Outlook: 1990–2005

Occupational employment projections

Even though job openings are expected to occur at all levels of education and training, opportunities to advance into the higher paying occupations will generally require post-secondary education

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Total employment is projected to increase by 20 percent, or by 24.6 million jobs, between 1990 to 2005, according to the Bureau of Labor Statistics' moderate growth scenario for the U.S. economy.[1] This rate of growth is just slightly more than half that of the previous 15-year period, 1975–90, largely because of the expected slowing of labor force growth.[2] Projected changes in the industrial composition of employment and changes in technology, combined with the overall slowing of employment growth, cause the projected employment trends of some of the major occupational groups and numerous detailed occupations to depart from their historical growth rates.

In general, the projections show faster rates of employment growth for occupations that require higher levels of education or training and slower rates of growth for those requiring less formal education or training. However, many slower growing occupations are expected to add significant numbers of jobs, primarily because of their large employment bases. Such occupations also are expected to have large numbers of job openings over the 1990–2005 period to replace workers who leave the labor force or transfer to other occupations. Consequently, employers will continue to require workers at all levels of education and training. Nevertheless, the fact remains that workers with higher levels of education or training usually will have more options in the job market and better prospects for obtaining the higher paying jobs.

This article discusses projected changes in the occupational structure of U.S. employment from 1990 to 2005. It also includes analyses of the impact of various factors on occupational employment, especially industry employment trends and expected changes in the occupational structure of industries. Data are presented to show how much each of these factors contributes to the overall projected employment change of major occupational groups. Further, the discussion addresses the relationship of occupational growth to educational requirements and to average earnings. Finally, the implications of the projections for workers in minority groups and young high school dropouts are discussed.

The article focuses initially on the moderate alternative of the three sets of occupational projections developed by BLS that are tied to the moderate economic and industry employment projections alternative presented in the articles by Norman Saunders (pp.13–30) and Max Carey and James C. Franklin (pp. 45–63). The major occupational differences among the three alternatives are discussed at the end of the article.

Major occupational groups

The structure of employment by major occupational group is expected to change only moder-

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ately from 1990 to 2005, as the shares of total employment for most groups are projected to change by less than 1 percentage point. Administrative support workers (including clerical) are expected to remain the largest occupational group in the projected year, just as they were in the 1990 base year, but are projected to decline as a proportion of total employment. Similarly, agricultural, forestry, fishing, and related occupations—the smallest group in both years—are expected to account for an even smaller proportion of all workers in 2005. The other major occupational groups are expected to retain their 1990 rankings, or at most to move up or down one position. The largest changes in the shares of total employment are projected for operators, fabricators, and laborers (down 1.9 percentage points) and professional specialty occupations (up 1.3 percentage points).

The most significant finding of the projections concerning the structure of occupational employment in the United States over the 1990–2005 period is the continuing above-average growth rate for jobs that require relatively higher levels of education or training. This is reflected primarily in the increasing proportions of executive, administrative, and managerial workers; professional specialty occupations; and technicians and related support occupations. These three major occupational groups, which represented just over one-fourth of total employment in 1990, are expected to account for 41 percent of the increase in employment between 1990 and 2005. Thus, while the broad occupational structure is projected to change slowly, the trend is in the direction of more jobs among those occupational groups with higher skills.

The number of executive, administrative, and managerial workers is expected to grow by 27 percent from 1990 to 2005, which represents an increase of 3.4 million jobs. (See table 1.) The industry-occupation employment matrix used in developing these projections affords an opportunity to look at both the industry and occupational composition of employment in 1990 and projected 2005. Thus, it can be shown that nearly one-half of the growth in the executive, administrative, and managerial occupational group is expected to be among those employed in the services industry division,[3] especially in the engineering and management services industries and in the business services industries. Other industry divisions with large projected increases in numbers of executive, administrative, and managerial workers are retail trade and finance, insurance, and real estate.

However, the projected rate of increase for this occupational group is considerably slower than it was from 1975 to 1990, when the number of executive, administrative, and managerial workers grew more than twice as fast as total employment. In addition, while managers increased faster than any other occupational group in the earlier period, their rate of growth from 1990 to 2005 is expected to be slower than those for technicians and related support occupations;

Table 1. **Employment by major occupational group, 1990 and projected 2005, moderate alternative projection, and percent change 1975–90 and 1990–2005**

[Numbers in thousands]

Occupation	1990		2005		Percent change	
	Number	Percent	Number	Percent	1975–90	1990–2005
Total, all occupations	122,573	100.0	147,191	100.0	37.4	20.1
Executive, administrative, and managerial	12,451	10.2	15,866	10.8	83.1	27.4
Professional specialty	15,800	12.9	20,907	14.2	59.9	32.3
Technicians and related support	4,204	3.4	5,754	3.9	75.7	36.9
Marketing and sales	14,088	11.5	17,489	11.9	55.1	24.1
Administrative support occupations, including clerical	21,951	17.9	24,835	16.9	33.9	13.1
Service occupations	19,204	15.7	24,806	16.9	36.1	29.2
Agricultural, forestry, fishing, and related occupations	3,506	2.9	3,665	2.5	–9.8	4.5
Precision production, craft, and repair	14,124	11.5	15,909	10.8	28.9	12.6
Operators, fabricators, and laborers	17,245	14.1	17,961	12.2	6.7	4.2

NOTE: The 1990 and 2005 employment data and the projected change 1990–2005 are derived from the industry-occupation employment matrixes for each year. The data on 1975–90 percent change were derived from the Current Population Survey (CPS) because a comparable industry-occupation matrix for 1975 is not available. The CPS data represent estimates of employed persons and exclude the estimates of persons with more than one job that are included in the industry-occupation employment matrixes. The CPS exclusion of dual jobholders affects the employment levels and trends of some occupational groups more than others. Therefore, the resulting comparisions of change between 1975–90 and 1990–2005 are only broadly indicative of trends.

professional specialty occupations; and service occupations. The restructuring of business operations in recent years, which has reduced the utilization of managerial workers in many companies, is expected to continue through 2005, thereby slowing the growth rate for this group.

The number of workers in professional specialty occupations is expected to increase by 32 percent from 1990 to 2005. The 5.1 million additional jobs for these workers are exceeded only by the increase in jobs for service workers. The numbers of professional workers are expected to grow in all major industrial sectors in the economy. However, more than 8 out of 10 additional jobs in this occupational category are in the services industry division, led by education and health services. Other industries that are expected to contribute significantly to the growth in jobs for professional workers are social services; engineering and management services; business services; and government. The rate of increase for professional specialty occupations is expected to be faster than the rate of growth for all occupations, just as it was in the 1975–90 period. Consequently, these workers are expected to increase their share of employment significantly, from 12.9 percent of total employment in 1990 to 14.2 percent in 2005.

Employment in the technicians and related support occupational group is projected to grow by 37 percent, more rapidly than any other major occupational group. In the previous 15-year period 1975–90, this group also was among the fastest growing major occupational groups. Of the 1.6 million jobs added for technicians by 2005, nearly 8 out of 10 are in the services industries. Within services, the majority of jobs for technicians are expected in the large and rapidly growing health services industry. Other industries that also are expected to have rapid increases in numbers of technicians by 2005 are engineering and management services and business services.

Employment of marketing and sales workers is projected to grow by 24 percent from 1990 to 2005—very near the average economywide growth rate of 20 percent—and to increase by 3.4 million jobs. These workers are highly concentrated in wholesale and retail trade, with nearly two-thirds employed in the fast-growing retail sector. In addition to these two trade sectors, significant growth in numbers of marketing and sales workers is expected in the service industry division and in finance, insurance, and real estate. However, the projected average rate of growth from 1990 to 2005 for marketing and sales workers is below that posted over the 1975–90 period, during which this group of workers grew faster than the overall average. The main reason for this change is a projected growth rate for wholesale and retail trade which is about half its rate over the preceding 15 years, reflecting the overall slowing of the economy.

Administrative support occupations (including clerical) are projected to increase by just 13 percent from 1990 to 2005 and, as a consequence, to decline from 17.9 percent of total employment in 1990 to 16.9 percent of the total in 2005. The slower-than-average projected growth rate for these workers is below the rate of growth experienced between 1975 and 1990, when their numbers increased about as fast as average. The primary reason for the expected slower growth rate is that many of the detailed occupations in this group are projected to be affected by office automation and other technological changes. However, because of the very large number of workers in this group, nearly 22 million in 1990, a substantial increase in jobs still is projected by 2005—2.9 million, even with the slower rate of growth. Nearly 8 out of 10 additional jobs for administrative support occupations (including clerical) will be found in the service industry division. An additional 367,000 are expected in finance, insurance, and real estate, and 327,000 more in wholesale and retail trade. However, significant job declines among administrative support workers are expected in manufacturing (–168,000); communications and utilities (–93,000); and Federal Government (–93,000).

The number of workers in service occupations is projected to increase by 29 percent from 1990 to 2005 and to add the largest number of jobs of any major occupational group—5.6 million. This faster-than-average growth rate, in contrast to a pace that was about average during 1975–90, is expected to place service occupations just slightly below administrative support workers (including clerical) as the occupational group with the largest number of jobs by 2005. More than half of the additional jobs projected for service occupations are in the rapidly growing services industry division. In addition, retail trade, with large numbers of food preparation and service workers, is projected to add another 2 million jobs, and local government, with a substantial number of protective service occupations, contributes about 341,000 more jobs. Overall, service occupations are expected to increase as a share of total employment from 15.7 percent in 1990 to 16.9 percent in 2005.

Agricultural, forestry, fishing, and related occupations are expected to reverse their earlier decline in employment of about 10 percent from 1975 to 1990 and to grow, but only by a very modest 5 percent through the year 2005. The increase of only 158,000 jobs is the smallest for

any major occupational group. Within this major group, jobs for farmers are expected to decline by 224,000. Offsetting this loss is the projected increase of 348,000 jobs for gardeners and groundskeepers (except farm), who are largely employed in the rapidly growing segment of agricultural services that provides gardening and lawn services.

Precision production, craft, and repair occupations are projected to grow more slowly than the average from 1990 to 2005, at a rate of 13 percent. Numbers of workers in this group also grew more slowly than average from 1975 to 1990. The total number of additional jobs is expected to be 1.8 million, with construction contributing 563,000 jobs and services, 528,000 jobs. The growth in wholesale and retail trade is projected to be 364,000 jobs. However, jobs for precision production, craft, and repair workers in manufacturing are expected to decline by 92,000, reflecting the overall decrease projected for manufacturing employment.

The number of operators, fabricators, and laborers is projected to grow by just 4 percent from 1990 to 2005 and, consequently, to decline from 14.1 percent of total employment to 12.2 percent over the projection period. This is the largest projected relative change for any major occupational group. This major group also grew more slowly than average in the preceding 15-year period 1975–90. Workers in this group are concentrated in the declining manufacturing sector and also are susceptible to job losses resulting from changes in technology and production processes. The large projected decline of 863,000 jobs for operators, fabricators, and laborers in manufacturing is expected to be more than offset by the gains expected in services; transportation, communications, and utilities; wholesale and retail trade; and construction. Consequently, employment for this group of workers is projected to increase by 728,000 jobs. Most of this growth will be for workers in the occupational group comprising transportation and material moving machine and vehicle operators.

Detailed occupations

The Bureau has developed employment projections through the year 2005 for more than 500 detailed occupations. In the previous section, those projections were discussed by major occupational group. The following discussion is intended to help the reader identify the detailed occupations (shown in table 2) that are expected to provide favorable job opportunities and those that are expected to experience employment declines. Occupations with favorable future prospects are analyzed from two perspectives, rate of projected growth and size of numerical increases. In addition to numerical growth, initial employment size of the occupation is a major factor in the number of future job openings, because of the need to replace workers who leave the labor force or transfer to other occupations. The replacement process will be discussed in more detail later in this article. Occupations that are expected to have favorable employment prospects are discussed below in conjunction with the levels of education required.

Fastest growing occupations. Virtually all of the 30 occupations with 25,000 or more workers in 1990 and the fastest projected growth rates are concentrated in one or more of the rapidly growing services industries. (See table 3.) A substantial number of these occupations are concentrated in the health services industries, which are expected to have particularly robust growth rates, ranging from 27 percent for hospitals to 107 percent for home health care services. This last industry, and individual and miscellaneous social services—which is also projected to grow very rapidly—employ more than two-thirds of home health aides, the detailed occupation with the fastest projected growth overall. Workers in this occupation are expected to be in great demand to provide personal and physical care for an increasing number of elderly people and for patients who are recovering from surgery and other serious conditions. Also found in these two rapidly growing industries are personal and home care aides, who perform a variety of light housekeeping tasks for those in need of home care. Other occupations in the health field with large projected rates of increase are physical therapists; radiologic technologists and technicians; medical assistants; physical and corrective therapy assistants and aides; medical secretaries; and occupational therapists.

Robust growth is projected for several occupations as a result of the continuing spread of computer technology. The employment of systems analysts and computer scientists is expected to grow rapidly to satisfy expanding needs for scientific research and applications in office and factory automation and telecommunications technology. The number of computer programmers also is expected to increase at a quick pace as government and industry seek new applications for computers and improvements to existing software. Increasing utilization of operations research technologies to improve productivity and reduce costs and a growing number of more affordable computers are expected to boost demand for operations research analysts. Finally, more data processing equipment repairers will be needed to install, maintain, and

Table 2. **Civilian employment by occupation, actual 1990 and projected to 2005, under low, medium, and high scenarios for economic growth**

[Numbers in thousands]

