Evaluating the 1995 BLS projections

Projections of the labor force and industry and occupational projections to 1995 were relatively accurate; differences that did occur are identified and analyzed to inform users and to improve future projections

Introduction
Neal H. Rosenthal

Howard N Fullerton, Jr,
Arthur Andreassen,
and
Carolyn M. Veneri

Howard N Fullerton, Jr, is a demographic statistician in the Office of Employment Projections, Bureau of Labor Statistics. Arthur Andreassen and Carolyn M. Veneri are economists in the same office.

The Bureau of Labor Statistics prepares projections of the labor force, industry employment, and occupational employment every other year. Because of the uncertainty inherent in making these projections, the Bureau evaluates the results of past projections each time a target year is reached, to gauge how well the projections tracked against actual change. The evaluations provide users of BLS projections with information to enhance their understanding of the problems faced in developing accurate projections and to assess the manner of using projections in the future. Among the many users of projections are those in the fields of career guidance, education planning, and public policy formulation. In these fields, numerous decisions are made based on differences in projected labor force growth rates by race, age, sex, and Hispanic origin and on comparisons of growth rates among industries and occupations. State employment security agencies incorporate data from BLS projections into the models they use to develop industry and occupational projections for their State. Business officials in the private sector utilize the projections in personnel planning and marketing research. Academic researchers employ the projections as background information to study a wide variety of topics dealing with the labor market. Knowledge of the accuracy of BLS projections affects whether an individual or agency will rely on the projections in the future and, if so, how the projections will subsequently be used.

The Bureau also considers evaluation to be an important stage of its projections program. Through evaluation, the Bureau can identify strengths and weaknesses in procedures used to prepare the projections. Such identification leads to changes in those procedures for use in the development of later projections.

Many causes of inaccuracies in the projections are identified in studies comparing actual with projected change in the labor force, industry employment, and occupational employment. Some of the broad assumptions made in the models used to develop the projections, such as levels of defense expenditures, are very sensitive to political forces and, therefore, subject to great uncertainty over a 10-year period. Other broad assumptions, such as the strength of the world economy, also are subject to considerable variability and are very important to levels of exports and imports that have a great impact on employment. In addition, a multitude of judgments stemming from the analyses conducted by BLS staff in determining specific effects of technological change are subject to significant error. For example, in assessing the impact of word-processing equipment on the employment of typists, it seemed clear in 1984 that technology would have a negative effect. That assessment turned out to be correct, but the projected decreases in the utilization of typists made by BLS analysts in gauging future staffing patterns of industries fell short of actual decreases.

Neal H. Rosenthal is Associate Commissoner, Office of Employment Projections, Bureau of Labor Statistics.

Evaluation measures

The general procedure the Office of Employment Projections uses to evaluate projections is to compare projected with actual data. Such comparisons can be presented in a variety of statistical measures, such as percent change or numerical growth. One of the problems with these measures is that it is difficult to determine the quality of the projections, because there are no established criteria to categorize them as good or bad. For example, if actual data show that employment in an occupation increased by 20 percent, and the Bureau projected a growth rate of, say, 10 percent (or 30 percent or 40 percent, for that matter), it is not clear whether the projected rate is good or bad. Consequently, users must establish their own standards of quality, based on the uses they make of the projections. In general, if their decisions would not differ if the projections were perfect, then the error is not significant. For instance, referring back to the foregoing numbers, if a user would have made the same decisions if the projected level were perfect (20 percent) as he or she in fact made with the 30-percent projection of growth, then the 30-percent projection may not be accurate, but it can be assumed to be accurate enough for that user's needs.

Because standards are not available, several measures that compare projected and actual employment are presented in the evaluations of labor force, industry employment, and occupational employment projections that follow. These include a simple comparison of the direction of change to see whether employment in the occupations that were projected to grow or decline actually did change in the direction projected. Numerical change also is presented, but the use of this measure to determine general accuracy can distort an evaluation, because the quality of projections having the same numerical error are different for occupations having different employment levels in the base year of the projection. For this reason, the measure given the most attention in the evaluations is the absolute percent error—the numerical error (positive or negative) divided by actual employment in the target year of the projection. Another measure used to evaluate the projections is a comparison of the distribution of the projected change with the distribution of the actual change. This measure is important for identifying whether any particular projection errors are related to judgment errors tied to a specific industry or occupation or to general projections of total employment.

The projection period used by the Bureau typically has ranged from 10 to 15 years, with the target year always ending in a zero or a five. The year 1995 was the target year of two sets of projections, 1982–95 and 1984–95. Only the 1984–95 projections are evaluated in this article, because the classification of occupations that was used for the 1982–95 projections was based on a system significantly different from the one used to tabulate current 1995 data. The Bureau's 1984–95 projections included three alternative scenarios, labeled high, moderate, and low growth. Only the moderate-growth projections are evaluated here, as they were the chief ones used by the Bureau, the alternatives having been used only sparingly, not just by the Bureau, but by others as well. In the 1996–2006 projections currently being developed (to be published in the November 1997 issue of the *Review*), only a moderate-growth scenario is being prepared.

The reader should note that differences in projected change and actual change are subject to measurement error because of both normal response errors and statistical errors associated with the surveys used to measure current employment in the base year, as well as the target year, of the projections. Some of these errors stem from changes in the surveys used to compile the data over time. For example, a modification was made to the Current Population Survey (CPS) in 1994 that significantly changed the reporting of labor force participation for older workers. This in turn had a measurable, significant impact on the quality of labor force participation rate projections for these workers. Accordingly, some projection errors identified in the evaluations may well reflect the effect of data collection changes in the CPS.

The labor force, industry employment, and occupational employment projections are highly interrelated, as the models used to develop each of these segments are dependent on each other. For example, the labor force projections have a great bearing on total employment projections, and industry employment projections influence occupational projections, because occupations tend to be concentrated by industry. The closeness of these relationships is shown clearly in the evaluations.

In general, the evaluations demonstrate that the BLS projections captured major trends in the labor force, in industry employment, and in occupational employment. The discussions that follow, however, each written by a different author, tend to focus on the *inaccuracies* of the projections. Odd though this may seem, it enables users to get a better understanding of the factors that are most likely to lead to projection errors. □

Evaluating the 1995 labor force projections

More accurate projections of population, shorter projection periods, and reduced labor force growth made BLS labor force projections to 1995 marginally better than those to 1990

Howard N Fullerton, Jr.

