42	45	42	34.02	41.28	32.91
Shear and slitter operators, metal .....	32	37	40	38	15.46	26.45	17.92
Shoemaking machine operators .....	68	54	59	55	-19.98	-13.07	-19.24
Surveyor helpers .....	48	68	70	68	39.92	45.20	41.45

**Table 2. Continued—Civilian employment in occupations with 25,000 workers or more, actual 1978 and projected 1990**

Occupation	Employment (in thousands)				Percent change, 1978-90		
	1978	1990 Low-trend	1990 High-trend I	1990 High-trend II	Low-trend	High-trend I	High-trend II
Tire changers and repairers	60	71	77	73	17.47	27.18	20.94
Winding operatives, not elsewhere classified	48	58	62	59	21.91	30.43	24.02
Coil winders	29	37	40	38	27.30	39.55	30.02
Writers, electronic	28	35	38	36	24.46	36.15	28.08
Wood machinists	27	33	34	32	23.67	27.82	22.10
Service workers	14,414	18,946	20,074	19,220	31.44	39.27	33.34
Food service workers	5,610	7,774	8,192	7,827	38.57	46.02	39.53
Bakers, bread and pastry	45	57	59	57	27.08	33.19	27.91
Bartenders	347	453	480	457	30.35	38.05	31.64
Butchers and meat cutters	178	212	225	214	18.64	25.84	19.90
Cooks, except private household	1,024	1,367	1,438	1,379	33.50	40.48	34.74
Cooks, institutional	296	370	386	378	25.19	30.68	27.69
Cooks, restaurant	320	445	471	448	39.18	47.43	40.12
Cooks, short order and specialty fast foods	408	552	580	554	35.07	42.13	35.63
Food preparation and service workers, fast food restaurant	714	1,206	1,265	1,210	68.84	77.10	69.37
Hosts/hostesses, restaurant, lounge, coffee shop	104	154	163	155	48.61	57.14	49.05
Kitchen helpers	771	1,072	1,131	1,084	38.98	46.74	40.53
Pantry, sandwich, and coffee makers	64	92	97	92	43.07	51.80	43.28
Waiters/waitresses	1,539	2,071	2,186	2,084	34.56	42.09	35.43
Waiters' assistants	252	363	384	366	43.72	52.20	45.03
Janitors and sextons	2,585	3,257	3,504	3,317	25.96	35.52	28.30
Selected health service workers	1,251	1,921	2,051	1,963	53.53	63.93	56.90
Medical assistants	81	116	123	116	44.20	52.27	43.52
Nurses' aides and orderlies	1,089	1,683	1,801	1,725	54.56	65.40	58.43
Psychiatric aides	77	115	120	116	49.50	56.20	49.86
Selected personal service workers	1,547	2,028	2,206	2,108	31.08	42.56	36.20
Barbers	114	142	160	149	23.90	40.06	30.14
Child-care attendants	35	55	60	59	56.26	67.85	66.53
Child-care workers	398	581	615	600	46.10	54.55	50.76
Cosmetologists and women's hair stylists	434	530	603	566	22.22	38.89	30.43
Elevator operators	45	59	64	60	30.70	40.89	32.30
Flight attendants	51	64	68	65	26.82	34.56	27.75
Game and ride operators and concession workers	28	37	38	36	33.10	35.85	29.47
Housekeepers, hotel and motel	49	67	74	69	35.70	50.95	39.86
Recreation facility attendants	65	83	85	82	28.33	31.02	27.63
Reducing instructors	26	29	35	32	12.22	35.84	25.21
School monitors	37	38	38	38	3.03	3.41	2.78
Ushers, lobby attendants, and ticket takers	40	46	46	46	15.44	14.50	13.87
Welfare service aides	84	126	132	130	51.15	57.25	55.24
Protective service workers	1,586	2,098	2,189	2,120	32.28	38.02	33.71
Correction officials and jailers	95	152	154	152	60.28	63.08	60.55
Crossing or bridge tenders	27	32	33	32	18.07	20.76	18.21
Crossing guards, school	38	48	49	49	28.55	30.81	28.79
Firefighters	200	256	260	256	27.62	29.88	27.86
Fire officers	46	59	60	59	28.56	30.81	28.79
Guards and doorkeepers	591	801	868	820	35.52	46.80	38.73
Police detectives	59	72	74	72	23.06	25.33	23.30
Police officers	94	119	121	119	26.68	28.93	26.91
Police patrolmen/women	358	459	467	460	28.02	30.26	28.25
Private household workers	1,160	982	993	988	-15.41	-14.39	-14.87
Child-care workers, private household	486	412	417	414	-15.32	-14.29	-14.78
Housekeepers, private household	118	100	101	100	-15.40	-14.39	-14.86
Maids and servants, private household	530	449	455	452	-15.20	-14.19	-14.67
Supervisors, nonworking, service	189	254	270	256	34.12	42.27	35.10
All other service workers	484	633	670	640	30.76	38.33	32.29
Laborers, except farm	5,902	6,955	7,441	7,078	17.83	26.07	19.92
Animal caretakers	88	113	122	124	27.63	38.19	40.57
Construction laborers, excluding carpenter helpers	277	348	365	352	25.74	31.67	27.01
Highway maintenance workers	170	211	215	212	24.44	26.61	24.66
Pipelayers	43	54	60	55	25.48	38.32	27.80
Reinforcing-iron workers	31	42	45	43	34.50	41.55	37.99
Cannery workers	82	80	84	89	-2.53	3.18	8.85
Cleaners, vehicle	118	150	159	160	27.04	35.07	35.76
Conveyor operators and tenders	55	62	68	63	13.82	23.96	15.65
Garbage collectors	110	137	148	137	24.37	34.39	24.34
Gardeners and groundkeepers, except farm	639	738	789	765	15.58	23.50	19.71
Helpers, trades	928	1,161	1,255	1,193	25.04	35.20	28.49
Line service attendants	27	32	34	32	17.74	25.49	18.61
Off-bearers	25	28	28	26	9.73	10.76	3.94
Riggers	28	33	35	34	16.99	24.70	19.58
Stock handlers	918	1,131	1,210	1,137	23.18	31.82	23.82
Order fillers	352	407	445	405	15.52	26.18	15.08
Stock clerks, sales floor	566	724	766	731	27.95	35.34	29.26
Timbercutting and logging workers	70	59	63	61	-15.96	-10.90	-13.58
Fallers and buckers	43	36	38	37	-16.60	-11.51	-14.18
Farmers and farmworkers	2,775	2,193	2,426	2,327	-20.97	-12.57	-16.13
Farmers and farm managers	1,486	1,231	1,355	1,281	-17.18	-8.81	-13.76
Farmers (owners and tenants)	1,445	1,200	1,321	1,248	-16.96	-8.61	-13.65
Farm managers	41	31	34	34	-25.02	-15.78	-17.65
Farm supervisors and laborers	1,289	963	1,071	1,046	-25.35	-16.90	-18.87
Farm supervisors	32	25	28	27	-22.40	-13.00	-14.25
Farm laborers	1,257	938	1,044	1,019	-25.42	-17.00	-18.99