Occupation	Total employment				1990–2005 employment change					
	1990	Projected, 2005			Number			Percent		
		Low	Moderate	High	Low	Moderate	High	Low	Moderate	High
Total, all occupations	122,573	136,806	147,191	154,543	14,233	24,618	31,969	12	20	26
Executive, administrative, and managerial occupations	12,451	14,782	15,866	16,625	2,331	3,414	4,173	19	27	34
Managerial and administrative occupations	8,838	10,417	11,174	11,703	1,579	2,336	2,865	18	26	32
Administrative services managers	221	252	273	287	31	52	66	14	23	30
Communication, transportation, and utilities operations managers	143	175	189	199	32	45	55	22	32	39
Construction managers	183	223	243	260	40	60	77	22	33	42
Education administrators	348	400	434	465	52	85	116	15	24	33
Engineering, mathematical, and natural science managers	315	387	423	441	72	108	126	23	34	40
Financial managers	701	828	894	939	127	193	238	18	28	34
Food service and lodging managers	595	762	793	819	166	198	224	28	33	38
Funeral directors and morticians	35	39	41	43	4	6	8	10	17	23
General managers and top executives	3,086	3,409	3,684	3,871	323	598	784	10	19	25
Government chief executives and legislators	71	68	74	80	–3	3	9	–4	4	12
Industrial production managers	210	227	251	260	17	41	50	8	20	24
Marketing, advertising, and public relations managers	427	582	630	659	154	203	232	36	47	54
Personnel, training, and labor relations managers	178	217	235	246	38	57	68	22	32	38
Property and real estate managers	225	288	302	311	62	76	86	28	34	38
Purchasing managers	248	275	298	312	26	49	64	11	20	26
All other managers and administrators	1,850	2,287	2,412	2,512	437	562	662	24	30	36
Management support occupations	3,613	4,364	4,691	4,922	752	1,079	1,309	21	30	36
Accountants and auditors	985	1,235	1,325	1,385	250	340	400	25	34	41
Budget analysts	64	73	78	82	9	14	18	14	22	28
Claims examiners, property and casualty insurance	30	37	40	42	7	9	12	21	31	38
Construction and building inspectors	60	65	71	76	6	11	16	9	19	27
Cost estimators	173	197	215	228	24	42	55	14	24	32
Credit analysts	36	43	46	48	7	10	12	19	27	34
Employment interviewers, private or public employment service	83	94	102	108	11	19	25	13	23	30
Inspectors and compliance officers, except construction	156	190	202	214	34	46	58	22	30	37
Loan officers and counselors	172	205	219	230	33	47	58	19	28	34
Management analysts	151	218	230	240	67	79	88	44	52	58
Personnel, training, and labor relations specialists	278	339	366	384	61	87	105	22	31	38
Purchasing agents, except wholesale, retail, and farm products	218	246	266	276	28	47	58	13	22	27
Tax examiners, collectors, and revenue agents	62	66	70	73	5	8	11	8	13	18
Underwriters	105	121	130	138	16	25	33	16	24	31
Wholesale and retail buyers, except farm products	194	218	235	246	24	41	52	13	21	27
All other management support workers	846	1,017	1,097	1,153	171	251	307	20	30	36
Professional specialty occupations	15,800	19,379	20,907	22,140	3,578	5,107	6,340	23	32	40
Engineers	1,519	1,748	1,919	2,001	229	400	482	15	26	32
Aeronautical and astronautical engineers	73	81	88	91	8	15	18	11	20	24
Chemical engineers	48	50	54	57	1	6	8	2	12	17
Civil engineers, including traffic engineers	198	235	257	274	37	59	76	19	30	39
Electrical and electronics engineers	426	519	571	593	93	145	167	22	34	39
Industrial engineers, except safety engineers	135	145	160	166	11	26	31	8	19	23
Mechanical engineers	233	263	289	301	30	56	68	13	24	29
Metallurgists and metallurgical, ceramic, and materials engineers	18	20	22	23	2	4	5	10	21	26
Mining engineers, including mine safety engineers	4	4	4	5	–0	0	0	–4	4	10
Nuclear engineers	18	17	18	19	–1	–0	1	–7	–0	4
Petroleum engineers	17	16	18	18	–2	0	1	–10	1	3
All other engineers	347	397	436	454	50	89	107	14	26	31

Table 2. **Continued—Civilian employment by occupation, actual 1990 and projected to 2005, under low, medium, and high scenarios for economic growth**

[Numbers in thousands]

Occupation	Total employment				1990–2005 employment change					
	1990	Projected, 2005			Number			Percent		
		Low	Moderate	High	Low	Moderate	High	Low	Moderate	High
Architects and surveyors	236	260	284	300	24	48	64	10	20	27
Architects, except landscape and marine	108	124	134	142	15	26	34	14	24	31
Landscape architects	20	24	26	27	5	6	7	23	31	37
Surveyors	108	112	123	131	4	15	23	4	14	21
Life scientists	174	215	230	241	42	56	67	24	32	39
Agricultural and food scientists	25	30	32	33	5	7	8	20	27	31
Biological scientists	62	78	83	87	16	21	25	26	34	39
Foresters and conservation scientists	29	31	32	34	2	4	5	7	12	18
Medical scientists	19	29	31	33	10	12	14	55	66	74
All other life scientists	39	47	51	55	8	12	16	21	32	41
Computer, mathematical, and operations reasearch analysts	571	916	987	1,030	345	416	459	60	73	80
Actuaries	13	16	18	19	3	4	5	24	34	41
Systems analysts and computer scientists	463	769	829	864	306	366	401	66	79	87
Statisticians	16	16	18	18	1	2	3	5	12	16
Mathematicians and all other mathematical scientists	22	22	24	25	0	2	3	1	9	15
Operations research analysts	57	92	100	104	35	42	47	60	73	81
Physical scientists	200	223	241	251	24	41	51	12	21	26
Chemists	83	89	96	100	6	13	17	7	16	21
Geologists, geophysicists, and oceanographers	48	54	58	60	6	11	13	13	22	27
Meteorologists	5	7	7	7	1	2	2	22	30	34
Physicists and astronomers	20	20	21	22	–0	1	2	–2	5	9
All other physical scientists	44	54	59	62	11	15	18	24	34	41
Social scientists	224	301	320	336	77	96	112	34	43	50
Economists	37	43	45	47	5	8	10	14	21	26
Psychologists	125	193	204	214	68	79	90	55	64	72
Urban and regional planners	23	25	28	30	2	4	6	9	19	28
All other social scientists	38	40	43	45	1	4	6	4	11	17
Social, recreational, and religious workers	1,049	1,278	1,376	1,460	230	327	412	22	31	39
Clergy	209	214	228	240	5	19	31	2	9	15
Directors, religious activities and education	62	65	69	73	3	7	11	4	12	18
Human services workers	145	231	249	264	85	103	119	59	71	82
Recreational workers	194	224	241	257	30	47	63	15	24	32
Social workers	438	545	588	626	107	150	188	25	34	43
Lawyers and judicial workers	633	798	850	892	165	217	259	26	34	41
Judges, magistrates, and other judicial workers	46	53	57	61	7	11	15	14	24	33
Lawyers	587	745	793	830	158	206	244	27	35	42
Teachers, librarians, and counselors	5,687	6,701	7,280	7,813	1,014	1,593	2,126	18	28	37
Teachers, elementary	1,362	1,538	1,675	1,803	176	313	441	13	23	32
Teachers, preschool and kindergarten	425	555	598	636	130	173	211	31	41	50
Teachers, special education	332	428	467	503	96	134	170	29	40	51
Teachers, secondary school	1,280	1,575	1,717	1,849	296	437	570	23	34	45
College and university faculty	712	776	846	911	64	134	200	9	19	28
Other teachers and instructors	757	895	963	1,024	138	206	267	18	27	35
Farm and home management advisors	18	18	19	21	–1	1	2	–4	4	12
Instructors and coaches, sports and physical training	221	254	274	293	32	53	72	15	24	32
Adult and vocational education teachers	517	623	669	710	106	152	193	21	29	37
Instructors, adult (nonvocational) education	219	273	289	304	54	70	85	25	32	39
Teachers and instructors, vocational education and training	298	350	380	407	52	82	109	18	27	36
All other teachers and instructors	511	586	636	681	75	125	170	15	24	33
Librarians, archivists, curators, and related workers	166	172	187	200	6	21	34	4	12	20
Curators, archivists, museum technicians, and restorers	17	20	21	22	2	4	5	13	21	28
Librarians, professional	149	152	165	177	4	17	29	3	11	19
Counselors	144	177	192	206	33	49	63	23	34	44
Health diagnosing occupations	855	1,039	1,101	1,158	185	247	303	22	29	35
Dentists	174	186	196	205	12	21	30	7	12	17
Optometrists	37	42	45	47	5	8	10	13	20	27

Table 2. **Continued—Civilian employment by occupation, actual 1990 and projected to 2005, under low, medium, and high scenarios for economic growth**

[Numbers in thousands]

Occupation	Total employment				1990–2005 employment change					
	1990	Projected, 2005			Number			Percent		
		Low	Moderate	High	Low	Moderate	High	Low	Moderate	High
Physicians	580	730	776	818	150	196	238	26	34	41
Podiatrists	16	22	23	24	6	7	8	39	46	53
Veterinarians and veterinary inspectors	47	59	62	64	12	14	17	26	31	35
Health assessment and treating occupations	2,305	3,072	3,304	3,505	767	999	1,201	33	43	52
Dietitians and nutritionists	45	52	56	59	7	11	14	16	24	32
Pharmacists	169	190	204	215	21	35	46	13	21	27
Physician assistants	53	67	72	76	13	18	23	25	34	42
Registered nurses	1,727	2,318	2,494	2,648	591	767	921	34	44	53
Therapists	311	446	479	508	135	168	197	43	54	63
Occupational therapists	36	52	56	60	16	20	24	44	55	65
Physical therapists	88	145	155	164	57	67	76	65	76	86
Recreational therapists	32	42	45	48	10	13	15	30	39	47
Respiratory therapists	60	84	91	97	25	31	37	41	52	62
Speech–language pathologists and audiologists	68	85	91	97	17	23	29	24	34	43
All other therapists	26	37	40	42	11	13	16	41	51	60
Writers, artists, and entertainers	1,542	1,799	1,915	1,995	257	373	454	17	24	29
Artists and commercial artists	230	288	303	313	58	73	84	25	32	36
Athletes, coaches, umpires, and referees	32	41	43	46	9	11	13	27	34	41
Dancers and choreographers	9	11	12	12	3	3	4	29	38	45
Designers	339	399	428	447	60	89	108	18	26	32
Designers, except interior designers	270	311	335	349	42	65	80	16	24	30
Interior designers	69	88	93	98	18	24	28	26	34	40
Musicians	252	260	276	288	8	24	36	3	9	14
Photographers and camera operators	120	140	148	154	20	28	35	16	23	29
Camera operators, television, motion picture, video	13	16	17	18	3	5	5	28	37	43
Photographers	107	123	131	136	16	23	29	15	22	27
Producers, directors, actors, and entertainers	95	125	134	139	31	39	45	32	41	47
Public relations specialists and publicity writers	109	121	130	137	12	21	28	11	19	25
Radio and TV announcers and newscasters	57	63	68	71	7	11	14	12	20	26
Reporters and correspondents	67	76	81	84	9	14	17	13	20	25
Writers and editors, including technical writers	232	274	292	303	42	60	71	18	26	31
All other professional workers	808	1,028	1,102	1,158	221	294	350	27	36	43
Technicians and related support occupations	4,204	5,317	5,754	6,063	1,113	1,550	1,859	26	37	44
Health technicians and technologists	1,833	2,413	2,595	2,752	580	763	919	32	42	50
Clinical lab technologists and technicians	258	299	321	341	41	63	83	16	24	32
Dental hygienists	97	127	137	145	30	40	48	31	41	50
EEG technologists	7	10	11	11	3	4	4	46	57	67
EKG technicians	16	14	15	16	–2	–1	0	–12	–5	1
Emergency medical technicians	89	107	116	123	18	26	34	20	30	38
Licensed practical nurses	644	849	913	968	205	269	324	32	42	50
Medical records technicians	52	74	80	84	23	28	33	44	54	63
Nuclear medicine technologists	10	15	16	17	4	6	7	42	53	63
Opticians, dispensing and measuring	64	81	88	93	18	24	29	28	37	45
Radiologic technologists and technicians	149	234	252	268	86	103	119	58	70	80
Surgical technologists	38	55	59	63	17	21	25	44	55	65
All other health professionals, paraprofessionals, and technicians	409	547	588	623	138	179	214	34	44	52
Engineering and science technicians and technologists	1,327	1,498	1,640	1,718	170	312	391	13	24	29
Engineering technicians	755	881	965	1,008	126	210	253	17	28	33
Electrical and electronic technicians/technologists	363	444	488	508	81	125	145	22	34	40
All other engineering technicians and technologists	392	437	477	500	45	85	108	11	22	28
Drafters	326	335	370	391	8	44	65	3	13	20
Science and mathematics technicians	246	282	305	320	36	58	73	14	24	30
Technicians, except health and engineering and science	1,044	1,406	1,519	1,592	363	475	548	35	46	53

Table 2. **Continued—Civilian employment by occupation, actual 1990 and projected to 2005, under low, medium, and high scenarios for economic growth**

[Numbers in thousands]

Occupation	Total employment				1990–2005 employment change					
	1990	Projected, 2005			Number			Percent		
		Low	Moderate	High	Low	Moderate	High	Low	Moderate	High
Aircraft pilots and flight engineers	90	111	120	126	21	31	37	24	34	41
Air traffic controllers	32	33	34	35	2	2	3	5	7	9
Broadcast technicians	33	31	34	35	–1	1	3	–3	4	8
Computer programmers	565	811	882	923	246	317	359	44	56	63
Legal assistants and technicians, except clerical	220	309	329	345	89	109	125	40	49	57
Paralegals	90	156	167	176	66	77	85	73	85	95
Title examiners and searchers	29	32	33	35	2	4	5	7	13	18
All other legal assistants, including law clerks	100	121	129	134	21	28	34	21	28	34
Programmers, numerical, tool, and process control	8	7	8	9	–0	0	1	–5	6	9
Technical assistants, library	65	66	72	77	1	7	13	2	11	20
All other technicians	33	38	40	42	5	7	10	15	23	29
Marketing and sales occupations	14,088	16,288	17,489	18,313	2,200	3,401	4,226	16	24	30
Cashiers	2,633	3,094	3,318	3,474	461	685	842	18	26	32
Counter and rental clerks	215	268	289	303	53	74	88	25	34	41
Insurance sales workers	439	496	527	553	57	88	114	13	20	26
Real estate agents, brokers, and appraisers	413	471	492	508	58	79	95	14	19	23
Brokers, real estate	69	79	83	85	10	14	16	15	20	24
Real estate appraisers	44	51	54	57	8	11	13	18	24	29
Sales agents, real estate	300	340	355	366	40	55	66	13	18	22
Salespersons, retail	3,619	4,180	4,506	4,728	561	887	1,109	15	24	31
Securities and financial services sales workers	191	250	267	279	59	76	88	31	40	46
Stock clerks, sales floor	1,242	1,343	1,451	1,524	101	209	282	8	17	23
Travel agents	132	199	214	224	68	82	92	51	62	70
All other sales and related workers	5,204	5,987	6,426	6,719	783	1,222	1,515	15	23	29
Administrative support occupations, including clerical	21,951	22,996	24,835	26,158	1,044	2,884	4,207	5	13	19
Adjusters, investigators, and collectors	1,058	1,218	1,313	1,384	160	255	326	15	24	31
Adjustment clerks	320	360	390	409	40	70	89	12	22	28
Bill and account collectors	183	226	244	256	43	60	72	23	33	39
Insurance claims and policy processing occupations	423	486	521	550	62	98	127	15	23	30
Insurance adjusters, examiners, and investigators	147	177	189	200	29	42	52	20	28	35
Insurance claims clerks	104	119	128	135	15	24	31	15	23	30
Insurance policy processing clerks	172	190	204	216	18	32	44	10	19	25
Welfare eligibility workers and interviewers	93	102	111	119	9	18	26	10	19	28
All other adjusters and investigators	38	43	47	50	5	9	12	14	23	31
Communications equipment operators	345	219	236	248	–126	–108	–96	–37	–31	–28
Telephone operators	325	205	221	232	–120	–104	–93	–37	–32	–28
Central office operators	53	20	22	23	–33	–31	–30	–62	–59	–57
Directory assistance operators	26	10	11	11	–16	–16	–15	–62	–59	–57
Switchboard operators	246	175	189	198	–71	–57	–47	–29	–23	–19
All other communications equipment operators	20	14	15	16	–5	–5	–4	–28	–23	–20
Computer operators and peripheral equipment operators	320	334	361	379	14	42	59	4	13	19
Computer operators, except peripheral equipment	282	296	320	336	13	38	53	5	13	19
Peripheral EDP equipment operators	37	38	41	43	1	4	6	2	10	16
Financial records processing occupations	2,860	2,555	2,750	2,887	–305	–110	28	–11	–4	1
Billing, cost, and rate clerks	318	308	332	350	–11	14	32	–3	5	10
Billing, posting, and calculating machine operators	95	91	99	104	–4	4	9	–4	4	10
Bookkeeping, accounting, and auditing clerks	2,276	1,994	2,143	2,248	–281	–133	–27	–12	–6	–1
Payroll and timekeeping clerks	171	162	176	185	–9	5	13	–5	3	8
Information clerks	1,418	1,861	2,003	2,104	443	584	686	31	41	48
Hotel desk clerks	118	150	158	162	32	40	45	27	34	38
Interviewing clerks, except personnel and social welfare	144	185	200	209	41	56	66	29	39	46
New accounts clerks, banking	106	113	121	127	6	14	21	6	13	19