For the 1984–95 period, the Bureau of Labor Statistics correctly identified the most significant labor force trends. In terms of the direction of change in labor force participation rates, the most significant errors were in the cases of very young workers and older workers. These errors, however, had a small impact on the projection error for the total labor force because of the relatively small number of workers in the two age groups.

Levels

The projection of the total civilian labor force, 129.2 million, was 3.1 million lower than the actual 1995 labor force of 132.3 million, an error of 2.8 percent.[1] (See table 1.) The Bureau correctly projected the slowing rate of labor force growth for the 1984–95 period, compared with the previous 11 years. The 27-percent increase from 1973 to 1984 was projected to slow to 13.8 percent from 1984 to 1995, but the actual slowing was somewhat less, as the actual growth was 16.5 percent. That the projected rate of growth was lower than the actual rate reflects offsetting errors in the population projections prepared by the Bureau of the Census and the labor force participation rates for specific age, sex, and racial groups that were prepared by the BLS.

The labor force for both men and women was projected too low, with two-thirds of the error accounted for by men.

White men over the age of 60 were underprojected by more than 1 million, or nearly half of the 2.1 million error for men, although they accounted for less than 6 percent of the labor force in 1995. Black and other men were underprojected at every age group, except for those 45 to 49 years. Young men from 20 to 24 also were underprojected, by 549,000, roughly 26 percent of the error; they were only 10.3 percent of the labor force in 1995. The projections for black and other women were highly accurate, except for those older than 70 and those under 24 years of age. White women older than 45 were significantly underprojected, in contrast to white women 20 to 39 years, who were overprojected.

The projection error was 1.9 percent for whites and 8.4 percent for blacks and others. The latter group was underprojected by 1.3 million, roughly 40 percent of the total error, although it accounted for only 15 percent of the labor force in 1995. For these workers, 22 of the 26 age and sex groups for which projections were developed were underprojected. Population underprojections, probably chiefly of Asians, who make up a large part of the "other" group, are largely responsible for this error. Except for the underprojection of older and younger workers, the individual age and sex group projections for whites were more evenly split between under- and over-projections.

Despite the relatively large projection errors for some groups, the projected distribution of the labor force in 1995 by age, sex, and race was very close to the actual distribution. As might be expected from the foregoing discussion, the projected share for blacks (14.8 percent) was lower than their actual share (15.4 percent), but nevertheless fairly accurate when viewed by separate age and sex groups.

Labor force participation

The Bureau's major input to the 1995 labor force projections was the projection of labor force participation rates for specific age, sex, and racial groups, which rates were then applied to population projections developed by the Bureau of the Census. The accuracy of the overall projection of labor force participation, 66.6 percent, reflects several offsetting errors for age, sex, and racial groups. Definite patterns are revealed by the errors for the age groups 16 to 24 (youth), 25 to 59 (prime-age workers), and 60 and older (older workers) for men and women in each of the two racial groups for which projections were evaluated, namely, "whites" and "blacks and others."

The direction of change was projected correctly for all age, sex, and racial subgroups in the prime-age group, except 25-to-29-year-old white men and 40-to-44-year-old black men. Participation rates for both of these were projected to remain unchanged, and both declined. The rates for all other age subgroups of prime-age men, in both racial groups, were projected to decline, and all did. In almost all of the groups, however, the projected rate of decline was less than what actually occurred. The largest error was the result of greater-than-projected declines in the labor force participation of black and other males 35 to 49 years of age. (See table 2.)

For prime-age women, participation rates for all age subgroups, both for whites and for blacks and others, were correctly projected to increase. For

Table 1. Civilian labor force, 1984 actual and 1995 projected and actual

[Numbers in thousands]