tional Employment Statistics (OES) Survey to collect data on occupational staffing patterns of industries more frequently. These data are obtained directly from establishments by mail survey. The survey is a Federal-State cooperative program in which data are collected by State employment security agencies according to standards, procedures, and methods developed by the BLS. All nonagricultural industries, except private households, are covered in this survey on a 3-year cycle—manufacturing industries during the first year, and roughly half of nonmanufacturing industries in each of the next 2 years. Each industry is therefore surveyed every 3 years. Survey questionnaires are tailored to an industry's occupational structure. For example, the iron and steel industry questionnaire does not list barber as an occupation. Each questionnaire is limited to a maximum of 200 occupations; residual categories, such as "other professional and technical workers" are included so that an establishment can list its total employment. Employers are requested to identify large or emerging occupations in their establishments, which are not found on the questionnaire.

Because data for all States were not available until the late 1970's, it was not until 1980 that national matrix for 1978 based on OES survey data could be developed. Occupational staffing patterns for the 1978 matrix were derived from the OES surveys of manufacturing industries in 1977; nonmanufacturing, except trade and regulated industries in 1978; and trade and regulated industries in 1979. Occupational employment estimates for 1978 were obtained by applying the occupational staffing pattern for each industry to the total wage-and-salary employment in that industry in 1978. The Bureau's Current Employment Survey (CES) was the source of the industry totals. As a result of using the OES survey as the data base, the number of detailed industries and occupations in the Bureau's industry-occupation matrix will increase substantially.

### **Differences among surveys**

Wage-and-salary employment totals for agricultural and private household industries were obtained from the Current Population Survey (CPS) because the OES survey and the CES do not cover employment in these industries. Occupational distributions of employment in these industries were developed from the census-based matrix; detailed occupations in the census-based matrix were reclassified in the OES occupational framework.