Table 2. **Continued—Civilian employment by occupation, actual 1990 and projected to 2005, under low, medium, and high scenarios for economic growth**

[Numbers in thousands]

Occupation	Total employment				1990–2005 employment change					
	1990	Projected, 2005			Number			Percent		
		Low	Moderate	High	Low	Moderate	High	Low	Moderate	High
Receptionists and information clerks	900	1,228	1,322	1,394	328	422	494	36	47	55
Reservation and transportation ticket agents and travel clerks	150	186	202	212	36	52	62	24	34	41
Mail clerks and messengers	280	285	306	321	5	26	41	2	9	15
Mail clerks, except mail machine operators and postal service	137	136	146	153	–1	9	16	–0	7	12
Messengers	143	149	160	168	6	17	25	4	12	18
Postal clerks and mail carriers	439	479	519	548	40	80	109	9	18	25
Postal mail carriers	305	350	380	401	45	74	96	15	24	31
Postal service clerks	134	129	140	147	–5	6	14	–4	4	10
Material recording, scheduling, dispatching, and distributing occupations	2,513	2,534	2,754	2,888	21	241	375	1	10	15
Dispatchers	209	249	269	285	40	60	76	19	29	36
Dispatchers, except police, fire, and ambulance	138	168	181	191	30	43	53	22	31	38
Dispatchers, police, fire, and ambulance	71	80	87	94	10	17	23	14	24	33
Meter readers, utilities	50	35	37	39	–15	–12	–10	–30	–25	–20
Order fillers, wholesale and retail sales	197	195	211	222	–1	14	25	–1	7	13
Procurement clerks	56	48	51	53	–8	–4	–2	–14	–8	–4
Production, planning, and expediting clerks	237	217	239	248	–20	1	10	–9	1	4
Stock clerks, stockrooom, warehouse, or yard	752	726	786	824	–26	34	72	–4	4	10
Traffic, shipping, and receiving clerks	762	788	860	901	26	97	138	3	13	18
Weighers, measurers, checkers, and samplers, recordkeeping	37	35	38	40	–2	1	3	–5	4	8
All other material recording, scheduling, and distribution workers	214	242	263	276	28	50	63	13	23	29
Records processing occupations, except financial	949	966	1,045	1,100	17	96	151	2	10	16
Advertising clerks	18	19	21	21	1	3	4	8	15	20
Brokerage clerks	60	63	68	71	3	8	11	5	13	19
Correspondence clerks	30	34	37	39	4	7	9	13	22	29
File clerks	271	278	300	317	7	29	46	2	11	17
Library assistants and bookmobile drivers	117	119	130	139	2	13	23	2	11	19
Order clerks, materials, merchandise, and service	291	276	300	314	–16	9	23	–5	3	8
Personnel clerks, except payroll and timekeeping	129	145	155	162	16	27	34	13	21	26
Statement clerks	33	32	34	36	–1	1	3	–4	3	9
Secretaries, stenographers, and typists	4,680	4,735	5,110	5,387	55	429	706	1	9	15
Secretaries	3,576	3,813	4,116	4,338	237	540	762	7	15	21
Legal secretaries	281	385	413	435	104	133	154	37	47	55
Medical secretaries	232	363	390	415	131	158	183	57	68	79
Secretaries, except legal and medical	3,064	3,065	3,312	3,488	2	248	425	0	8	14
Stenographers	132	116	125	132	–16	–7	0	–12	–5	0
Typists and word processors	972	805	869	916	–166	–103	–55	–17	–11	–6
Other clerical and administrative support workers	7,090	7,811	8,439	8,912	721	1,349	1,822	10	19	26
Bank tellers	517	459	492	518	–58	–25	1	–11	–5	0
Clerical supervisors and managers	1,218	1,373	1,481	1,559	155	263	341	13	22	28
Court clerks	47	53	58	62	6	11	16	14	24	33
Credit authorizers, credit checkers, and loan and credit clerks	240	278	298	313	38	58	73	16	24	30
Credit authorizers	21	24	26	27	3	5	6	15	24	31
Credit checkers	48	55	60	63	7	12	15	16	24	31
Loan and credit clerks	151	175	187	197	25	37	46	16	24	31
Loan interviewers	20	23	25	26	3	4	6	13	21	27
Customer service representatives, utilities	109	111	120	126	2	11	17	2	10	15
Data entry keyers, except composing	456	471	510	536	14	54	79	3	12	17
Data entry keyers, composing	19	21	23	24	2	4	5	11	20	25
Duplicating, mail, and other office machine operators	169	176	191	200	7	22	31	4	13	18
General office clerks	2,737	3,149	3,407	3,597	411	670	859	15	24	31
Municipal clerks	22	25	27	29	3	5	7	13	23	33

Table 2. **Continued—Civilian employment by occupation, actual 1990 and projected to 2005, under low, medium, and high scenarios for economic growth**

[Numbers in thousands]

Occupation	Total employment				1990–2005 employment change					
	1990	Projected, 2005			Number			Percent		
		Low	Moderate	High	Low	Moderate	High	Low	Moderate	High
Proofreaders and copy markers	29	26	28	29	–4	–2	–0	–12	–5	–1
Real estate clerks	29	32	34	35	3	5	6	12	17	21
Statistical clerks	85	50	54	57	–35	–31	–28	–41	–36	–33
Teacher aides and educational assistants	808	999	1,086	1,165	192	278	358	24	34	44
All other clerical and administrative support workers	604	587	629	662	–17	25	58	–3	4	10
Service occupations	19,204	23,374	24,806	25,951	4,170	5,602	6,747	22	29	35
Cleaning and building service occupations, except private household	3,435	3,804	4,068	4,261	369	633	826	11	18	24
Institutional cleaning supervisors	142	166	177	185	24	35	43	17	24	30
Janitors and cleaners, including maids and housekeeping cleaners	3,007	3,332	3,562	3,728	326	555	721	11	18	24
Pest controllers and assistants	51	52	55	57	1	4	6	2	8	13
All other cleaning and building service workers	235	254	274	291	19	39	56	8	17	24
Food preparation and service occupations	7,705	9,582	10,031	10,387	1,877	2,325	2,681	24	30	35
Chefs, cooks, and other kitchen workers	3,069	3,906	4,104	4,264	837	1,035	1,195	27	34	39
Cooks, except short order	1,170	1,512	1,594	1,661	342	424	491	29	36	42
Bakers, bread and pastry	140	180	192	200	40	52	60	28	37	43
Cooks, institution or cafeteria	415	493	530	563	78	115	149	19	28	36
Cooks, restaurant	615	840	872	898	225	257	283	37	42	46
Cooks, short order and fast food	743	953	989	1,018	209	246	274	28	33	37
Food preparation workers	1,156	1,442	1,521	1,585	286	365	429	25	32	37
Food and beverage service occupations	4,400	5,392	5,623	5,803	992	1,223	1,403	23	28	32
Bartenders	400	404	422	436	3	21	35	1	5	9
Dining room and cafeteria attendants and bar helpers	461	592	619	641	131	158	180	28	34	39
Food counter, fountain, and related workers	1,607	2,067	2,158	2,229	459	550	622	29	34	39
Hosts and hostesses, restaurant, lounge, or coffee shop	184	220	229	235	36	44	51	19	24	28
Waiters and waitresses	1,747	2,110	2,196	2,262	363	449	515	21	26	29
All other food preparation and service workers	236	283	304	319	47	67	83	20	29	35
Health service occupations	1,972	2,636	2,832	3,002	664	860	1,030	34	44	52
Ambulance drivers and attendants, except EMT's	12	14	15	16	1	2	3	11	20	28
Dental assistants	176	220	236	250	44	60	74	25	34	42
Medical assistants	165	268	287	306	102	122	140	62	74	85
Nursing aides and psychiatric aides	1,374	1,824	1,960	2,077	450	587	703	33	43	51
Nursing aides, orderlies, and attendants	1,274	1,700	1,826	1,934	426	552	660	33	43	52
Psychiatric aides	100	124	134	143	24	34	43	24	34	43
Occupational therapy assistants and aides	10	14	15	16	4	5	6	46	57	67
Pharmacy assistants	83	94	101	107	11	18	24	13	22	29
Physical and corrective therapy assistants and aides	45	68	74	78	24	29	33	53	64	74
All other health service workers	107	134	144	153	27	37	46	25	35	43
Personal service occupations	2,192	2,983	3,164	3,316	790	972	1,124	36	44	51
Amusement and recreation attendants	184	213	228	241	29	44	57	16	24	31
Baggage porters and bellhops	31	39	42	43	8	10	12	25	33	37
Barbers	77	73	76	79	–4	–1	2	–5	–1	2
Child care workers	725	1,027	1,078	1,123	303	353	398	42	49	55
Cosmetologists and related workers	636	751	793	830	115	157	194	18	25	30
Hairdressers, hairstylists, and cosmetologists	597	703	742	775	106	145	178	18	24	30
Manicurists	25	33	35	37	8	10	11	30	38	45
Shampooers	14	16	17	18	2	3	4	13	21	29
Flight attendants	101	146	159	168	46	59	67	45	59	67
Homemaker-home health aides	391	682	733	776	291	343	385	75	88	99
Home health aides	287	512	550	582	224	263	295	78	92	103
Personal and home care aides	103	170	183	194	67	79	90	64	77	87
Ushers, lobby attendants, and ticket takers	48	51	55	57	3	6	9	6	13	19

Table 2. **Continued—Civilian employment by occupation, actual 1990 and projected to 2005, under low, medium, and high scenarios for economic growth**

[Numbers in thousands]

Occupation	Total employment				1990–2005 employment change					
	1990	Projected, 2005			Number			Percent		
		Low	Moderate	High	Low	Moderate	High	Low	Moderate	High
Private household workers	782	514	555	584	−268	−227	−198	−34	−29	−25
Child care workers, private household	314	176	190	200	−138	−124	−114	−44	−40	−36
Cleaners and servants, private household	411	287	310	326	−124	−101	−85	−30	−25	−21
Cooks, private household	12	9	10	11	−3	−2	−1	−22	−16	−12
Housekeepers and butlers	45	42	45	48	−3	0	3	−7	1	6
Protective service occupations	2,266	2,765	2,995	3,185	500	729	920	22	32	41
Firefighting occupations	280	321	348	374	41	68	95	15	24	34
Firefighters	210	241	262	281	31	51	71	15	24	34
Firefighting and prevention supervisors	58	66	72	77	8	14	20	15	24	34
Fire inspection occupations	12	13	15	16	2	3	4	14	24	34
Law enforcement occupations	886	1,093	1,187	1,277	208	302	392	23	34	44
Correction officers	230	342	372	400	112	142	170	49	61	74
Police and detectives	655	751	815	877	96	160	222	15	24	34
Police and detective supervisors	93	105	113	122	11	20	28	12	21	30
Police detectives and investigators	69	77	83	88	8	14	19	12	20	27
Police patrol officers	384	455	495	533	71	111	149	18	29	39
Sheriffs and deputy sheriffs	72	74	81	87	2	9	15	3	12	21
Other law enforcement occupations	37	40	43	47	3	7	10	9	18	27
Other protective service workers	1,101	1,352	1,460	1,534	251	359	433	23	33	39
Detectives, except public	47	61	66	69	14	19	22	31	41	47
Guards	883	1,094	1,181	1,238	211	298	354	24	34	40
Crossing guards	54	52	57	61	−2	2	7	−4	4	13
All other protective service workers	116	145	157	167	28	40	50	24	34	43
All other service workers	852	1,090	1,161	1,216	238	309	364	28	36	43
Agriculture, forestry, fishing, and related occupations	3,506	3,514	3,665	3,799	7	158	293	0	5	8
Animal caretakers, except farm	106	138	145	151	32	40	45	31	38	43
Farm occupations	901	802	828	853	−99	−73	−48	−11	−8	−5
Farm workers	837	723	745	766	−114	−92	−71	−14	−11	−8
Nursery workers	64	78	83	86	15	19	23	23	30	36
Farm operators and managers	1,223	990	1,023	1,054	−233	−200	−169	−19	−16	−14
Farmers	1,074	822	850	876	−252	−224	−198	−23	−21	−18
Farm managers	149	168	173	177	19	24	28	13	16	19
Fishers, hunters, and trappers	61	66	69	71	5	8	10	8	13	16
Captains and other officers, fishing vessels	8	9	10	10	1	1	2	13	18	21
Fishers, hunters, and trappers	53	57	60	61	4	6	8	7	12	15
Forestry and logging occupations	148	144	150	158	−4	1	9	−3	1	6
Forest and conservation workers	40	41	43	45	1	3	5	4	8	13
Timber cutting and logging occupations	108	102	106	113	−6	−2	4	−5	−2	4
Fallers and buckers	36	34	35	37	−2	−1	1	−6	−3	2
Logging tractor operators	29	29	30	32	−0	1	3	−1	3	9
Log handling equipment operators	16	16	17	18	−0	1	2	−0	4	11
All other timber cutting and related logging workers	27	23	24	26	−3	−2	−1	−12	−9	−4
Gardeners and groundskeepers, except farm	874	1,158	1,222	1,275	284	348	401	33	40	46
Supervisors, farming, forestry, and agricutural related occupations	65	69	72	74	4	7	9	6	10	14
All other agricultural, forestry, fishing, and related workers	129	146	156	164	18	27	35	14	21	27
Precision production, craft, and repair occupations	14,124	14,710	15,909	16,698	586	1,785	2,574	4	13	18
Blue-collar worker supervisors	1,792	1,760	1,912	2,003	−32	120	211	−2	7	12
Construction trades	3,763	4,244	4,557	4,818	481	794	1,055	13	21	28
Bricklayers and stone masons	152	169	183	194	18	31	42	12	20	28
Carpenters	1,057	1,134	1,209	1,274	76	152	216	7	14	20
Carpet installers	73	84	88	92	11	15	19	15	21	26
Ceiling tile installers and acoustical carpenters	20	20	22	23	0	2	4	2	11	19
Concrete and terrazzo finishers	113	118	128	137	5	15	24	4	13	21
Drywall installers and finishers	143	163	175	186	20	33	43	14	23	30
Electricians	548	652	706	748	104	158	200	19	29	36
Glaziers	42	47	51	55	5	9	12	13	22	30

Table 2. **Continued—Civilian employment by occupation, actual 1990 and projected to 2005, under low, medium, and high scenarios for economic growth**

[Numbers in thousands]