Labor force group	1984	1995 Projected	1995 Actual	Percent change, 1984–95 Projected	Percent change, 1984–95 Actual	Numerical error (projected minus actual)	Percent error	Share of labor force, 1995 Projected	Share of labor force, 1995 Actual
Total	113,544	129,168	132,304	13.8	16.5	–3,136	–2.8	100.0	100.0
Men, 16 and older	63,835	69,282	71,360	8.5	11.8	–2,078	–3.3	53.6	53.9
Women, 16 and older	49,709	59,886	60,944	20.5	22.6	–1,058	–2.1	46.4	46.1
White	98,492	110,086	111,950	11.8	13.7	–1,864	–1.9	85.2	84.6
Men	56,062	59,894	61,146	6.8	9.1	–1,252	–2.2	46.4	46.2
16 and 17 years	1,420	1,374	1,429	–3.2	.7	–55	–3.9	1.1	1.1
18 and 19 years	2,189	1,904	1,998	–13.0	–8.7	–94	–4.3	1.5	1.5
20 to 24 years	7,370	5,773	6,096	–21.7	–17.3	–323	–4.4	4.5	4.6
25 to 29 years	8,315	7,074	7,224	–14.9	–13.1	–150	–1.8	5.5	5.5
30 to 34 years	7,721	8,390	8,445	8.7	9.4	–55	–.7	6.5	6.4
35 to 39 years	6,842	8,635	8,587	26.2	25.5	48	.7	6.7	6.5
40 to 44 years	5,506	7,880	7,827	43.1	42.2	53	1.0	6.1	5.9
45 to 49 years	4,518	6,920	6,740	53.2	49.2	180	4.0	5.4	5.1
50 to 54 years	4,165	5,163	4,991	24.0	19.8	172	4.1	4.0	3.8
55 to 59 years	3,880	3,605	3,589	–7.1	–7.5	16	.4	2.8	2.7
60 to 64 years	2,530	1,873	2,220	–26.0	–12.3	–347	–13.7	1.5	1.7
65 to 69 years	900	647	1,074	–28.1	19.4	–427	–47.5	.5	.8
70 years and older	705	656	926	–7.0	31.3	–270	–38.3	.5	.7
Women	42,431	50,192	50,804	18.3	19.7	–612	–1.4	38.9	38.4
16 and 17 years	1,300	1,201	1,320	–7.6	1.5	–119	–9.2	.9	1.0
18 and 19 years	2,043	1,668	1,798	–18.4	–12.0	–130	–6.4	1.3	1.4
20 to 24 years	6,363	5,306	5,170	–16.6	–18.7	136	2.1	4.1	3.9
25 to 29 years	6,297	6,136	5,890	–2.6	–6.5	246	3.9	4.8	4.5
30 to 34 years	5,624	7,166	6,766	27.4	20.3	400	7.1	5.5	5.1
35 to 39 years	5,101	7,439	7,024	45.8	37.7	415	8.1	5.8	5.3
40 to 44 years	4,139	6,679	6,674	61.4	61.2	5	.1	5.2	5.0
45 to 49 years	3,302	5,646	5,856	71.0	77.3	–210	–6.4	4.4	4.4
50 to 54 years	2,915	4,024	4,218	38.0	44.7	–194	–6.6	3.1	3.2
55 to 59 years	2,593	2,525	2,908	–2.6	12.2	–383	–14.8	2.0	2.2
60 to 64 years	1,699	1,460	1,714	–14.1	.9	–254	–14.9	1.1	1.3
65 to 69 years	631	563	837	–10.8	32.6	–274	–43.4	.4	.6
70 years and older	423	379	629	–10.4	48.8	–250	–59.2	.3	.5
Black and other	15,082	19,082	20,354	26.5	35.0	–1,272	–8.4	14.8	15.4
Men	7,803	9,388	10,215	20.3	30.9	–827	–10.6	7.3	7.7
16 and 17 years	171	171	239	.0	39.8	–68	–39.8	.1	.2
18 and 19 years	353	301	370	–14.7	4.8	–69	–19.5	.2	.3
20 to 24 years	1,224	1,017	1,243	–16.9	1.5	–226	–18.4	.8	.9
25 to 29 years	1,285	1,265	1,428	–1.6	11.1	–163	–12.7	1.0	1.1
30 to 34 years	1,168	1,518	1,573	30.0	34.6	–55	–4.7	1.2	1.2
35 to 39 years	955	1,468	1,497	53.7	56.8	–29	–3.1	1.1	1.1
40 to 44 years	734	1,249	1,277	70.2	74.0	–28	–3.9	1.0	1.0
45 to 49 years	596	975	932	63.6	56.4	43	7.1	.8	.7
50 to 54 years	497	663	759	33.4	52.6	–96	–19.2	.5	.6
55 to 59 years	386	412	427	6.7	10.6	–15	–3.9	.3	.3
60 to 64 years	253	229	268	–9.5	6.0	–39	–15.5	.2	.2
65 to 69 years	83	71	124	–14.5	49.2	–53	–63.7	.1	.1
70 years and older	98	49	77	–50.0	–21.2	–28	–28.8	.0	.1
Women	7,279	9,694	10,140	33.2	39.3	–446	–6.1	7.5	7.7
16 and 17 years	158	167	237	5.7	49.8	–70	–44.1	.1	.2
18 and 19 years	308	271	374	–12.0	21.4	–103	–33.4	.2	.3
20 to 24 years	1,088	1,010	1,179	–7.2	8.4	–169	–15.6	.8	.9
25 to 29 years	1,198	1,304	1,369	8.8	14.3	–65	–5.5	1.0	1.0
30 to 34 years	1,115	1,562	1,502	40.1	34.7	60	5.4	1.2	1.1
35 to 39 years	932	1,513	1,545	62.3	65.8	–32	–3.4	1.2	1.2
40 to 44 years	724	1,312	1,320	81.2	82.3	–8	–1.1	1.0	1.0
45 to 49 years	558	1,044	997	87.1	78.7	47	8.4	.8	.8
50 to 54 years	455	694	731	52.5	60.6	–37	–8.1	.5	.6
55 to 59 years	382	449	485	17.5	26.8	–36	–9.3	.3	.4
60 to 64 years	237	261	249	10.1	5.0	12	5.1	.2	.2
65 to 69 years	74	75	82	1.4	10.5	–7	–9.2	.1	.1
70 years and older	50	32	70	–36.0	40.8	–38	–76.8	.0	.1

NOTE: Dash indicates data not available.

Table 2. Civilian labor force participation rate, 1984 actual and 1995 projected

[Numbers in thousands]