Because an establishment may have workers in more occupations than the 200 listed on the questionnaire for the employer's industry, the OES surveys do not obtain complete employment counts for all occupations. In general, if survey data accounted for less than an esti-

mated 90 percent of total employment in an occupation, the data were collapsed into residual categories in the matrix. (About 400 occupations were treated in this manner.) If the survey accounted for more than an estimated 90 percent of an occupation's employment, the remainder was estimated on the basis of patterns from the census-based matrix. Estimates of employment in selected industries for about 200 occupations were developed through this procedure, but the sum of these estimates accounted for less than 4 percent of total national employment.

The OES surveys do not cover self-employed workers and unpaid family workers. Occupational employment estimates for these classes of workers also were developed from CPS and census-based matrix data and reclassified into the OES occupational framework. However, because of data limitations and resource constraints the occupational estimates for self-employed and unpaid family workers were not distributed across industries. Consequently, industry/occupation cross-tabulations are available only for wage-and-salary employment. To develop total employment estimates by occupation, employment of wage-and-salary workers was added to totals of self-employed and unpaid family workers.

Detailed occupational employment estimates in the OES survey-based matrix for 1978-90 generally are not comparable with those in previous census-based matrices because of many major differences in the underlying data sources. The census counts persons, whereas the OES survey counts jobs. The employment total in the OES matrix is higher than the total in the census matrix, because one person may hold more than one job. The difference between the numbers of jobs and of persons employed in 1978 was roughly 10 percent, but it varied among occupations. The census is a household survey, while the OES study is directed at employers. Household surveys generally are completed by one individual, who reports for all members of the household. Employer surveys are completed by an official of the responding establishment and generally are based on records.

In the census, individuals report themselves in the occupation in which they work the most hours. Respondents to the OES surveys are instructed to report employees performing more than one job in the one that requires the highest skill level; also, definitions that imply a specific skill level for each occupation are listed on the questionnaire. In the census, the titles reported by respondents are grouped into categories which may include workers with greatly different skill levels; categories usually take the title of the most prominent occupation in that group. For example, the title "lawyer" includes lawyers and law clerks which are separate titles in the OES survey.<sup>7</sup> □

<sup>1</sup> This article is one in a series presenting data from the ongoing projections program. The first article reported on new labor force projections (see Howard N. Fullerton, Jr., "The 1995 labor force: a first look", *Monthly Labor Review*, December 1980, pp. 11-21). The second article, appearing in this issue of the *Review*, gives new macroeconomic projections for 1985 and 1990. The third article, also in this issue, describes projections of industry output and industry employment for 1985 and 1990.

<sup>2</sup> For the most recent census-based matrix, see George T. Silvestri, *The National Industry-Occupation Employment Matrix, 1970, 1978, and Projected 1990*, Bulletin 2086 (Bureau of Labor Statistics, 1981).

<sup>3</sup> Statistics on employment in this article are based on a count of jobs, as used in the Bureau's Current Employment Surveys and Occupational Employment Statistics Surveys, rather than a count of persons as used in the Current Population Surveys and decennial census. Because one worker may hold more than one job, employment on a "jobs" concept is greater than employment on a "persons" concept. Differences between these surveys are discussed in more detail elsewhere in this article.

Employment in this article is slightly different than that in the other ones in this issue. Self-employed and unpaid family workers by industry are estimated by different methods. In addition, government employment in this article is based in the BLS establishment survey. In the other articles, government employment is based on National Income Accounts data from the Department of Commerce.

<sup>4</sup> Later in 1981, employment projections for occupations with base-year employment of 5,000 or more will be published in the industry-occupation matrix.

<sup>5</sup> An important limitation should be kept in mind when evaluating occupational employment projections that were generated by applying the industry-occupational matrix to the various industry projections. The occupational projections assume that all industries will have an average occupational composition regardless of the changes that occur in industry employment under the different scenarios. However, occupational composition of an increase or decrease in an industry's total employment may differ from the average occupational composition of the industry as a result of changes in product mix, capacity utilization, and other factors. For example, differences in the assumptions embodied in the various scenarios can produce shifts in an industry's product mix which increase employment requirements in some occupations, while reducing requirements in others.

<sup>6</sup> For a detailed description of how the occupational employment projections were developed, see Richard P. Oliver, *Methodology for Labor Force, Industry and Occupational Employment Projections to 1990*, a BLS report to be published later this year.

<sup>7</sup> For more information on the differences between the OES survey-based matrix and the census-based matrix, write to the Bureau of Labor Statistics, Office of Economic Growth and Employment Projections, Division of Occupational Outlook, Washington, D.C. 20212.