Occupation	Total employment				1990–2005 employment change					
	1990	Projected, 2005			Number			Percent		
		Low	Moderate	High	Low	Moderate	High	Low	Moderate	High
Hard tile setters	28	33	35	37	4	7	9	16	24	30
Highway maintenance workers	151	172	188	202	22	37	52	14	24	34
Insulation workers	70	80	87	93	10	17	23	15	24	33
Painters and paperhangers, construction and maintenance	453	533	564	590	80	111	137	18	24	30
Paving, surfacing, and tamping equipment operators	73	87	95	102	14	22	29	19	30	39
Pipelayers and pipelaying fitters	55	67	72	77	11	17	22	20	31	40
Plasterers	28	30	32	34	1	4	6	5	13	20
Plumbers, pipefitters, and steamfitters	379	426	459	485	47	80	106	12	21	28
Roofers	138	158	169	179	20	31	41	14	23	30
Structural and reinforcing metal workers	80	87	95	102	8	16	22	10	20	28
All other construction trades workers	160	184	198	209	25	38	49	15	24	31
Extractive and related workers, including blasters	237	223	247	257	−14	9	20	−6	4	8
Oil and gas extraction occupations	80	68	78	80	−12	−2	−0	−15	−2	−1
Roustabouts	38	31	36	37	−6	−1	−1	−17	−4	−2
All other oil and gas extraction occupations	42	37	42	43	−6	−0	0	−14	−1	1
Mining, quarrying, and tunneling occupations	24	19	20	21	−6	−5	−4	−24	−19	−15
All other extraction and related workers	133	137	148	157	4	15	24	3	12	18
Mechanics, installers, and repairers	4,900	5,262	5,669	5,946	362	769	1,046	7	16	21
Communications equipment mechanics, installers, and repairers	125	71	77	81	−54	−48	−44	−43	−38	−35
Central office and PBX installers and repairers	80	43	46	48	−38	−34	−32	−47	−43	−40
Frame wirers, central office	11	4	5	5	−7	−7	−7	−63	−60	−58
Radio mechanics	13	12	13	14	−1	−0	1	−9	−1	4
Signal or track switch maintainers	4	2	2	3	−2	−2	−2	−44	−40	−37
All other communications equipment mechanics, installers, and repairers	16	10	11	11	−6	−5	−5	−38	−33	−30
Electrical and electronic equipment mechanics, installers, and repairers	530	502	540	565	−28	10	35	−5	2	7
Data processing equipment repairers	84	123	134	140	40	50	56	48	60	67
Electrical powerline installers and repairers	99	101	108	113	2	9	14	2	9	14
Electronic home entertainment equipment repairers	41	43	46	48	2	5	7	5	13	18
Electronics repairers, commercial and industrial equipment	75	83	88	92	8	13	16	10	17	22
Station installers and repairers, telephone	47	20	21	22	−27	−26	−25	−58	−55	−53
Telephone and cable TV line installers and repairers	133	85	92	98	−48	−40	−35	−36	−30	−26
All other electrical and electronic equipment mechanics, installers, and repairers	52	47	51	53	−5	−1	1	−9	−2	2
Machinery and related mechanics, installers, and repairers	1,675	1,834	1,980	2,074	159	305	400	9	18	24
Industrial machinery mechanics	474	477	520	542	3	46	68	1	10	14
Maintenance repairers, general utility	1,128	1,283	1,379	1,447	154	251	319	14	22	28
Millwrights	73	75	82	86	2	9	13	2	12	18
Vehicle and mobile equipment mechanics and repairers	1,568	1,762	1,892	1,987	194	324	419	12	21	27
Aircraft mechanics and engine specialists	122	140	151	158	18	29	36	15	24	29
Aircraft engine specialists	17	19	21	21	2	4	4	15	22	27
Aircraft mechanics	105	121	131	136	16	26	31	15	24	30
Automotive body and related repairers	219	249	267	281	30	48	62	14	22	28
Automotive mechanics	757	861	923	969	104	166	212	14	22	28
Bus and truck mechanics and diesel engine specialists	268	302	326	343	34	58	76	13	22	28
Farm equipment mechanics	48	49	52	55	1	4	7	3	9	14
Mobile heavy equipment mechanics	104	109	117	123	5	13	19	5	13	18

Table 2. **Continued—Civilian employment by occupation, actual 1990 and projected to 2005, under low, medium, and high scenarios for economic growth**

[Numbers in thousands]

Occupation	Total employment				1990–2005 employment change					
	1990	Projected, 2005			Number			Percent		
		Low	Moderate	High	Low	Moderate	High	Low	Moderate	High
Motorcycle, boat, and small engine mechanics	50	51	55	58	1	5	7	3	10	15
Motorcycle repairers	12	12	13	13	0	1	2	4	11	16
Small engine specialists	39	39	42	44	1	4	6	2	9	14
Other mechanics, installers, and repairers	1,002	1,093	1,180	1,240	91	177	237	9	18	24
Bicycle repairers	15	16	17	18	1	2	2	5	11	16
Camera and photographic equipment repairers	7	8	9	9	1	1	2	10	17	21
Coin and vending machine servicers and repairers	26	24	26	27	–2	–0	1	–8	–1	4
Electric meter installers and repairers	14	15	16	17	1	2	3	11	18	24
Electromedical and biomedical equipment repairers	8	11	12	13	3	4	5	40	51	60
Elevator installers and repairers	19	20	22	23	1	3	5	7	17	24
Heat, air conditioning, and refrigeration mechanics and installers	219	246	266	280	27	46	61	12	21	28
Home appliance and power tool repairers	71	65	70	73	–6	–1	3	–8	–1	4
Musical instrument repairers and tuners	9	8	9	9	–0	0	1	–4	2	7
Office machine and cash register servicers	73	76	82	86	3	9	14	5	13	19
Precision instrument repairers	50	50	54	56	–0	4	6	–0	8	12
Riggers	14	13	14	15	–1	–0	1	–6	–0	4
Tire repairers and changers	81	88	95	100	7	14	19	9	17	23
Watchmakers	7	4	5	5	–3	–2	–2	–37	–33	–30
All other mechanics, installers, and repairers	390	447	484	508	57	94	118	15	24	30
Production occupations, precision	3,134	2,928	3,208	3,338	–206	74	204	–7	2	7
Assemblers, precision	352	209	236	243	–143	–116	–109	–41	–33	–31
Aircraft assemblers, precision	32	31	34	35	–1	2	3	–3	6	9
Electrical and electronic equipment assemblers, precision	171	78	90	92	–93	–81	–79	–55	–48	–46
Electromechanical equipment assemblers, precision	49	27	31	32	–21	–18	–17	–44	–37	–35
Fitters, structural metal, precision	15	12	13	14	–3	–2	–1	–21	–14	–9
Machine builders and other precision machine assemblers	50	37	42	43	–13	–8	–7	–25	–17	–14
All other precision assemblers	34	23	26	27	–11	–8	–7	–32	–24	–21
Food workers, precision	301	271	286	297	–30	–15	–4	–10	–5	–1
Bakers, manufacturing	34	32	32	33	–2	–1	–0	–6	–4	–1
Butchers and meatcutters	234	207	220	229	–27	–14	–4	–12	–6	–2
All other precision food and tobacco workers	34	33	34	35	–1	0	1	–2	1	3
Inspectors, testers, and graders, precision	668	592	659	683	–77	–9	15	–11	–1	2
Metal workers, precision	936	930	1,021	1,065	–6	85	129	–1	9	14
Boilermakers	22	21	23	24	–1	1	2	–4	3	9
Jewelers and silversmiths	40	44	48	50	4	8	10	9	20	24
Machinists	386	389	427	444	3	41	58	1	10	15
Sheet metal workers and duct installers	233	242	263	278	9	30	44	4	13	19
Shipfitters	13	12	12	13	–1	–0	–0	–9	–4	–1
Tool and die makers	141	130	145	150	–11	4	9	–7	3	6
All other precision metal workers	101	92	103	106	–9	2	6	–9	2	6
Printing workers, precision	161	181	195	203	20	33	41	12	21	26
Bookbinders	7	8	8	8	0	1	1	5	13	18
Compositors and typesetters, precision	14	13	14	15	–1	–0	0	–8	–2	1
Job printers	15	17	18	19	2	3	4	14	23	28
Paste-up workers	30	32	34	36	2	4	5	5	13	18
Electronic pagination systems workers	12	14	16	16	3	4	5	24	33	39
Photoengravers	8	9	9	10	0	1	1	5	13	17
Camera operators	17	19	20	21	2	4	4	13	21	26
Strippers, printing	32	40	43	44	8	11	13	25	34	40
Platemakers	14	16	17	18	2	3	4	15	23	29
All other printing workers, precision	12	14	15	16	2	3	3	15	23	28
Textile, apparel, and furnishings workers, precision	272	274	302	313	2	29	41	1	11	15

Table 2. **Continued—Civilian employment by occupation, actual 1990 and projected to 2005, under low, medium, and high scenarios for economic growth**

[Numbers in thousands]

Occupation	Total employment				1990–2005 employment change					
	1990	Projected, 2005			Number			Percent		
		Low	Moderate	High	Low	Moderate	High	w	Moderate	High
Custom tailors and sewers	116	129	137	143	13	21	27	11	18	23
Patternmakers and layout workers, fabric and apparel	16	12	15	15	–4	–1	–0	–23	–4	–2
Shoe and leather workers and repairers, precision	27	16	22	23	–11	–5	–4	–40	–19	–15
Upholsterers	64	65	70	72	1	6	8	1	10	13
All other precision textile, apparel, and furnishings workers	50	52	57	60	2	7	10	5	15	20
Woodworkers, precision	213	223	240	251	10	27	39	5	13	18
Cabinetmakers and bench carpenters	107	114	122	128	7	14	21	6	13	19
Furniture finishers	34	35	38	39	1	4	6	3	12	17
Wood machinists	46	48	51	54	1	5	8	3	12	17
All other precision woodworkers	25	26	29	30	1	3	4	3	13	17
Other precision workers	231	249	270	283	18	39	52	8	17	23
Dental lab technicians, precision	57	56	59	63	–1	3	6	–2	4	10
Optical goods workers, precision	19	22	25	26	3	6	6	14	29	34
Photographic process workers, precision	18	19	21	22	2	3	4	8	16	21
All other precision workers	137	152	165	173	15	28	36	11	21	26
Plant and system occupations	297	294	317	335	–4	19	37	–1	6	12
Chemical plant and system operators	35	28	30	31	–7	–5	–3	–21	–14	–10
Electric power generating plant operators, distributors, and dispatchers	44	45	48	50	1	4	6	2	9	14
Power distributors and dispatchers	18	18	19	20	–0	1	2	–1	6	11
Power generating and reactor plant operators	26	27	29	31	1	3	4	3	11	17
Gas and petroleum plant and system occupations	31	25	27	28	–5	–3	–3	–18	–11	–9
Stationary engineers	35	33	36	37	–2	0	2	–5	1	7
Water and liquid waste treatment plant and system operators	78	93	101	109	15	23	30	19	29	39
All other plant and system operators	74	69	75	79	–5	1	4	–7	1	6
Operators, fabricators, and laborers	17,245	16,448	17,961	18,796	–797	716	1,550	–5	4	9
Machine setters, set-up operators, operators, and tenders	4,905	4,104	4,579	4,754	–800	–326	–151	–16	–7	–3
Numerical control machine tool operators and tenders, metal and plastic	70	78	87	90	7	16	19	11	23	27
Combination machine tool setters, set-up operators, operators, and tenders	93	102	113	118	10	21	25	11	23	27
Machine tool cut and form setters, operators, and tenders, metal and plastic	765	529	585	609	–236	–179	–156	–31	–23	–20
Drilling and boring machine tool setters and set-up operators, metal and plastic	52	35	39	40	–17	–13	–12	–33	–26	–23
Grinding machine setters and set-up operators, metal and plastic	72	49	54	56	–24	–18	–16	–33	–25	–22
Lathe and turning machine tool setters and set-up operators, metal and plastic	80	55	61	63	–26	–20	–17	–32	–24	–22
Machine forming operators and tenders, metal and plastic	174	119	131	137	–55	–43	–37	–32	–25	–21
Machine tool cutting operators and tenders, metal and plastic	145	93	104	107	–52	–42	–38	–36	–29	–26
Punching machine setters and set-up operators, metal and plastic	52	38	42	44	–14	–10	–8	–27	–18	–15
All other machine tool cutting and forming, etc	189	140	155	161	–49	–34	–28	–26	–18	–15
Metal fabricating machine setters, operators, and related workers	140	136	149	156	–5	9	16	–3	6	11
Metal fabricators, structural metal products	34	35	37	40	1	4	6	2	11	18
Soldering and brazing machine operators and tenders	11	10	11	11	–1	–0	0	–12	–1	2
Welding machine setters, operators, and tenders	95	92	101	105	–4	6	10	–4	6	10
Metal and plastic processing machine setters, operators, and related workers	393	355	396	411	–38	3	18	–10	1	5

Table 2. **Continued—Civilian employment by occupation, actual 1990 and projected to 2005, under low, medium, and high scenarios for economic growth**

[Numbers in thousands]

Occupation	Total employment				1990–2005 employment change					
	1990	Projected, 2005			Number			Percent		
		Low	Moderate	High	Low	Moderate	High	Low	Moderate	High
Electrolytic plating machine operators and tenders, setters and set-up operators, metal and plastic	43	34	38	39	−10	−6	−4	−22	−13	−10
Foundry mold assembly and shakeout workers	10	6	7	7	−3	−3	−2	−33	−26	−23
Furnace operators and tenders	22	19	21	22	−3	−0	0	−12	−2	2
Heaters, metal and plastic	5	4	5	5	−0	0	0	−9	1	6
Heating equipment setters and set-up operators, metal and plastic	7	6	7	7	−1	−0	0	−10	−0	4
Heat treating machine operators and tenders, metal and plastic	21	19	21	22	−2	0	1	−10	0	4
Metal molding machine operators and tenders, setters, and set-up operators	38	28	31	32	−10	−7	−6	−26	−18	−15
Nonelectrolytic plating machine operators and tenders, setters, and set-up operators, metal and plastic	7	5	6	6	−2	−1	−1	−22	−15	−11
Plastic molding machine operators and tenders, setters, and set-up operators	143	155	173	180	12	31	37	8	21	26
All other metal and plastic machine setters, operators, and related workers	99	79	88	91	−20	−11	−8	−20	−11	−8
Printing, binding, and related workers	393	430	466	484	37	72	90	9	18	23
Bindery machine operators and set-up operators	71	73	79	82	2	8	11	3	11	16
Printing press operators	224	249	268	279	24	44	54	11	19	24
Letterpress operators	16	13	14	15	−3	−2	−1	−16	−10	−6
Offset lithographic press operators	91	113	122	127	22	31	36	25	34	39
Printing press machine setters, operators and tenders	104	106	115	120	3	12	16	3	11	16
All other printing press setters and set-up operators	14	16	17	17	2	3	3	13	20	25
Photoengraving and lithographing machine operators, and photographers	98	108	119	123	10	21	25	10	21	25
Photoengraving and lithographic machine operators and tenders	6	6	7	7	1	1	1	11	20	25
Screen printing machine setters and set-up operators	26	28	31	32	2	5	6	6	19	22
Typesetting and composing machine operators and tenders	26	30	32	33	4	6	7	14	23	28
All other printing, binding, and related workers	40	44	48	50	4	8	10	11	21	26
Textile and related setters, operators, and related workers	1,090	751	912	936	−339	−178	−153	−31	−16	−14
Extruding and forming machine operators and tenders, synthetic or glass fibers	21	18	20	21	−3	−1	0	−12	−3	1
Pressing machine operators and tenders, textile, garment, and related materials	84	85	96	100	0	12	16	0	14	19
Sewing machine operators, garment	585	368	469	478	−217	−116	−106	−37	−20	−18
Sewing machine operators, nongarment	131	121	138	142	−10	7	11	−8	5	8
Textile bleaching and dyeing machine operators and tenders	28	17	20	21	−11	−8	−7	−39	−28	−26
Textile draw-out and winding machine operators and tenders	199	116	138	142	−82	−61	−57	−41	−31	−29
Textile machine setters and set-up operators	42	26	30	31	−16	−11	−10	−38	−27	−25
Woodworking machine setters, operators, and other related workers	136	142	152	160	6	16	24	4	12	17
Head sawyers and sawing machine operators and tenders, setters, and set-up operators	72	75	80	85	3	8	13	4	11	17
Woodworking machine operators and tenders, setters, and set-up operators	64	67	72	75	3	8	11	4	12	18
Other machine setters, set-up operators, operators, and tenders	1,825	1,582	1,718	1,790	−243	−106	−35	−13	−6	−2
Boiler operators and tenders, low pressure	21	20	22	23	−2	0	1	−7	0	6
Cement and gluing machine operators and tenders	35	25	28	29	−10	−7	−6	−28	−20	−16