Labor force group	1984	1995 Projected	1995 Actual	Percent change, 1984–95 Projected	Percent change, 1984–95 Actual	Numerical error (projected minus actual)	Percent error
Total	64.4	66.6	66.6	2.2	2.2	0.0	0.0
Men, 16 and older	76.4	75.3	75.0	−1.1	−1.4	.3	.4
Women, 16 and older	53.6	58.9	58.9	5.3	5.4	.0	−.1
White	64.6	66.8	67.1	2.2	2.4	−.3	−.4
Men	77.1	75.8	75.7	−1.3	−1.4	.1	.1
16 and 17 years	47.0	49.3	47.7	2.3	.7	1.6	3.3
18 and 19 years	70.7	75.6	69.9	4.9	−.9	5.7	8.2
20 to 24 years	86.5	89.5	85.1	3.0	−1.4	4.4	5.2
25 to 29 years	94.8	94.9	93.6	.1	−1.2	1.3	1.4
30 to 34 years	96.0	95.6	94.5	−.4	−1.5	1.1	1.1
35 to 39 years	96.3	95.3	93.7	−1.0	−2.6	1.6	1.7
40 to 44 years	95.7	94.7	93.2	−1.0	−2.6	1.5	1.6
45 to 49 years	94.1	92.7	91.8	−1.4	−2.4	.9	1.0
50 to 54 years	89.9	89.3	87.8	−.6	−2.0	1.5	1.7
55 to 59 years	81.6	78.7	78.6	−2.9	−3.0	.1	.1
60 to 64 years	56.7	46.3	54.3	−10.4	−2.4	−8.0	−14.8
65 to 69 years	24.8	16.8	27.4	−8.0	2.7	−10.6	−38.7
70 years and older ..	11.5	8.3	11.7	−3.2	.2	−3.4	−29.1
Women	53.3	58.4	59.0	5.1	5.7	−.6	−.9
16 and 17 years	44.8	44.9	46.7	.1	1.8	−1.8	−3.8
18 and 19 years	65.2	64.8	64.5	−.4	−.6	.3	.4
20 to 24 years	72.5	79.0	72.3	6.5	−.1	6.7	9.3
25 to 29 years	70.8	81.7	75.9	10.9	5.1	5.8	7.7
30 to 34 years	68.8	81.4	75.7	12.6	6.9	5.7	7.6
35 to 39 years	69.5	81.2	76.5	11.7	6.9	4.7	6.2
40 to 44 years	69.7	79.3	78.8	9.6	9.1	.5	.6
45 to 49 years	66.1	74.0	78.2	7.9	12.1	−4.2	−5.4
50 to 54 years	59.3	66.7	71.5	7.4	12.2	−4.8	−6.7
55 to 59 years	49.4	51.3	60.0	1.9	10.6	−8.7	−14.5
60 to 64 years	32.9	32.2	38.2	−.7	5.3	−6.0	−15.7
65 to 69 years	14.1	12.1	18.1	−2.0	4.0	−6.0	−33.1
70 years and older ..	4.4	3.1	5.4	−1.3	1.0	−2.3	−42.4
Black and other	62.8	65.9	64.3	3.1	1.5	1.6	2.5
Men	71.7	71.7	70.7	.0	−1.0	1.0	1.4
16 and 17 years	26.9	27.7	29.9	.8	3.0	−2.2	−7.4
18 and 19 years	55.3	54.5	51.8	−.8	−3.5	2.7	5.2
20 to 24 years	77.2	76.6	74.3	−.6	−2.8	2.3	3.1
25 to 29 years	87.1	84.2	86.9	−2.9	−.1	−2.7	−3.1
30 to 34 years	89.6	87.2	88.2	−2.4	−1.4	−1.0	−1.1
35 to 39 years	90.8	89.5	85.0	−1.3	−5.8	4.5	5.3
40 to 44 years	90.3	90.3	86.8	.0	−3.5	3.5	4.0
45 to 49 years	87.3	87.3	82.5	.0	−4.8	4.8	5.8
50 to 54 years	82.0	81.7	79.6	−.3	−2.4	2.1	2.6
55 to 59 years	68.7	64.4	66.4	−4.3	−2.3	−2.0	−3.0
60 to 64 years	50.0	44.8	47.9	−5.2	−2.1	−3.1	−6.4
65 to 69 years	22.7	16.5	26.0	−6.2	3.3	−9.5	−36.5
70 years and older ..	15.0	6.0	9.2	−8.9	−5.8	−3.2	−34.7
Women	55.3	61.1	58.9	5.8	3.5	2.2	3.8
16 and 17 years	24.6	27.0	30.1	2.4	5.5	−3.1	−10.4
18 and 19 years	45.8	45.5	50.2	−.3	4.4	−4.7	−9.4
20 to 24 years	60.5	64.5	62.7	4.0	2.2	1.8	2.8
25 to 29 years	68.4	76.5	70.7	8.1	2.3	5.8	8.2
30 to 34 years	70.6	81.5	72.2	10.9	1.6	9.3	12.9
35 to 39 years	74.0	81.9	74.7	7.9	.7	7.2	9.7
40 to 44 years	72.2	80.9	76.2	8.7	4.1	4.7	6.1
45 to 49 years	67.3	78.0	73.5	10.7	6.2	4.5	6.1
50 to 54 years	60.0	69.1	65.5	9.1	5.5	3.6	5.5
55 to 59 years	53.0	54.7	59.1	1.7	6.1	−4.4	−7.4
60 to 64 years	37.4	36.8	34.3	−.6	−3.1	2.5	7.2
65 to 69 years	14.8	11.6	12.3	−3.2	−2.5	−.7	−5.3
70 years and older ..	5.0	2.2	5.4	−2.8	.4	−3.2	−59.6

NOTE: Dash indicates data not available.

white women, the projections were too high for those aged 25 to 44 and too low for those 45 to 59. For black and other women, the projected rates for all the prime-age groups were too high, except those 55 to 59.

For youths 16 to 17, participation rates for all sex and racial groups were correctly projected to increase. For age groups 18 to 19 and 20 to 24, the projected direction of change was not the same for every sex and racial group, and the actual direction of change was not consistent for each age group. The patterns of labor force change for these groups are very difficult to discern and, consequently, difficult to project. Several large errors for young workers can be seen in table 2 for specific age, sex, and racial groups.

The projections of labor force participation rates for older workers generally had the largest percent errors, in part because the rates for these workers are relatively small, and small percentage-point errors result in a large percent error. It is also apparent that some of the observed error is due to the redesign of the Current Population Survey (CPS) in 1994, which resulted in a greater proportion of older persons being enumerated as labor force participants. Based on trends at the time the projections were developed, participation rates for all age groups over 60 years were projected to decline. In general, the direction of change for those 60 to 64 years of age was correctly projected in all sex and racial groups, except white women. Most of the other age, sex, and racial groups, however, showed increasing participation (see table 2), but some groups may have shown an increase only because of the CPS redesign.

Population

The Bureau of the Census underprojected the civilian noninstitutional population by 4.8 million. (See table 3.) The percent error was large for both black and other men and black and other women. These two groups represented only 7.3 percent

Table 3. Civilian noninstitutional population, 1984 actual and 1995 projected and actual

[Numbers in thousands]