Table 2. **Continued—Civilian employment by occupation, actual 1990 and projected to 2005, under low, medium, and high scenarios for economic growth**

[Numbers in thousands]

Occupation	Total employment				1990–2005 employment change					
	1990	Projected, 2005			Number			Percent		
		Low	Moderate	High	Low	Moderate	High	Low	Moderate	High
Chemical equipment controllers, operators, and tenders	75	56	61	63	−19	−14	−11	−25	−19	−15
Cooking and roasting machine operators and tenders, food and tobacco	31	26	26	27	−6	−5	−4	−18	−16	−14
Crushing and mixing machine operators and tenders	135	134	145	151	−1	10	16	−1	7	12
Cutting and slicing machine setters, operators, and tenders	88	81	89	92	−7	1	4	−8	1	5
Dairy processing equipment operators, including setters	18	15	16	16	−3	−2	−2	−15	−13	−11
Electronic semiconductor processors	32	19	22	22	−13	−10	−10	−41	−31	−30
Extruding and forming machine setters, operators, and tenders	94	85	93	97	−9	−1	3	−10	−1	3
Furnace, kiln, or kettle operators and tenders	56	48	53	55	−8	−4	−1	−15	−6	−2
Laundry and drycleaning machine operators and tenders, except pressing	173	198	212	223	26	39	50	15	23	29
Motion picture projectionists	13	11	12	12	−2	−1	−1	−15	−9	−5
Packaging and filling machine operators and tenders	324	278	297	308	−46	−27	−16	−14	−8	−5
Painting and coating machine operators	160	143	158	165	−16	−2	5	−10	−1	3
Coating, painting, and spraying machine Coating, painting, and spraying machine operators, tenders, setters, and set-up operators	117	103	115	119	−14	−3	2	−12	−2	2
Painters, transportation equipment	42	40	43	45	−2	1	3	−4	3	8
Paper goods machine setters and set-up operators	59	53	57	59	−6	−2	1	−10	−3	1
Photographic processing machine operators and tenders	58	64	69	73	6	11	15	11	20	25
Separating and still machine operators and tenders	26	19	21	21	−6	−5	−4	−25	−20	−17
Shoe sewing machine operators and tenders	18	5	10	10	−13	−8	−8	−71	−46	−43
Tire building machine operators	14	8	9	9	−6	−5	−5	−45	−38	−34
All other machine operators, tenders, setters, and set-up operators	396	294	320	334	−102	−75	−62	−26	−19	−16
Hand workers, including assemblers and fabricators	2,675	2,100	2,307	2,394	−575	−368	−281	−21	−14	−11
Cannery workers	78	70	73	74	−8	−6	−4	−10	−7	−5
Coil winders, tapers, and finishers	20	11	13	13	−8	−6	−6	−41	−33	−31
Cutters and trimmers, hand	59	48	55	57	−11	−4	−2	−19	−6	−3
Electrical and electronic assemblers	232	112	128	131	−121	−105	−101	−52	−45	−44
Grinders and polishers, hand	84	59	65	67	−25	−19	−16	−30	−23	−20
Machine assemblers	50	40	44	46	−11	−6	−4	−21	−12	−9
Meat, poultry, and fish cutters and trimmers, hand	121	132	136	140	11	15	19	9	12	15
Metal pourers and casters, basic shapes	12	10	11	11	−2	−1	−1	−18	−9	−6
Painting, coating, and decorating workers, hand	46	46	50	52	0	4	6	0	9	14
Portable machine cutters	13	10	12	13	−3	−0	−0	−24	−4	−2
Pressers, hand	17	15	18	19	−2	1	1	−14	4	8
Sewers, hand	16	11	15	15	−5	−1	−1	−28	−7	−5
Solderers and brazers	28	21	24	24	−7	−5	−4	−25	−16	−13
Welders and cutters	332	317	344	360	−15	13	29	−4	4	9
All other assemblers and fabricators	1,192	888	980	1,018	−304	−212	−173	−26	−18	−15
All other hand workers	375	311	339	352	−64	−36	−23	−17	−10	−6
Transportation and material moving machine and vehicle operators	4,730	5,329	5,743	6,043	599	1,013	1,312	13	21	28
Motor vehicle operators	3,417	3,997	4,301	4,522	580	883	1,105	17	26	32
Bus drivers	561	680	738	789	118	177	228	21	32	41
Bus drivers	159	183	198	210	23	39	51	15	24	32
Bus drivers, school	402	497	541	579	95	138	177	24	34	44
Taxi drivers and chauffeurs	108	132	140	146	24	32	38	22	29	35
Truckdrivers	2,701	3,126	3,360	3,522	425	659	821	16	24	30

Table 2. **Continued—Civilian employment by occupation, actual 1990 and projected to 2005, under low, medium, and high scenarios for economic growth**

[Numbers in thousands]

Occupation	Total employment				1990–2005 employment change					
	1990	Projected, 2005			Number			Percent		
		Low	Moderate	High	Low	Moderate	High	Low	Moderate	High
Driver/sales workers	339	359	381	397	20	42	58	6	12	17
Truckdrivers, light and heavy	2,362	2,767	2,979	3,125	405	617	763	17	26	32
All other motor vehicle operators	47	58	62	65	12	16	18	25	33	40
Rail transportation workers	107	95	102	108	–12	–5	2	–11	–4	2
Locomotive engineers	16	14	15	16	–2	–1	–0	–12	–6	–0
Railroad brake, signal, and switch operators	35	27	29	31	–8	–6	–5	–23	–18	–13
Railroad conductors and yardmasters	28	22	24	25	–6	–4	–3	–20	–14	–9
Rail yard engineers, dinkey operators, and hostlers	8	7	8	8	–1	–0	0	–12	–5	1
Subway and streetcar operators	14	21	23	24	7	9	11	53	66	79
All other rail vehicle operators	6	3	3	4	–2	–2	–2	–42	–38	–35
Water transportation and related workers	140	135	144	153	–5	4	13	–4	3	10
Able seamen, ordinary seamen, and marine oilers	22	16	17	18	–6	–5	–4	–28	–24	–18
Captains and pilots, ship	14	13	14	15	–1	0	1	–4	1	9
Mates, ship, boat, and barge	7	6	7	7	–1	–0	0	–9	–4	4
Ship engineers	7	5	5	6	–1	–1	–1	–23	–19	–13
All other transportation and related workers	91	94	102	108	4	11	17	4	12	18
Material moving equipment operators	1,019	1,053	1,142	1,202	34	123	183	3	12	18
Crane and tower operators	51	50	54	57	–1	4	6	–2	7	13
Excavation and loading machine operators	74	77	83	88	2	9	14	3	12	19
Grader, dozer, and scraper operators	93	96	104	110	2	11	17	3	11	18
Hoist and winch operators	11	12	13	13	1	1	2	4	13	19
Industrial truck and tractor operators	431	433	469	492	2	38	60	0	9	14
Operating engineers	157	186	201	214	28	44	57	18	28	36
All other material moving equipment operators	201	200	218	227	–0	17	26	–0	8	13
All other transportation and material moving equipment operators	47	50	54	57	3	7	10	5	14	21
Helpers, laborers, and material movers, hand	4,935	4,914	5,332	5,606	–21	396	670	–0	8	14
Freight, stock, and material movers, hand	884	912	990	1,037	28	106	153	3	12	17
Hand packers and packagers	667	685	744	774	18	77	107	3	12	16
Helpers, construction trades	552	583	636	679	32	84	128	6	15	23
Machine feeders and offbearers	255	229	249	260	–26	–6	5	–10	–2	2
Parking lot attendants	50	57	61	64	7	11	15	14	23	29
Refuse collectors	124	120	129	137	–4	5	13	–4	4	10
Service station attendants	246	212	229	240	–34	–17	–6	–14	–7	–2
Vehicle washers and equipment cleaners	240	274	295	310	34	55	70	14	23	29
All other helpers, laborers, and material movers, hand	1,918	1,842	1,999	2,103	–76	80	185	–4	4	10

repair the increasing number of computers in use.

Several additional occupations that are projected to enjoy robust growth, but which are not health- or computer-related, should be mentioned. Paralegals, with the second fastest rate of employment growth overall, are expected to be in great demand in both legal and related fields, due to efforts to provide more cost-effective and efficient legal services to the public. The employment of human services workers is projected to expand in facilities and programs that serve the elderly, the mentally impaired, or the developmentally disabled. Projected increases in spending on travel by consumers and industry are expected to have a favorable impact on the employment of travel agents and flight attendants over the 1990–2005 period. A final occupation worth noting is that of management analyst, which is expected to experience rapid growth as government and industry increasingly rely on such expertise to improve the performance of their organizations.

Occupations with the largest job growth. Many of the occupations with the largest numerical job increases are concentrated in a specific industry group that is expected to expand significantly through the year 2005. (See table 4.) For example, retail trade is expected to increase by

more than 5 million jobs, health services by nearly 3.9 million, and educational services by 2.3 million. These three industry sectors are projected to account for nearly half of the growth in wage and salary jobs from 1990 to 2005.

Two of the occupations with the largest job growth, salespersons, retail (887,000 jobs) and cashiers (685,000 jobs), are, of course, found largely in retail trade. Several other occupations with large projected numerical increases are in the large and rapidly growing industry within retail trade, eating and drinking places—food counter, fountain, and related workers; waiters and waitresses; food preparation workers; and both restaurant and short-order cooks.

Several health-related occupations are expected to benefit from the large increases in employment projected for public and private hospitals, which are expected to add 1.3 million jobs for a total of almost 6 million workers in 2005. Jobs for registered nurses are projected to increase by 767,000 over the 1990 level, and those for nursing aides, orderlies, and attendants are expected to be up by 552,000. In the moderate projection, licensed practical nurses benefit from the very rapid growth in nursing and personal care facilities, gaining 269,000 jobs. Home health aide, which was previously mentioned as the occupation projected to grow the fastest, is expected to increase by 263,000 jobs.

Projected increases in student enrollments and declining teacher-student ratios in public schools are expected to spur the demand for teachers in elementary and secondary schools by 313,000 and 437,000 jobs, respectively. Enrollments are expected to increase much faster in secondary schools than in elementary schools. The trend toward greater utilization of teacher aides and educational assistants is assumed to continue through 2005, and results in an increase of 278,000 jobs for these workers in elementary and secondary schools.

Most of the remaining occupations listed in table 4 are found in industries throughout the economy and their growth, as a consequence, is dependent upon many factors. As mentioned in the previous section, numbers of computer programmers and systems analysts are expected to increase with the continued spread of computer technology. Because receptionists and information clerks interact a great deal with people and because their duties are difficult to automate, they are projected to show important increases in employment. General office clerks are expected to continue to replace other administrative support workers (including clerical) who have a

Table 3. **Fastest growing occupations, 1990-2005, moderate alternative projection**

[Numbers in thousands]

Occupation	Employment		Numerical change	Percent change
	1990	2005		
Home health aides	287	550	263	91.7
Paralegals	90	167	77	85.2
Systems analysts and computer scientists	463	829	366	78.9
Personal and home care aides	103	183	79	76.7
Physical therapists	88	155	67	76.0
Medical assistants	165	287	122	73.9
Operations research analysts	57	100	42	73.2
Human services workers	145	249	103	71.2
Radiologic technologists and technicians	149	252	103	69.5
Medical secretaries	232	390	158	68.3
Physical and corrective therapy assistants and aides	45	74	29	64.0
Psychologists	125	204	79	63.6
Travel agents	132	214	82	62.3
Correction officers	230	372	142	61.4
Data processing equipment repairers	84	134	50	60.0
Flight attendants	101	159	59	58.5
Computer programmers	565	882	317	56.1
Occupational therapists	36	56	20	55.2
Surgical technologists	38	59	21	55.2
Medical records technicians	52	80	28	54.3
Management analysts	151	230	79	52.3
Respiratory therapists	60	91	31	52.1
Child care workers	725	1,078	353	48.8
Marketing, advertising, and public relations managers	427	630	203	47.4
Legal secretaries	281	413	133	47.4
Receptionists and information clerks	900	1,322	422	46.9
Registered nurses	1,727	2,494	767	44.4
Nursing aides, orderlies, and attendants	1,274	1,826	552	43.4
Licensed practical nurses	644	913	269	41.9
Cooks, restaurant	615	872	257	41.8

Table 4. **Occupations with the largest job growth, 1990-2005, moderate alternative projection**

[Numbers in thousands]

Occupation	Employment		Numerical change	Percent change
	1990	2005		
Salespersons, retail	3,619	4,506	887	24.5
Registered nurses	1,727	2,494	767	44.4
Cashiers	2,633	3,318	685	26.0
General office clerks	2,737	3,407	670	24.5
Truckdrivers, light and heavy	2,362	2,979	617	26.1
General managers and top executives	3,086	3,684	598	19.4
Janitors and cleaners, including maids and housekeeping cleaners	3,007	3,562	555	18.5
Nursing aides, orderlies, and attendants	1,274	1,826	552	43.4
Food counter, fountain, and related workers	1,607	2,158	550	34.2
Waiters and waitresses	1,747	2,196	449	25.7
Teachers, secondary school	1,280	1,717	437	34.2
Receptionists and information clerks	900	1,322	422	46.9
Systems analysts and computer scientists	463	829	366	78.9
Food preparation workers	1,156	1,521	365	31.6
Child care workers	725	1,078	353	48.8
Gardeners and groundskeepers, except farm	874	1,222	348	39.8
Accountants and auditors	985	1,325	340	34.5
Computer programmers	565	882	317	56.1
Teachers, elementary	1,362	1,675	313	23.0
Guards	883	1,181	298	33.7
Teacher aides and educational assistants	808	1,086	278	34.4
Licensed practical nurses	644	913	269	41.9
Clerical supervisors and managers	1,218	1,481	263	21.6
Home health aides	287	550	263	91.7
Cooks, restaurant	615	872	257	41.8
Maintenance repairers, general utility	1,128	1,379	251	22.2
Secretaries, except legal and medical	3,064	3,312	248	8.1
Cooks, short order and fast food	743	989	246	33.0
Stock clerks, sales floor	1,242	1,451	209	16.8
Lawyers	587	793	206	35.1

limited number of functions. The occupation, secretaries, except legal and medical—while growing more slowly than average—is expected to employ 3.3 million workers in 2005, an increase of 248,000 jobs over the 1990 employment level.

An interesting comparison is between the total increase in employment from those occupations that are projected as the fastest growing (table 3) and the increase from those projected to account for the greatest numerical growth (table 4). The first group accounts for 22 percent of the projected overall growth in employment, while the second group accounts for 50 percent (some occupations are included in both of the groups).

Educational requirements for growth jobs. The educational requirements of workers are quite varied among the 30 occupations that are projected to grow most rapidly and the 30 occupations with the largest numerical increases. In exhibit 1, these occupations are presented in three groups, according to the level of education required: occupations that generally require a bachelor's degree or more education; those that generally require some post-secondary training or extensive employer training; and those that generally require high school graduation or less education. In general, a majority of the occupations require education or training beyond high school. In fact, more than 2 out of 3 of the 30 fastest growing occupations and nearly half of the 30 with the largest number of jobs added had a majority of workers with education or training beyond high school in 1990.

Occupations that generally require at least a bachelor's degree are concentrated in the professional specialty group. Several occupations in the second educational attainment group (Group II) require specific formal training obtained in public and private institutions, including community and junior colleges, which offer occupationally oriented training programs. A few occupations in this second group—such as maintenance repairers, general utility—most often require skills obtained through employer training programs. The third group of occupations are those that require high school graduation or less education. Some occupations, such as secretaries, except legal and medical, may require high school vocational training, but many other occupations have no specific formal training require-

ments, and jobs skills in these occupations are generally learned on the job in a relatively short time.

Declining occupations

Projected declines in industry employment, technological change, and other factors are expected to reduce the demand for workers in some specific occupations over the 1990–2005 period. The following discussion focuses on those occupations with the largest job declines, rather than on those with the fastest rates of decline. Many detailed occupations in the latter category are small in size, and the resulting employment declines consequently are not very significant.

More than half of the 30 occupations with large projected declines are concentrated in manufacturing, in which employment is projected to contract by nearly 600,000 jobs by 2005. (See table 5.) Several manufacturing industries are expected to suffer employment declines resulting from projections of reduced defense expenditures, increased imports, and higher levels of productivity resulting from advances in technology. The more factors that contribute to the overall employment shrinkage in any industry, the larger the declines among occupations specific to that industry. For example, approximately 61,000 jobs for textile draw-out and winding machine operators and tenders are projected to be lost due to increased automation and an overall decline in employment in the textile industry. Other occupations in manufacturing that are projected to contract due to the wider adoption of computer controlled machinery and other automated processes include electrical and electronic assemblers (–105,000 jobs); electrical and electronic equipment assemblers, precision (–81,000 jobs); machine forming operators and tenders, metal and plastic (–43,000 jobs); machine tool cutting operators and tenders, metal and plastic (–42,000 jobs); and lathe and turning machine tool setters and set-up operators, metal and plastic (–20,000 jobs).

Some occupations are projected to decline due to increased office automation, including bookkeeping, accounting, and auditing clerks (–133,000 jobs) and typists and word processors (–103,000 jobs).

Several declining occupations are found in industries that are expected to continue their long-run loss of employment through 2005. The projected decrease in crops and livestock production in agriculture, for example, is expected to result in 224,000 jobs lost for farmers and a

Exhibit 1. Projected growth occupations, by level of education required

Group I: *Occupations generally requiring a bachelor's degree or more education*

- System analysts and computer scientists
- Physical therapists
- Operations research analysts
- Psychologists
- Computer programmers
- Occupational therapists
- Management analysts
- Marketing, advertising, and public relations managers
- General managers and top executives
- Teachers, secondary school
- Teachers, elementary school
- Accountants and auditors
- Lawyers

Group II: *Occupations generally requiring some post-secondary training or extensive employer training*

- Paralegals
- Radiologic technologists and technicians
- Medical assistants
- Physical and corrective therapy assistants and aides
- Data processing equipment repairers
- Medical records technicians
- Surgical technicians
- Cooks, restaurant
- Respiratory therapists
- Licensed practical nurses
- Maintenance repairers, general utility
- Teacher aides and educational assistants
- Registered nurses
- Legal secretaries
- Medical secretaries

Group III: *Occupations generally requiring high school graduation or less education*

- Home health aides
- Human services workers
- Personal and home care aides
- Correction officers
- Travel agents
- Flight attendants
- Salespersons, retail
- General office clerks
- Cashiers
- Food counter, fountain, and related workers
- Truckdrivers, light and heavy
- Nursing aides, orderlies, and attendants
- Janitors and cleaners, including maids and housekeeping cleaners
- Waiters and waitresses
- Food preparation workers
- Receptionists and information clerks
- Gardeners and groundskeepers, except farm
- Guards
- Child care workers
- Secretaries, except legal and medical
- Cooks, short order and fast food
- Clerical supervisors and managers
- Stock clerks, sales floor

loss of 92,000 jobs for farmworkers. The movement toward child care outside the home is expected to result in a decline of 124,000 jobs for child care workers in private households. Finally, the telephone communications industry is projected to lose more than 200,000 jobs by 2005, resulting in reduced employment prospects for several occupations shown in the table of declining occupations.

Self-employed workers

Some 10.2 million self-employed workers accounted for 8.3 percent of the nearly 123 million job total in 1990. The number of self-employed workers is projected to grow by 1.5 million, or a total of 15 percent, between 1990 and 2005. (See table 6.) This rate of growth is somewhat slower than the projected total increase of 21 percent for wage and salary employees. Among the detailed occupations, however, there is a great deal of variation in the projected growth of self-employed workers.

Self-employed workers, like wage and salary workers, can be discussed from an industry or from an occupational perspective. From an industry view, more than half of all self-employed workers were concentrated in the services industry division and in retail trade in 1990. The services industry division alone had nearly 4 million self-employed workers, twice as many as any other sector, and accounted for nearly 40 percent of the total. Retail trade had 1.5 million self-employed workers in 1990, or 15 percent of the total, and construction and agriculture, forestry, and fisheries both employed just slightly less than that number. Virtually all of the recent job growth among self-employed workers by industry has been in services; construction; and finance, insurance, and real estate. Employment declines among the self-employed have been occurring in agriculture, forestry, and fishing and in retail trade.

From 1990 to 2005, about one-third of the increase in self-employed workers by occupa-

Table 5. **Occupations with the largest job declines, 1990–2005, moderate alternative projection**

[Numbers in thousands]

Occupation	Employment		Numerical change	Percent change
	1990	2005		
Farmers	1,074	850	–224	–20.9
Bookkeeping, accounting, and auditing clerks	2,276	2,143	–133	–5.8
Child care workers, private household	314	190	–124	–39.5
Sewing machine operators, garment	585	469	–116	–19.8
Electrical and electronic assemblers	232	128	–105	–45.1
Typists and word processors	972	869	–103	–10.6
Cleaners and servants, private household	411	310	–101	–24.5
Farm workers	837	745	–92	–11.0
Electrical and electronic equipment assemblers, precision	171	90	–81	–47.5
Textile draw-out and winding machine operators and tenders	199	138	–61	–30.6
Switchboard operators	246	189	–57	–23.2
Machine forming operators and tenders, metal and plastic	174	131	–43	–24.5
Machine tool cutting operators and tenders, metal and plastic	145	104	–42	–28.6
Telephone and cable TV line installers and repairers	133	92	–40	–30.4
Central office and PBX installers and repairers	80	46	–34	–42.5
Central office operators	53	22	–31	–59.2
Statistical clerks	85	54	–31	–36.1
Packaging and filling machine operators and tenders	324	297	–27	–8.3
Station installers and repairers, telephone	47	21	–26	–55.0
Bank tellers	517	492	–25	–4.8
Lathe and turning machine tool setters and set-up operators, metal and plastic	80	61	–20	–24.4
Grinders and polishers, hand	84	65	–19	–22.5
Electromechanical equipment assemblers, precision	49	31	–18	–36.5
Grinding machine setters and set-up operators, metal and plastic	72	54	–18	–25.1
Service station attendants	246	229	–17	–7.1
Directory assistance operators	26	11	–16	–59.4
Butchers and meatcutters	234	220	–14	–5.9
Chemical equipment controllers, operators, and tenders	75	61	–14	–19.1
Drilling and boring machine tool setters and set-up operators, metal and plastic	52	39	–13	–25.6
Meter readers, utilities	50	37	–12	–24.8

Table 6. **Self-employed workers in occupations with 50,000 workers or more, actual 1990 and projected to 2005**

[Numbers in thousands]

Occupation	1990			2005			Change in self-employed, 1990–2005	
	Total employment	Self-employed workers	Percent of total employment	Total employment	Self-employed workers	Percent of total employment	Number	Percent
Total, all occupations	122,573	10,161	8.3	147,191	11,663	7.9	1,502	14.8
Executive, administrative, and managerial occupations	12,451	1,598	12.8	15,866	2,106	13.3	508	31.8
Managerial and administrative occupations	8,838	1,328	15.0	11,174	1,778	15.9	450	33.9
Food service and lodging managers	595	247	41.5	793	280	35.3	33	13.4
Property and real estate managers	225	89	39.5	302	110	36.5	21	23.6
Management support occupations	3,613	270	7.5	4,691	328	7.0	58	21.5
Accountants and auditors	985	102	10.4	1,325	110	8.3	8	7.8
Management analysts	151	68	44.9	230	100	43.4	32	47.1
Professional specialty occupations	15,800	1,446	9.2	20,907	1,727	8.3	281	19.4
Social scientists	224	65	29.0	320	106	33.1	41	63.1
Psychologists	125	51	40.9	204	90	44.1	39	76.5
Lawyers and judicial workers	633	198	31.3	850	205	24.1	7	3.5
Lawyers	587	198	33.8	793	205	25.9	7	3.5
Teachers, librarians, and counselors	5,687	134	2.4	7,280	165	2.3	31	23.1
Other teachers and instructors	757	108	14.3	963	135	14.0	27	25.0
Adult and vocational education teachers	517	108	20.9	669	135	20.2	27	25.0
Instructors, adult (nonvocational) education	219	108	49.3	289	135	46.7	27	25.0
Health diagnosing occupations	855	271	31.7	1,101	310	28.1	39	14.4
Dentists	174	92	52.7	196	103	52.6	11	12.0
Physicians	580	139	24.0	776	160	20.6	21	15.1
Health assessment and treating occupations	2,305	69	3.0	3,304	89	2.7	20	29.0
Writers, artists, and entertainers	1,542	517	33.5	1,915	603	31.5	86	16.6
Artists and commercial artists	230	143	62.2	303	190	62.8	47	32.9
Designers	339	114	33.6	428	123	28.7	9	7.9
Designers, except interior designers	270	86	31.9	335	90	26.9	4	4.7
Musicians	252	75	29.7	276	85	30.8	10	13.3
Writers and editors, including technical writers	232	78	33.6	292	89	30.5	11	14.1
Technicians and related support occupations	4,204	107	2.5	5,754	132	2.3	25	22.9
Marketing and sales occupations	14,088	1,831	13.0	17,489	1,903	10.9	72	4.0
Insurance sales workers	439	139	31.7	527	150	28.5	11	7.9
Real estate agents, brokers, and appraisers	413	255	61.8	492	281	57.2	26	10.4
Sales agents, real estate	300	199	66.3	355	220	62.0	21	10.6
Salespersons, retail	3,619	187	5.2	4,506	200	4.4	13	7.0
Administrative support occupations, including clerical	21,951	338	1.5	24,835	382	1.5	44	13.0
Financial records processing occupations	2,860	147	5.1	2,750	164	6.0	17	11.6
Bookkeeping, accounting, and auditing clerks	2,276	143	6.3	2,143	160	7.5	17	11.9
Secretaries, stenographers, and typists	4,680	88	1.9	5,110	110	2.2	22	25.0

Table 6. **Continued—Self-employed workers in occupations with 50,000 workers or more, actual 1990 and projected to 2005**

[Numbers in thousands]

Occupation	1990			2005			Change in self-employed, 1990–2005	
	Total employment	Self-employed workers	Percent of total employment	Total employment	Self-employed workers	Percent of total employment	Number	Percent
Service occupations	19,204	1,220	6.4	24,805	1,662	6.7	442	36.2
Cleaning and building service occupations, except private household	3,435	238	6.9	4,068	352	8.7	114	47.9
Janitors and cleaners, including maids and housekeeping cleaners	3,007	221	7.4	3,562	332	9.3	111	50.2
Food preparation and service occupations	7,706	79	1.0	10,031	80	.8	1	1.3
Chefs, cooks, and other kitchen workers	3,069	50	1.6	4,104	55	1.3	5	10.0
Personal service occupations	2,192	824	37.6	3,164	1,112	35.1	288	34.9
Barbers	77	59	76.8	76	59	77.8	0	0.0
Child care workers	725	466	64.3	1,078	676	62.7	210	45.0
Cosmetologists and related workers	636	296	46.5	793	374	47.1	78	26.4
Hairdressers, hairstylists, and cosmetologists	597	287	48.1	742	363	48.9	76	26.5
Agriculture, forestry, fishing, and related occupations	3,506	1,380	39.4	3,665	1,250	34.1	−131	−9.5
Farm operators and managers	1,223	1,074	87.8	1,023	850	83.1	−224	−20.9
Farmers	1,074	1,074	100.0	850	850	100.0	−224	−20.9
Gardeners and groundskeepers, except farm	874	166	19.0	1,222	250	20.5	84	50.6
Precision production, craft, and repair occupations	14,124	1,686	11.9	15,909	1,932	12.1	246	14.6
Blue-collar worker supervisors	1,792	130	7.3	1,912	143	7.5	13	10.0
Construction trades	3,763	936	24.9	4,557	1,158	25.4	222	23.7
Carpenters	1,057	373	35.3	1,209	450	37.2	77	20.6
Electricians	548	58	10.6	706	75	10.6	17	29.3
Painters and paperhangers, construction and maintenance	453	214	47.2	564	289	51.2	75	35.0
Plumbers, pipefitters, and steamfitters	379	65	17.2	459	75	16.4	10	15.4
Mechanics, installers, and repairers	4,900	407	8.3	5,669	411	7.3	4	1.0
Machinery and related mechanics, installers, and repairers	1,675	56	3.3	1,980	65	3.3	9	16.1
Vehicle and mobile equipment mechanics and repairers	1,568	240	15.3	1,892	225	11.9	−15	−6.3
Automotive mechanics	757	152	20.1	923	145	15.7	−7	−4.6
Other mechanics, installers, and repairers	1,002	73	7.3	1,180	77	6.5	4	5.5
Production occupations, precision	3,134	205	6.5	3,208	212	6.6	7	3.4
Textile, apparel, and furnishings workers, precision	272	90	33.0	302	96	31.8	6	6.7
Custom tailors and sewers	116	61	52.7	137	70	51.0	9	14.8
Operators, fabricators, and laborers	17,245	555	3.2	17,961	570	3.2	15	2.7
Machine setters, set-up operators, operators, and tenders	4,905	93	1.9	4,579	97	2.1	4	4.3
Hand workers, including assemblers and fabricators	2,675	103	3.9	2,307	119	5.2	16	15.5
Transportation and material moving machine and vehicle operators	4,730	285	6.0	5,743	278	4.8	−7	−2.5
Motor vehicle operators	3,417	248	7.3	4,301	242	5.6	−6	−2.4
Truckdrivers	2,701	196	7.3	3,360	174	5.2	−22	−11.2
Truckdrivers, light and heavy	2,362	182	7.7	2,979	160	5.4	−22	−12.1
Helpers, laborers, and material movers, hand	4,935	74	1.5	5,332	76	1.4	2	2.7

tion is expected to occur among executive, administrative, and managerial occupations—508,000 jobs out of 1.5 million. The recent trend of faster job growth among self-employed managers than among their wage and salary counterparts is expected to continue through 2005 as many individuals continue to start up their own businesses.

The next largest increase in self-employment (442,000 jobs) occurs in service occupations. Numerous additional opportunities (210,000) are expected for self-employed child care workers as more and more families seek child care outside the home. Other occupations with projected increases in self-employed workers include janitors and cleaners, including maids and housekeeping cleaners (111,000) and hairdressers, hairstylists, and cosmetologists (76,000).