Labor force group	1984	1995		Percent change, 1984–95		Numerical error (projected minus actual)	Percent error	Share of labor force, 1995	
		Projected	Actual	Projected	Actual			Projected	Actual
Total	176,383	193,817	198,584	9.9	12.6	−4,767	−2.7	100.0	100.0
Men, 16 and older	83,605	92,065	95,178	10.1	13.8	−3,113	−3.7	47.5	47.9
Women, 16 and older	92,778	101,752	103,406	9.7	11.5	−1,654	−1.8	52.5	52.1
White	152,347	164,860	166,914	8.2	9.6	−2,054	−1.3	85.1	84.1
Men	72,723	78,975	80,733	8.6	11.0	−1,758	−2.4	40.7	40.7
16 and 17 years	3,019	2,787	2,995	−7.7	−.8	−208	−6.9	1.4	1.5
18 and 19 years	3,094	2,519	2,859	−18.6	−7.6	−340	−11.0	1.3	1.4
20 to 24 years	8,522	6,450	7,163	−24.3	−15.9	−713	−8.4	3.3	3.6
25 to 29 years	8,775	7,454	7,721	−15.1	−12.0	−267	−3.0	3.8	3.9
30 to 34 years	8,041	8,776	8,932	9.1	11.1	−156	−1.9	4.5	4.5
35 to 39 years	7,103	9,061	9,167	27.6	29.1	−106	−1.5	4.7	4.6
40 to 44 years	5,751	8,321	8,400	44.7	46.1	−79	−1.4	4.3	4.2
45 to 49 years	4,800	7,465	7,345	55.5	53.0	120	2.5	3.9	3.7
50 to 54 years	4,635	5,782	5,683	24.7	22.6	99	2.1	3.0	2.9
55 to 59 years	4,756	4,581	4,565	−3.7	−4.0	16	.3	2.4	2.3
60 to 64 years	4,461	4,042	4,087	−9.4	−8.4	−45	−1.0	2.1	2.1
65 to 69 years	3,635	3,853	3,919	6.0	7.8	−66	−1.8	2.0	2.0
70 years and older	6,133	7,884	7,896	28.6	28.7	−12	−.2	4.1	4.0
Women	79,624	85,885	86,181	7.9	8.2	−296	−.4	44.3	43.4
16 and 17 years	2,899	2,675	2,827	−7.7	−2.5	−152	−5.2	1.4	1.4
18 and 19 years	3,135	2,574	2,787	−17.9	−11.1	−213	−6.8	1.3	1.4
20 to 24 years	8,782	6,717	7,150	−23.5	−18.6	−433	−4.9	3.5	3.6
25 to 29 years	8,897	7,511	7,761	−15.6	−12.8	−250	−2.8	3.9	3.9
30 to 34 years	8,176	8,804	8,941	7.7	9.4	−137	−1.7	4.5	4.5
35 to 39 years	7,335	9,161	9,186	24.9	25.2	−25	−.3	4.7	4.6
40 to 44 years	5,936	8,422	8,468	41.9	42.7	−46	−.8	4.3	4.3
45 to 49 years	4,998	7,630	7,489	52.7	49.8	141	2.8	3.9	3.8
50 to 54 years	4,916	6,033	5,901	22.7	20.0	132	2.7	3.1	3.0
55 to 59 years	5,248	4,923	4,845	−6.2	−7.7	78	1.5	2.5	2.4
60 to 64 years	5,164	4,533	4,488	−12.2	−13.1	45	.9	2.3	2.3
65 to 69 years	4,475	4,653	4,631	4.0	3.5	22	.5	2.4	2.3
70 years and older	9,663	12,249	11,707	26.8	21.2	542	5.6	6.3	5.9
Black and other	24,035	28,957	31,670	20.5	31.8	−2,713	−11.3	14.9	15.9
Men	10,882	13,090	14,445	20.3	32.7	−1,355	−12.5	6.8	7.3
16 and 17 years	636	618	799	−2.8	25.7	−181	−28.5	.3	.4
18 and 19 years	638	552	714	−13.5	11.9	−162	−25.4	.3	.4
20 to 24 years	1,586	1,328	1,672	−16.3	5.4	−344	−21.7	.7	.8
25 to 29 years	1,476	1,502	1,643	1.8	11.3	−141	−9.6	.8	.8
30 to 34 years	1,304	1,741	1,783	33.5	36.7	−42	−3.2	.9	.9
35 to 39 years	1,052	1,640	1,761	55.9	67.4	−121	−11.5	.8	.9
40 to 44 years	813	1,383	1,472	70.1	81.0	−89	−10.9	.7	.7
45 to 49 years	683	1,117	1,130	63.5	65.5	−13	−1.9	.6	.6
50 to 54 years	606	812	953	34.0	57.2	−141	−23.3	.4	.5
55 to 59 years	562	640	643	13.9	14.4	−3	−.5	.3	.3
60 to 64 years	506	511	560	1.0	10.7	−49	−9.7	.3	.3
65 to 69 years	365	431	476	18.1	30.5	−45	−12.4	.2	.2
70 years and older	655	815	839	24.4	28.1	−24	−3.6	.4	.4
Women	13,153	15,867	17,225	20.6	31.0	−1,358	−10.3	8.2	8.7
16 and 17 years	642	618	786	−3.7	22.4	−168	−26.2	.3	.4
18 and 19 years	672	596	744	−11.3	10.7	−148	−22.0	.3	.4
20 to 24 years	1,798	1,566	1,880	−12.9	4.6	−314	−17.5	.8	.9
25 to 29 years	1,751	1,704	1,937	−2.7	10.6	−233	−13.3	.9	1.0
30 to 34 years	1,579	1,916	2,080	21.3	31.8	−164	−10.4	1.0	1.0
35 to 39 years	1,259	1,847	2,069	46.7	64.3	−222	−17.6	1.0	1.0
40 to 44 years	1,003	1,622	1,731	61.7	72.6	−109	−10.9	.8	.9
45 to 49 years	829	1,339	1,356	61.5	63.6	−17	−2.1	.7	.7
50 to 54 years	758	1,005	1,116	32.6	47.2	−111	−14.6	.5	.6
55 to 59 years	721	821	820	13.9	13.8	1	.1	.4	.4
60 to 64 years	634	709	725	11.8	14.4	−16	−2.6	.4	.4
65 to 69 years	501	646	667	28.9	33.2	−21	−4.3	.3	.3
70 years and older	1,006	1,478	1,313	46.9	30.5	165	16.4	.8	.7

and 8.7 percent, respectively, of the population in 1995, but each accounted for more than 28 percent of the projection error. Their population was underprojected largely because of assumptions about undocumented immigrants. The Bureau of the Census has revised its methodology for projecting the population of undocumented immigrants since it issued projections for the 1984–95 labor force, and, as a result, the magnitude of the error for this difficult-to-project group has been significantly reduced.

The population projection error actu-

ally offset errors in labor force participation projections. If the projected 1995 labor force participation rates for each age, sex, and racial group were applied to the actual 1995 population, the result would have increased the labor force by 6.9 million, and the projection would have been 3.8 million too high. Although some of the age, sex, and racial group labor force participation rates were projected too low, and some of the population groups too high, the net effect was that labor force participation rate projections were too high and popu-

lation projections too low, just about off-setting each other.　　　　□

Footnote

[1] This section focuses on the 1995 projections as part of the Bureau's series of 1984–95 projections. In the previous series of projections, covering the 1982–95 period, the projected labor force of 131.4 million was more accurate, with the error being 900,000, or 0.7 percent. For a review of all six BLS labor force projections to 1995, see Howard N Fullerton, "Evaluating the 1995 BLS Labor Force Projections," *1997 Proceedings of the Section on Government Statistics* ((Alexandria, VA, American Statistical Association, forthcoming).

Evaluating the 1995 industry employment projections

The 1995 BLS projections of industry employment foretold the trend of almost all major industry groupings, as the economy hewed closely to the path projected for it

Arthur Andreassen

BLS industry employment projections correctly described most broad industry trends over the 1984–95 period. Most of the major industry sectors projected to have faster-than-average growth did so, and 2 of the 3 major sectors projected to decline did lose employment from 1984 to 1995. Services and retail trade were projected to account for 65 percent of the net change in employment, which was very close to the actual 72 percent they attained. Downsizing, which has resulted in the contracting out of many operations, especially in manufacturing industries, is one of many factors that have led to a growth in services faster than that projected.

Major industry sectors

Total wage and salary employment was underprojected by 6.6 million, reflecting chiefly the 3.1 million underprojection of the labor force, but also the unforeseen faster growth of wage and salary employment, compared with that of the labor force. The faster growth stemmed from an unexpected increase in dual jobholders over the projection period. Despite the large numerical underprojection of total employment, the projected 1995 distribution of employment by major industrial sector closely matched the actual distribution. Indeed, the shares of total employment for all but two sectors, agriculture and

wholesale trade, were projected to change in the correct direction. Agriculture's share was projected to decline, but it maintained its small 1.7 percent of employment. This was because, although agricultural *production* declined as projected, a rapid growth in agricultural *services*, stemming largely from lawn care services, offset that decline. Wholesale trade's share was projected to increase from 5.7 percent to 5.9 percent, but it actually dropped to 5.3 percent. Wholesale trade was the only sector whose employment growth rate was incorrectly projected to be faster than total employment. The industry grew more slowly than projected because manufacturing, an intensive user of wholesale trade distribution services, grew more slowly than projected. (See table 1.)

Manufacturing's share of employment was correctly projected to decline; however, instead of dropping from 20 percent to 18.4 percent, it fell even lower, to 15.5 percent. These projections were prepared in 1984, just as the economy was emerging from the deeper of two recessions in the 1980s, and it was assumed that manufacturing would recover from its losses, as in the past, but not reach its 1979 peak. But this did not occur. The overprojection was concentrated in defense-related industries in durable goods manufacturing. Nondu-

| Table 1. | Wage and salary employment, by major industry group, 1984 actual and 1995 projected and actual |

[Numbers in thousands]

| Industry | 1984 | 1995 | | | | Percent change, 1984–95 | | Numerical error, 1995 | Percent error, 1995 | Share of total growth, 1984–95 | |
| | | Projected | | Actual | | | | | | | |
		Level	Share (percent)	Level	Share (percent)	Projected	Actual			Projected	Actual
Total, all industries[1]	96,843	112,267	100.0	118,833	100.0	15.9	22.7	−6,566	−5.5	100.0	100.0
Agriculture, forestry, and fisheries	1,668	1,401	1.2	1,976	1.7	−16.0	18.4	−575	−29.1	−1.7	1.4
Mining	620	601	.5	418	.4	−3.1	−32.6	183	43.8	−.1	−.9
Construction	4,726	5,225	4.7	5,407	4.5	10.6	14.4	−182	−3.4	3.2	3.1
Manufacturing	19,369	20,683	18.4	18,405	15.5	6.8	−5.0	2,278	12.4	8.5	−4.4
Durables	11,476	12,986	11.6	10,596	8.9	13.2	−7.7	2,390	22.6	9.8	−4.0
Nondurables	7,894	7,697	6.9	7,809	6.6	−2.5	−1.1	−112	−1.4	−1.3	−.4
Transportation, communications, and utilities	5,232	6,031	5.4	6,280	5.3	15.3	20.0	−249	−4.0	5.2	4.8
Wholesale trade	5,568	6,578	5.9	6,324	5.3	18.1	13.6	254	4.0	6.5	3.4
Retail trade, including eating and drinking places	16,512	19,549	17.4	20,840	17.5	18.4	26.2	−1,291	−6.2	19.7	19.7
Finance, insurance, and real estate	5,683	6,740	6.0	6,949	5.8	18.6	22.3	−209	−3.0	6.9	5.8
Services	21,517	28,468	25.4	33,042	27.8	32.3	53.6	−4,574	−13.8	45.1	52.4
Business and professional services, except medical	8,011	11,728	10.4	13,479	11.3	46.4	68.2	−1,751	−13.0	24.1	24.9
Other services	13,506	16,740	14.9	19,564	16.5	23.9	44.9	−2,824	−14.4	21.0	27.5
Government	15,947	16,991	15.1	19,192	16.2	6.5	20.4	−2,201	−11.5	6.8	14.8

[1] Employment data for wage and salary employment are from the BLS Current Employment Statistics (payroll) survey, which counts jobs. Agriculture and private household data are from the Current Population Survey (household survey), which counts workers.

rable-goods-manufacturing industries were correctly projected to decline, not only as a share of total employment, but also in absolute levels. Employment in mining was correctly projected to decline as well, but the actual decline was much steeper than the projection. Employment in construction in 1995 was very close to the projected level, but construction's share of employment was overprojected.

Employment in services was correctly projected to increase faster than employment in all other sectors, although the actual rate was underprojected. Services accounted for 70 percent of the underprojection in total employment. Government employment was correctly projected to decline as a share of total employment, but the decline was much less than projected. The finance, insurance, and real estate sector and the transportation, communications, and utilities sector had relatively small projection errors.

Gross domestic product

Changes made since 1984 to the definition of real demand and to how it is calculated make it difficult to compare the dollar values of actual and projected gross domestic product (GDP). The evaluation that follows, therefore, is largely based on relative values and actual and projected annual average percent change. Total GDP was projected to grow at an annual average of 2.8 percent, but actual growth was much slower, 2.5 percent. Higher-than-projected employment levels were offset by a slower-than-projected growth in output per worker hour. (See table 2.)