Other areas that will provide opportunities for self-employment are professional speciality occupations (281,000 jobs) and precision production, craft, and repair (246,000 jobs). Both of these groups have large numbers of detailed occupations in which the proportion of self-employed workers to all workers is relatively high.

Occupations in the marketing and sales fields had the most self-employed workers in 1990, but they are projected to grow by only 72,000 workers, or a cumulative 4 percent, from 1990 to 2005. Growth in numbers of salaried employees in medium-size and large establishments in industries that employ these workers is expected to outpace the increases among self-employed workers. However, in many sales occupations, the self-employed will still account for a sizable portion of total employment in 2005.

Within the major group "agriculture, forestry, fishing, and related occupations," the number of self-employed farmers is projected to continue its long-run decline and to shrink by about 224,000 due to a reduction in the number of smaller farms. The one occupation in this major group that is expected to experience growth in the number of self-employed workers is gardeners and groundskeepers (up 84,000).

Table 7. **Employment change classified by occupational employment change factors and factor combinations, 1990–2005**

[Employment in millions]

Factors	Total projected change	Change due to—		Number of occupations
		Industrial-related component	Occupational structure	
Total, all factor combinations	24.6	24.6	[1]0.0	507
Increases from both industry and structure change	19.4	14.6	4.9	233
Decreases from both industry and structure change	−1.1	−.5	−.6	50
Increase from industry change and decrease from structure change	6.4	11.1	−4.7	175
Decrease from industry change and increase from structure change	−.1	−.5	.4	49

[1] At the total, all factor combinations level, the net change due to occupational structure is zero because changes to any detailed occupation must be counterbalanced by a change in the opposite direction to one or more different occupations.

Table 8. **Employment change classified by occupational employment factors and major occupational group, 1990-2005**

[Employment in millions]

Occupation	Employment change—		
	Total	Due to industry change	Due to occupational structure change
Total, all occupations	24.6	24.6	[1]0.0
Executive, administrative, and managerial	3.4	2.9	.6
Professional specialty	5.1	4.1	1.0
Technicians and related support	1.6	1.2	.4
Marketing and sales	3.4	2.8	.6
Administrative support, including clerical	2.9	5.0	−2.1
Service occupations	5.6	5.5	.1
Agriculture, forestry, and fishing	.2	.1	.1
Precision production, craft, and repair	1.8	1.6	.1
Operators, fabricators, and laborers	.7	1.4	−.7

[1] At the total, all occupations level, the net change due to occupational structure is zero because changes to any detailed occupation must be counterbalanced by a change in the opposite direction to one or more different occupations.

Factors underlying change, 1990–2005

Two interacting factors statistically summarize the variety of reasons for change in occupational employment—shifts in employment among industries and changes in the occupational structure of industries. The among-industry employment shifts are driven both by changes in the components of final demand, such as reductions in defense expenditures and increases in exports, as well as by interindustry purchases, which, in turn, are influenced by technological change, product development, and relative prices. Changes in occupational structure also reflect the impact of technological changes, product shifts, organizational changes, and other influences that affect the utilization of workers by occupation within an industry.

The method of determining how much of the projected employment change is attributable to

Table 9. **Total job opportunities due to replacements and projected occupational employment change, 1990–2005**

[Employment in thousands]

Occupational title	1990 total employment	Job openings due to net replacements 1990–2005	Job openings due to growth, 1990–2005[1]	Total job openings, 1990–2005	Opportunity ratio
Total, all occupations	122,573	38,851	26,892	65,743	0.54
Executive, administrative, and managerial	12,451	3,085	3,414	6,499	.52
Professional specialty occupations	15,800	4,281	5,107	9,388	.59
Engineers, architects, and surveyors	1,755	571	448	1,019	.58
Mathematical and computer scientists	571	82	416	498	.87
Natural scientists	373	171	97	268	.72
Health diagnosing occupations	855	307	247	554	.65
Health assessment and treating occupations	2,305	591	999	1,590	.69
Teachers, college and university	712	339	134	473	.66
Teachers, except college and university	4,666	1,107	1,389	2,496	.54
Counselors, educational and vocational	144	41	49	90	.63
Librarians, archivists, and curators	166	52	21	73	.44
Social scientists and urban planners	224	50	96	146	.65
Social, recreational, and religious workers	1,049	186	327	513	.49
Lawyers and judges	633	191	217	408	.64
Writers, artists, and entertainers	1,542	440	373	813	.53
Technicians and related support	4,204	1,200	1,551	2,751	.65
Health technologists and technicians	1,833	434	763	1,197	.65
Engineering and related technologists and technicians	1,081	368	254	622	.58
Science technicians	246	97	58	155	.63
Technicians, except health, engineering, and science	1,044	300	475	775	.74
Sales occupations	14,088	5,379	3,401	8,780	.62
Administrative support, including clerical	21,951	6,413	3,389	9,722	.44
Supervisors, administrative support	1,218	444	263	707	.58
Computer equipment operators	320	43	42	85	.26
Secretaries, stenographers, and typists	4,680	1,524	540	2,064	.44
Information clerks	1,418	350	584	934	.66
Records processing occupations, except financial	949	393	96	489	.51
Financial records processing occupations	2,860	951	23	974	.34
Duplicating, mail, and other office machine operators	169	81	22	103	.61
Communication equipment operators	345	132	0	132	.38
Mail and message distributing occupations	718	231	107	338	.47
Material recording, scheduling, distribution company	2,513	720	257	977	.39
Adjusters and investigators	1,058	170	255	425	.40
Miscellaneous administrative support	5,703	1,374	1,121	2,495	.44
Service occupations	19,204	7,403	5,830	13,233	.69
Private household	782	249	0	249	.32
Protective service occupations	2,266	936	729	1,665	.73
Food preparation and service occupations	7,705	4,149	2,325	6,474	.84
Health service occupations	1,972	403	860	1,263	.64
Cleaning and building service occupations	3,435	990	633	1,623	.47
Personal service occupations	2,192	475	973	1,448	.66
Precision production, craft, and repair	14,124	4,764	2,068	6,832	.48
Mechanics and repairers	4,900	1,569	887	2,456	.50
Construction trades	3,763	1,114	794	1,908	.51
Extractive occupations	237	62	15	77	.33
Precision production occupations	3,134	1,189	74	1,263	.40
Operators, fabricators, and laborers	17,245	5,449	1,734	7,183	.42
Machine operators, assemblers, and inspectors	7,580	2,455	281	2,736	.36
Transportation and material moving occupations	4,730	1,262	1,033	2,295	.49
Handlers, equipment cleaners, helpers, and laborers	4,935	1,732	420	2,152	.44
Farming, forestry, and fishing	3,506	863	477	1,340	.38

[1] Job openings due to growth are a result of summing the employment increases for detailed occupations within each of the occupational groups shown in this table.

among-industry employment change and how much to changes in the occupational structure of industries incorporates a three-step procedure using the industry-occupational employment matrix. In the first step, the actual projected change in employment by occupation is computed by subtracting the 1990 employment for an occupation from the 2005 projected employment. This calculation represents the total change for the occupation caused both by the industry employment shifts and by the projected occupational ratio changes.

In the second step, the occupational staffing pattern distribution of industries shown in the 1990 matrix is multiplied by the 2005 projected industry employment totals. The resulting employment totals indicate the employment that would be observed if the only factor affecting projected occupational employment were the projected change in industry employment. The 1990 occupational employment is then subtracted from the 2005 occupational employment level resulting from this step. This subtraction yields the amount of occupational employment change due to shifts of employment among industries.

In the final step, the employment change for an occupation, calculated in the second step, is subtracted from the employment change for each occupation obtained in the first step. This subtraction yields the occupational employment change due to occupational structure change and the interaction of these two factors with each other.

The factor differences from this procedure are shown in table 7. The first column of data in the table is the total projected change computed in step 1. The second column is the industry employment-related change derived from using the static industry-occupation matrix in step 2. The third column is the occupational structure-related change from step 3.

Table 7 indicates the significance of the factors causing employment to change at the major occupational group level. It also shows the number of detailed occupations contributing to the employment change in each of four cases in which industry employment and occupational ratios either increase or decrease. In the first case, both the industry employment change and the occupational structure change are causing employment in the occupation to grow. It is important to note that both factor increases are on a net basis. For instance, although the industry employment factor is increasing on a net basis in the first combination, the employment for any occupation may be found in some declining industries in the 2005 industry-occupation matrix, but these declines are more than offset by increases in the occupation's employment in industries in which employment is growing.

In the second case, both the industry employment change and the occupational structure change lead to decreasing employment in the occupation. In the third case, the industry employment change works toward increasing employment and the occupational structure change works toward lowering it. In the fourth case, the effects of these two factors are reversed.

Nearly all of the 24.6 million change in employment based on the actual projected change by occupation occurred in the two cases in which industry employment was increasing on a net basis for the occupation. This is natural because employment in most nonmanufacturing industries is projected to grow and that in the manufacturing industries is projected to decline only moderately. In the two cases with increasing industry employment, most of the job growth occurs in the combination with increasing occupational ratios. As can be seen from the table, there was a projected increase of 6.4 million workers stemming from the third combination in the first data column. Of this number, there was an 11.1 million increase due to among-industry employment change alone and an offsetting decline of 4.7 million due to occupational ratio decreases.

In the largest combination, where both industry employment and occupational ratios work in the direction of expanding employment in an occupation, 14.6 million of the total increase comes solely from industry employment increases. Another 4.9 million comes from rising occupational ratios within the industries.

Table 10. **Median annual earnings by occupation and level of education, 1987**

Occupation	Total, all levels	Less than high school	High school	1–3 years college	4 years college or more
Total, all occupations	$21,543	$15,249	$18,902	$21,975	$31,029
Executive, administrative, and managerial	30,264	22,306	23,286	27,255	37,252
Professional specialty	30,116	19,177	23,233	27,458	31,311
Technicians and related support	24,489	16,207	21,358	23,830	28,004
Marketing and sales	22,220	13,746	17,654	22,546	32,747
Administrative support occupations, including clerical	17,120	15,535	16,554	17,491	20,823
Service occupations	13,443	10,764	13,093	16,937	21,381
Precision production, craft, and repair	24,856	20,465	25,140	27,042	30,938
Operators, fabricators, and laborers	18,132	15,365	19,303	21,627	22,114
Agriculture, forestry, fishing, and related workers	11,781	10,571	12,730	16,331	17,130

Table 11. **Selected occupational groups ranked by 1990–2005 projected percentage rate of employment growth and levels of educational attainment and median weekly earnings in 1990**

Occupation	1990–2005 rates of employment change	Levels of educational attainment (Percent of occupational employment)				Median weekly earnings
		Less than high school	High school	1–3 years of college	4 or more years of college	
Total, all occupations	20	15	39	22	24	$ 415
Mathematical and computer scientists	73	0	10	24	66	734
Personal service	44	18	52	22	8	252
Health service	44	19	52	23	5	263
Health assessment and treating	43	1	87	34	58	600
Health technologists and technicians	42	2	31	42	25	398
Lawyers and judges	34	0	2	2	96	1,052
Protective service	32	9	42	34	15	468
Food preparation and service	30	36	42	17	5	220
Teachers, except college and university	30	1	6	9	84	522
Health diagnosing	29	1	2	2	96	824
Executive, administrative, and managerial	27	4	27	24	45	604
Engineers	26	1	8	17	74	809
Natural scientists	26	1	4	7	88	661
Sales	24	12	39	25	24	401
Engineering and related technologists and technicians	23	4	36	40	21	509
Supervisors, administrative support	22	4	42	29	24	497
Transportation and material moving	21	26	54	15	4	413
Construction trades	21	25	51	18	6	479
Teachers, college and university	19	1	2	7	90	747
Cleaning and building service	18	40	45	11	3	272
Mechanics and repairers	16	19	54	22	6	476
Mail and message distributing	15	8	50	31	11	514
Computer equipment operators	13	4	47	34	15	374
Secretaries, stenographers, and typists	9	3	53	34	10	342
Handlers, equipment cleaners, helpers, and laborers	8	35	48	14	3	298
Farming, forestry, and fishing	5	37	41	14	8	257
Financial records processing	−4	4	55	29	12	338
Machine operators, assemblers, and inspectors	−9	31	54	12	4	325
Private household workers	−29	50	36	10	4	172

Table 8 shows the amount of projected employment change by major occupational group that is attributable to projected changes in industry employment and projected changes to the occupational structure of industries. Most of the change shown for the occupational groups is due to projected shifts in employment among industries. However, the occupational groups consisting of administrative support workers, including clerical; professional specialty workers; and operators, fabricators, and laborers all have significant employment change due to expected changes in occupational structure.

Replacements and job openings

The discussion thus far has been concerned with one aspect of the projected total demand for workers over the 1990–2005 period—occupational employment growth. Another aspect of demand is the need to replace workers who leave their occupations to enter others, or who retire or leave the labor force for other reasons. Consequently, even occupations with little or no employment growth and those that are projected to decline provide job openings. Of the total number of job openings in 2005, more are expected to result from net replacement needs than from employment growth in the economy.[4] Estimates of net replacement needs for selected occupations are presented in table 9, along with job openings due to growth for the 1990–2005 period. The sum of the two columns is termed total job openings. The ratio of total job openings to 1990 employment for the occupation is called the "opportunity ratio." It represents the relationship of projected job openings to current (1990) employment.

One of the highest opportunity ratios (0.84) is for food preparation and service occupations. Nearly twice as many of the total job openings are expected to come from net replacement

needs as from job openings due to growth for this occupation, despite the projected cumulative employment increase of 30 percent in the food preparation and service occupations. Much of the high net replacement rate arises from occupational transfers of younger workers, especially in fast food establishments.

Another occupation with a high opportunity ratio (0.87) is mathematical and computer scientists, which also is projected to grow rapidly. In contrast to food preparation and service occupations, only a sixth of the total job openings for this occupation come from net replacements. The occupation is characterized by a relatively young work force with strong attachment to the occupation. The low average age means that not many workers will be lost due to death or retirement, and the strong occupational attachment keeps the rate of occupational transfers relatively low.

Other high opportunity ratios are found among protective service occupations (0.73); and technicians, except health, engineering, and scientific (0.74). A final occupational group worth noting is machine operators, assemblers, and inspectors, which has a low opportunity ratio (0.36). Despite a projected decline in employment of 694,000 jobs by 2005 (computed from data in table 2), more than 2.7 million workers will be needed to replace those who are projected to leave the occupation.

Table 12. **Percent distribution of employed persons by years of school completed for women, black, and Hispanic workers, 1990**

Years of school	Total, all workers	Women	Blacks	Hispanics
Total	100.0	100.0	100.0	100.0
Less than high school	15.3	12.9	19.9	41.4
High school	39.3	41.5	43.1	32.9
1-3 years of college	21.6	23.2	22.3	16.0
4 years of college or more	24.0	22.4	14.7	9.8

Implications of the projections

The differential growth of occupations has a variety of implications for the job market through the year 2005. They involve education, earnings, and job opportunities for members of minority groups and young high school dropouts.

Education and occupational earnings. The following questions about the implications of the occupational employment projections on the educational needs of workers and the potential for earnings in various occupations need to be considered. First, do workers in occupations that require higher levels of education have higher median earnings than those in occupations with lower educational requirements? Second, are occupations that require the most education and yield the greatest earnings projected to grow more rapidly than those that require less education and pay less? To shed light on the first question, we can look at the most recently available data on levels of median annual earnings by occupation and level of education. (See table 10.)

Among the major occupational groups, workers at each level of education have higher median earnings than those at the next lower level of education. The differences in earnings between those with 4 years of college or more and those with less education is much greater for some occupational groups than for others. For example, executive, administrative, and managerial workers and sales workers with at least 4 years of college earn significantly more than their counterparts with less education. The earnings differentials for those with at least 4 years of college and those with less education are not nearly as great for professional specialty occupations and technicians and related support workers.

The second question seeks to determine whether occupations that are projected to grow the most rapidly are those that require the most education and have the highest median earnings. The method used to answer this question is to compare current levels of educational attainment and current median weekly earnings by occupation with the projected rates of occupational employment change. These data point to two important conclusions. First, workers in occupations with higher levels of educational attainment generally earn more than workers with lower levels of education. Second, many of the occupations projected to grow the most rapidly between 1990 and 2005 are among those with higher levels of education and earnings.

Table 11 shows selected intermediate occupational groups[5] by level of educational attainment and median weekly earnings, ranked by the 1990–2005 projected rates of employment change. Twelve of the occupational groups are projected to grow faster than average, and of these, three-fourths have above-average median weekly earnings. Many of these groups are professional specialty occupations, which have large proportions of workers with 4 years of college or more and who currently have above-average

Table 13. **Percent change in employment for selected occupations, 1990–2005, and percent of employment composed of women, blacks, and Hispanics, 1990**

Occupation	Percent change, 1990–2005	Percent in 1990 composed of—		
		Women	Blacks	Hispanics
Total, all occupations	20	45	10	8
Executive, administrative, and managerial	27	40	6	4
Professional specialty occupations	32	51	7	3
Engineers	26	9	3	3
Mathematical and computer scientists	73	37	7	3
Natural scientists	26	26	3	4
Health diagnosing occupations	29	18	3	4
Health assessment and treating occupations	43	86	7	3
Teachers, college and university	19	38	5	3
Teachers, except college and university	30	74	9	4
Lawyers and judges	34	21	3	3
Technicians and related support	37	49	9	4
Health technologists and technicians	42	84	14	5
Engineerng and related technologists and technicians	23	20	7	5
Sales occupations	24	49	6	5
Administrative support, including clerical	13	80	11	7
Supervisors, administrative support	22	58	12	7
Computer equipment operators	13	66	13	7
Secretaries, stenographers, and typists	9	98	9	5
Financial records processing	–4	92	6	5
Mail and message distributing	15	45	25	5
Service occupations	29	60	17	11
Private household	–29	60	17	11
Protective service	32	15	17	6
Food preparation and service	30	60	12	13
Health service	44	90	26	6
Cleaning and building service	18	44	22	17
Personal service	44	82	12	7
Precision production, craft, and repair	13	9	8	9
Mechanics and repairers	16	4	8	7
Construction trades	21	2	7	9
Operators, fabricators, and laborers	4	26	15	12
Machine operators, assemblers, and inspectors	–9	40	14	14
Transportation and material moving	21	9	15	9
Handlers, equipment cleaners, helpers, and laborers	8	18	16	13
Farming, forestry, and fishing	5	16	6	14

earnings. These include lawyers and judges; health diagnosing occupations; engineers; mathematical and computer scientists; natural scientists; health assessment and treating occupations; and teachers, except college and university. The only professional specialty occupational group with a large proportion of college educated workers that is projected to grow more slowly than average is college and university teachers.

Other than professional specialty occupations, the only groups with both rapid projected rates of growth and above-average earnings are executive, administrative, and managerial occupations; engineering and related technologists and technicians; and protective service workers. Finally, it should be noted that a few occupational groups that are not projected to grow as rapidly have average or higher median weekly earnings, including supervisors, administrative support; mail and message distributing occupations; mechanics and repairers; and construction trades workers.

Women and minority workers. What do the 1990–2005 projections imply for future job opportunities for women and minority workers? Presently, the fastest growing segments of the labor force—women, blacks, and Hispanics—are disproportionately employed in occupations that are projected to grow more slowly or to decline, or, regardless of growth path, that pay relatively lower wages. Unless these labor force groups are utilized more efficiently, the Nation may face problems in filling the higher skilled, higher paying positions that are expected to grow the fastest in the future.

As table 12 shows, the educational attainment of employed women roughly matches that of the labor force as a whole. Given this, women can be expected to increase their proportions in the higher paying jobs, such as professional specialties, and executive, administrative, and managerial jobs in which they are already significantly represented. Despite their educational attainment, however, women are underrepresented in certain professional occupations (such as engineers, health-diagnosing occupations, and lawyers and judges) and overrepresented in some lower paying occupations (such as administrative support).

Table 12 also show that blacks have lower educational attainment at the college level, and that Hispanics—the fastest-growing labor force group—have below-average attainment at the four measured academic levels. Presently, black workers and Hispanic workers are employed in virtually every occupation, but are more heavily concentrated in occupations projected to decline

or grow more slowly. (See table 13.) This, coupled with their current relatively lower educational attainment—41 percent of Hispanic workers had not finished high school in 1990—may presage trouble for U.S. society unless gains in schooling among minority workers continue, particularly at the post-secondary level. Both groups have high proportions of workers in service occupations that are projected to grow faster than the average over the projections period. However, many of these jobs have below-average earnings.[6]

Young high school dropouts. The last population group to which we turn our attention are young people who do not have a high school diploma. What are the job prospects for workers entering a labor market in which most growing occupations require higher levels of education and training? What opportunities, if any, exist for such employees to move up the job ladder? To shed some light on these questions, we can compare recent occupational distribution patterns of high school dropouts in two age groups (16 to 24 years and 25 to 34 years) with the occupational distribution of workers in the same age groups who have graduated from high school. (See table 14.) These two age groups have been selected to compare the kinds of jobs held by young high school dropouts and those held by young graduates with the jobs held by workers with the same educational status, but who are somewhat older and who have more work experience. Thus, we can infer the extent to which workers with and without a high school diploma are able to improve themselves in labor market terms.

The data show that high school dropouts are at a decided disadvantage in the job market and have fewer opportunities for job advancement than those who obtain a high school education. In 1990, more than half of those who did not complete high school in both of the age groups studied were employed either as operators, fabricators, and laborers (projected to grow slowly) or in service occupations (projected to grow rapidly). Both of these groups currently have below-average median weekly earnings. Very few of the high school dropouts were employed as managers, professionals, or technicians—fewer than 4 percent of the 16- to 24-year-olds and only 6 percent of the 25- to 34-year-olds. Employment opportunities in these three occupational groups also are limited for high school graduates, but their proportions of total employment in both of the age groups are more than twice those for workers who did not earn a diploma. The labor market advantages of finishing high school are clear.

Alternative projections

The discussion of projections of occupational employment through the year 2005 thus far has focused on the moderate alternative of the three sets of projections developed by BLS. This section of the article presents a brief analysis of the differences in employment, at the level of the major occupational group, between the moderate-trend scenario and the low-trend and high-trend projections. Compared to a cumulative 20-percent growth rate for total employment in the moderate projection, the growth rates in the low-

Table 14. **Percent distribution of full-time workers not in school by number of years of school completed and age group, 1990[1]**

Occupation	Completed less than 12 years of school		Completed 12 years of school	
	Age 16–24	Age 25–34	Age 16–24	Age 25–34
Total, all occupations	100.0	100.0	100.0	100.0
Executive, administrative, and managerial	2.0	3.2	4.2	7.8
Professional specialty	1.1	1.0	1.8	2.2
Technicians and related support	.6	.7	2.0	2.9
Marketing and sales	8.6	5.0	12.4	9.5
Administrative support occupations, including clerical	6.4	5.1	20.4	18.0
Service occupations	22.3	17.8	16.1	12.6
Agricultural, forestry, and fishing	8.9	6.6	3.2	2.9
Precision production, craft, and repair	16.7	23.5	14.6	19.8
Operators, fabricators, and laborers	33.4	37.2	25.4	24.3

[1] Excludes students under 25 years old.

Table 15. **Percent distribution of employment by occupation, 1990 and projected 2005 alternatives**

Occupation	1990	2005		
		Low	Moderate	High
Total, all occupations	100.0	100.0	100.0	100.0
Executive, administrative, and managerial occupations	10.2	10.8	10.8	10.8
Professional specialty	12.9	14.2	14.2	14.3
Technicians and related support	3.5	3.9	3.9	3.9
Marketing and sales	11.5	11.9	11.9	11.8
Administrative support occupations, including clerical	17.9	16.8	16.9	16.9
Service occupations	15.7	17.1	16.9	16.8
Agricultural, forestry, and fishing	2.9	2.6	2.5	2.5
Precision production, craft, and repair	11.5	10.8	10.8	10.8
Operators, fabricators, and laborers	14.0	12.0	12.2	12.2

Table 16. **Range of projected employment for detailed occupations under alternative growth scenarios**

[Numbers in thousands]

Occupation	1990 employment	Moderate-trend employment change, 1990–2005	Low- to high-trend employment difference, 2005
All other sales workers	5,204	1,222	732
Salespersons, retail	3,619	887	548
General managers and top executives	3,086	598	461
General office clerks	2,737	670	448
Secretaries, except legal and medical	3,064	248	423
Janitors and cleaners	3,007	555	396
Cashiers	2,633	685	381
Truckdrivers, light and heavy	2,362	617	358
Registered nurses	1,727	767	331
Teachers, secondary school	1,280	437	274

trend and high-trend alternatives are expected to be 12 percent and 26 percent. (See table 2.)

The distribution of total employment by major occupational group varies little among the three sets of projections alternatives for 2005 because of offsetting changes among the detailed occupations within each of the major groups. (See table 15.) Among the detailed occupations, however, significant numerical differences exist between each of the alternatives. In fact, even the direction of projected employment change for an occupation from 1990 to 2005 can be different among the alternatives. For example, the occupation "furnace operators and tenders" is projected to decline in employment in both the low and moderate alternatives, but is projected to expand in the high scenario. The differences in projected occupational employment change among the alternatives are caused only by differences in the projected levels of industry employment, because the same set of occupational staffing patterns by industry is used in all three projections alternatives.

The range of total employment in 2005 from the low-trend alternative to the high-trend alternative is 17.7 million workers. Therefore, the range in projected employment for detailed occupations can be very large, particularly for occupations of large size, as shown in table 16.

THE OCCUPATIONAL PROJECTIONS presented in this article provide information to those interested in labor market issues. They also provide the background for analyses of future employment opportunities described in the BLS publication, *Occupational Outlook Handbook*. Job outlook information in the 1992–93 edition of the *Handbook*, scheduled for release in the spring of 1992, will use the projections presented in each of the articles that make up *Outlook: 1990–2005*. □

Footnotes

[1] The 1990 employment estimates described in this article are derived from the Bureau's industry-occupation employment matrix, which includes data for more than 500 detailed occupations and 250 detailed industries. The main sources of data used in the matrix are Current Employment Statistics (CES) estimates for total wage and salary jobs by industry and Occupational Employment Statistics (OES) data for employment by occupation within detailed industries. Total employment and occupational staffing patterns of wage and salary workers in agriculture, forestry, fishing, hunting, and trapping and in private households are derived from the Current Population Survey (CPS). Economywide data on self-employed and unpaid family workers by occupation also are derived from the CPS. The estimates derived from the CES and OES differ from those obtained from the CPS in a number of important ways. For example, employed persons who hold more than one job are counted more than once in the CES and OES estimates, but not in the CPS data, which exclude the secondary jobs. The concept of employment in this article, therefore, represents the combined estimates, from the different sources cited above, of people who were working in 1990 and the numbers of workers expected to be demanded by employers in 2005.

[2] See Howard N Fullerton, Jr., "Labor force projections: the baby boom moves on," pp. 31–44.

[3] The services industry division in the industry-occupation matrix includes employees in State and local government hospitals and education. In the article on industry employment by Max Carey and James Franklin on pages 45–63, workers in State and local government and hospitals are included in the estimates of government employment.

[4] Net replacements are calculated by comparing the flow of workers over time into and out of various occupations by age group. If an age group has more people entering an occupation than leaving it, the difference is termed net entrants. Similarly, if more people leave than enter, the difference is termed net leavers. The total of net leavers for all the age groups in an occupation is termed job openings due to replacements. Job openings due to growth are added to the replacements in order to more accurately reflect total job openings for an occupation.

[5] Intermediate occupational groups have not been mentioned previously in the article. They are aggregations of detailed occupations below the major occupation group levels.

[6] Asian-American workers, who have relatively high educational attainment, are not dealt with in this analysis because the worker universe is not large enough to yield reliable estimates at the level of occupational detail.

Research summaries

Improved estimates of future occupational replacement needs

Alan Eck

Many people and organizations need information about projected job openings by occupation—openings that result from employment growth or the need to replace workers who leave an occupation. For example, students and vocational counselors need such information to make informed decisions affecting career choices, planners of training programs need it to formulate rational education policies, and personnel specialists need it to focus their recruiting efforts. During the past several decades, information about employment growth has been provided biennially by the BLS employment projections program. While recognizing the importance of replacement needs in estimating job openings, BLS stopped developing estimates of such needs in the early 1980's because of concerns about the quality of the data and the methods of developing data appropriate for different users.

In 1990, BLS began an extensive project to review the methods used to develop estimates of replacement needs in the past and to determine whether improved estimates could be developed. This research summary presents an overview of the results of that project.[1]

Most descriptions of the labor market, such as those based on data from the monthly Current Population Survey (CPS), are developed from information pertaining to a single point in time that provides a snapshot of current conditions. Individuals are classified as employed, unemployed, or not in the labor force. Employed persons are further identified by occupation. For any pair of snapshots, whether taken a month or a year apart, the number of individuals in each category generally does not change very much. The image thereby projected is one of great stability in the labor market. However, this is practically never the case. During any time period, there is a great deal of movement into, out of, and between occupations. Measuring this movement to develop estimates of separations from occupations requires longitudinal data about workers at two points in time, data that are much less common than snapshots of current conditions. The research in the BLS project focused on the development of procedures that, using available data, would provide the best measure of movements of workers out of occupations over time.

The research concluded that two distinct types of estimates of occupational separations should be developed to meet the needs of all users. The first type of estimate, *total separations*, would measure all individuals who leave their occupation. The second, *net separations*, would measure the net movements of experienced workers into and out of occupations. It was found that both measures of separations are best developed using data from the CPS, but through different data elements. Total separations are best measured by identifying the experiences of individuals over a year's time, a finding that reinforces research conducted in the late 1970's and early 1980's. By contrast, net separations are best measured by following age cohorts of workers over a longer period of time, a methodology that results in a new approach to developing net occupational separations.

Concepts and definitions

Over the years, a variety of concepts have been used to calculate estimates of occupational replacement needs and job openings. These different concepts result in significantly different estimates of separations for the same occupation that often have confused users of the information. Accordingly, this section presents a brief summary of those concepts, in an effort to dispel whatever confusion might otherwise occur.[2]

Employment growth. If employment is measured at the beginning and end of a given period and is observed to increase, that increase is a measure of employment growth. A positive net change in employment, employment growth creates opportunities for workers to enter an occupation. It results from increased demand for goods and services in the economy and from changes in the occupational structure of industries and is the source of job openings identified by BLS projections.

Determining employment growth requires only information about employment at two points in time; no information about separations is required. However, employment growth also may be determined by using information about the labor market dynamics of an occupation. For example, employment growth over a given period can be calculated by subtracting the number of persons separating from an occupation from the number entering that occupation.

Total separations. Total separations identify the flow of individuals leaving an occupation, for any reason what-

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