Personal consumption expenditure is the largest and most stable of the major demand components of GDP. The projected annual growth rate of 2.9 percent for total personal consumption expenditure was very close to the actual rate, 2.7 percent. Here, an underprojection for durable goods consumption was off-

set by an overprojection for services consumption. The growth rate of gross domestic investment, the most variable of the major demand components of GDP, was overprojected. By contrast, the projection of producer's durable equipment was too low, as purchases of computer and communications equipment by businesses were much greater than projected. However, this was offset by the projection of nonresidential structures and residential structures, which was much too high. The growth of construction was spurred by the tax-encouraged building in the middle 1980s, but slowed significantly in later years because of legislation that affected the tax benefits of this investment.

Foreign trade, in both its import and export components, was projected to grow faster than the other major components of GDP, but it grew even faster than projected. The trade-weighted value of the dollar reached a post-World War II low in 1995, which helped ex-

port growth. Import growth from 1984 to 1995 reflected the generally healthy domestic economy during most of the period, as well as the unexpected low price of oil. Some of the components of government demand were significantly overprojected and others significantly underprojected. Changes in the international political situation resulted in a reversal of the defense buildup that started in the late 1970s. Consequently, national defense expenditures, which were projected to increase significantly, actually declined. In contrast, Federal nondefense expenditures rose faster than projected, as projected cutbacks did not occur. State and local government purchases were higher than projected, spurred by increases in spending for health and education.

Detailed industries

The BLS evaluation covers wage and salary workers in 117 industries or industry groups that sum to total employment.[1] Average errors have little analytical value, because some industry sectors, such as manufacturing, have large numbers of detailed industries, while other sectors, such as construction and wholesale trade, have no industry detail, and retail trade is divided into only two detailed industries. The projected direction of change was correct for 72 (62 percent) of the industries; 28 that were projected to increase and 44 to decline did so. Projected declines in 12 industries and increases in 33 were in the wrong direction.

Manufacturing industries are overrepresented in the evaluation, accounting for 75 industries, 64 percent of the total number evaluated, although they made up only 15 percent of employment in 1995. Durable goods account for 44 manufacturing industries, of which 30 declined over the 1994–95 period, only 10 of which were projected to do so. Among the most significant errors in the projections for manufacturing industries were those related to the overprojection of defense expenditures, including ordnance (119 percent), aerospace (60 percent), shipbuilding (35 percent), and communications and scientific equipment (58 percent). An unforeseen surge in imports of computers resulted in an overprojection of 123 percent in the computer and office equipment industry. In contrast, nine durable-goods-manufacturing industries were underprojected. Of these, the largest projection error was for motor vehicles and equipment. An increase in U.S. operations and a rise in production by foreign motor vehicle manufacturers resulted in U.S. jobs gains, rather than losses due to production in foreign countries. (See table 3.)

In the 31 nondurable goods industries, the projection errors were generally smaller than in durable goods industries. The food-manufacturing industries were all projected to decline, except for the miscellaneous group, and all did, save the miscellaneous group and meat products. However, the declines were generally less than projected. Drug manufacturing grew a little faster than projected, spurred by purchases from health service and government health industries.

Employment in 9 of the 12 detailed service industries that were evaluated increased faster than projected. One of the three that increased less than projected, private households, was projected to decline and did so, but the decline was even greater than projected. Beauty and barber shops and personal and repair services registered an increase in employment, but not as fast as was projected. Two of the service industries with the largest numerical projection errors—miscellaneous business, professional, and social services and doctors' offices, nursing homes, and miscellaneous health services—were projected to grow much faster than average, but they grew even faster than projected. The former industry was driven in part by very rapid, unprecedented growth in the early 1980s, when projections were

Table 2.	Growth in demand components between 1984 and 1995, actual and projected		

[Annual percent change]

Components of demand	Gross domestic product, 1984 to actual 1995 (1992 dollars)	Gross national product,[1] 1984 to projected 1995 (1992 dollars)[2]
Total	2.5	2.9
Personal consumption expenditures	2.7	2.8
Durable goods	3.7	2.8
Nondurable goods	1.9	1.9
Services	2.9	3.4
Gross private domestic investment	1.8	2.8
Producers' durable equipment	4.7	3.8
Nonresidential structures	−1.2	2.0
Residential structures	1.4	2.1
Change in business inventories	−4.0	.3
Net exports		
Exports	8.1	5.6
Imports	−6.3	−4.0
Government	2.0	2.5
Federal Government	.2	2.8
National defense	−.7	3.4
Nondefense	2.5	1.1
State and local government	3.3	2.3

[1] Actual 1995 demand data are available on a gross domestic product basis, rather than the projected gross national product basis.

[2] Actual 1995 demand data are available in 1992 chain-weighted dollars, rather than the projected 1972 fixed-weight dollars.

| Table 3. | Wage and salary employment, by industry, 1984 actual and 1995 projected and actual |

[Numbers in thousands]

| Industry | 1984 | 1995 | | | | Percent change, 1984–95 | | Numerical error, 1995 | Percent error, 1995 | Share of total growth, 1984–95 | |
| | | Projected | | Actual | | | | | | | |
		Level	Share (percent)	Level	Share (percent)	Projected	Actual			Projected	Actual
Total	96,843	112,267	100.0	118,833	100.0	15.9	22.7	–6,566	–5.5	100.0	100.0
Agricultural production	1,126	1,021	.9	1,064	.9	–9.3	–5.5	–43	–4.0	–.7	–.3
Agricultural services	501	330	.3	872	.7	–34.2	73.9	–542	–62.2	–1.1	1.7
Forestry, fishing, hunting, and trapping	41	50	.0	40	.0	22.0	–2.4	10	25.0	.1	.0
Metal mining	55	44	.0	51	.0	–20.3	–7.2	–7	–14.1	–.1	.0
Coal mining	196	185	.2	107	.1	–5.4	–45.4	78	73.2	–.1	–.4
Crude petroleum, natural gas, and gas liquids	261	263	.2	155	.1	.8	–40.5	108	69.5	.0	–.5
Nonmetallic minerals, except fuels	109	109	.1	105	.1	.5	–3.5	4	4.1	.0	.0
Construction, including oil and gas services	4,726	5,225	4.7	5,407	4.5	10.6	14.4	–182	–3.4	3.2	3.1
Logging	88	78	.1	82	.1	–10.9	–6.7	–4	–4.4	–.1	.0
Sawmills and planing mills	202	190	.2	186	.2	–6.1	–8.2	4	2.3	–.1	–.1
Wood products and mobile homes	428	435	.4	490	.4	1.7	14.5	–55	–11.2	.0	.3
Household furniture	296	321	.3	279	.2	8.6	–5.6	42	15.1	.2	–.1
Miscellaneous furniture and fixtures	191	242	.2	221	.2	27.0	15.8	21	9.6	.3	.1
Glass and glass products	163	167	.1	152	.1	2.5	–6.7	15	9.8	.0	.0
Cement and concrete	223	242	.2	222	.2	8.7	–.4	20	9.1	.1	.0
Stone, clay, and miscellaneous mineral products	176	212	.2	167	.1	20.5	–4.8	45	26.6	.2	.0
Blast furnaces and basic steel products	334	261	.2	239	.2	–21.9	–28.4	22	9.1	–.5	–.4
Foundries, forging, and refining ..	770	785	.7	721	.6	1.9	–6.4	64	8.9	.1	–.2
Metal cans and shipping containers	59	52	.0	41	.0	–11.3	–29.7	11	26.2	.0	–.1
Cutlery, handtools, and hardware	148	162	.1	131	.1	9.7	–11.0	31	23.3	.1	–.1
Plumbing and nonelectric heating equipment	65	60	.1	60	.1	–8.0	–7.7	0	–.3	.0	.0
Fabricated structural metal products	430	514	.5	428	.4	19.6	–.4	86	20.1	.5	.0
Screw machine products, bolts, rivets, etc.	96	108	.1	99	.1	12.1	2.6	9	9.3	.1	.0
Ordnance and ammunition	76	111	.1	51	.0	46.8	–32.8	60	118.5	.2	–.1
Miscellaneous fabricated metal products	342	394	.4	379	.3	15.4	10.8	16	4.1	.3	.2
Engines and turbines	113	124	.1	87	.1	9.7	–22.8	37	42.2	.1	–.1
Farm and garden machinery	108	136	.1	104	.1	26.4	–3.4	32	30.9	.2	.0
Construction and related machinery	257	334	.3	217	.2	29.8	–15.8	117	54.1	.5	–.2
Metalworking machinery and equipment	327	367	.3	340	.3	12.3	3.9	27	8.0	.3	.1
Special industry machinery	158	197	.2	167	.1	24.6	5.6	30	18.0	.3	.0
General industrial machinery and equipment	252	325	.3	253	.2	29.0	.4	72	28.5	.5	.0
Computer and office equipment ..	515	756	.7	340	.3	46.9	–34.0	416	122.5	1.6	–.8
Refrigeration and service industry machinery	171	194	.2	200	.2	13.3	16.7	–6	–2.9	.1	.1
Industrial machinery, n.e.c.[1]	317	322	.3	336	.3	1.6	5.9	–14	–4.1	.0	.1
Electric distribution equipment	111	231	.2	81	.1	108.3	–26.9	150	184.8	.8	–.1
Electrical industrial apparatus	201	241	.2	160	.1	19.7	–20.4	81	50.3	.3	–.2
Household appliances	146	150	.1	123	.1	2.6	–16.0	27	22.1	.0	–.1
Electric lighting and wiring equipment	202	223	.2	182	.2	10.5	–9.7	41	22.4	.1	–.1
Household audio and video equipment	90	85	.1	93	.1	–5.6	3.1	–8	–8.4	.0	.0
Communication and scientific equipment	986	1,164	1.0	737	.6	18.1	–25.3	427	58.0	1.2	–1.1
Electronic components and accessories	657	846	.8	582	.5	28.7	–11.5	265	45.5	1.2	–.3

Table 3. Continued—Wage and salary employment, by industry, 1984 actual and 1995 projected and actual

[Numbers in thousands]

Industry	1984	1995				Percent change, 1984–95		Numerical error, 1995	Percent error, 1995	Share of total growth, 1984–95	
		Projected		Actual							
		Level	Share (percent)	Level	Share (percent)	Projected	Actual			Projected	Actual
Miscellaneous electrical equipment	170	186	.2	154	.1	9.7	−9.1	32	20.7	.1	−.1
Motor vehicles and equipment	862	826	.7	933	.8	−4.1	8.3	−107	−11.5	−.2	.3
Aerospace	729	866	.8	541	.5	18.8	−25.8	325	60.0	.9	−.9
Ship and boat building and repairing	192	220	.2	163	.1	14.7	−15.3	58	35.4	.2	−.1
Railroad equipment	35	36	.0	38	.0	2.9	8.6	−2	−5.3	.0	.0
Miscellaneous transportation equipment	65	59	.1	70	.1	−9.8	6.7	−11	−15.5	.0	.0
Medical equipment, instruments, and supplies	208	234	.2	262	.2	12.4	25.7	−28	−10.6	.2	.2
Photographic equipment and supplies	124	135	.1	87	.1	9.0	−30.1	49	56.1	.1	−.2
Watches, clocks, and parts	14	14	.0	8	.0	−.7	−43.3	6	75.0	.0	.0
Jewelry, silverware, and plated ware	55	78	.1	51	.0	42.6	−7.3	27	53.8	.2	.0
Manufactured products, n.e.c.[1]	327	303	.3	343	.3	−7.3	4.9	−40	−11.6	−.2	.1
Meat products	355	328	.3	465	.4	−7.7	30.8	−137	−29.4	−.2	.5
Dairy products	163	126	.1	150	.1	−22.8	−8.2	−24	−15.9	−.2	−.1
Grain mill products, fats, and oils	166	124	.1	159	.1	−25.2	−3.9	−35	−22.2	−.3	.0
Bakery products	218	181	.2	212	.2	−16.9	−2.8	−31	−14.6	−.2	.0
Sugar and confectionery products	102	85	.1	99	.1	−16.5	−2.5	−14	−14.4	−.1	.0
Beverages	214	191	.2	179	.2	−10.9	−16.6	12	6.8	−.2	−.2
Miscellaneous foods and kindred products	390	415	.4	421	.4	6.3	7.9	−6	−1.5	.2	.1
Tobacco products	64	56	.0	39	.0	−12.8	−38.6	17	42.1	−.1	−.1
Weaving, finishing, yarn, and thread mills	432	354	.3	350	.3	−18.1	−19.0	4	1.2	−.5	−.4
Knitting mills	208	168	.1	191	.2	−19.0	−7.8	−23	−12.2	−.3	−.1
Carpets and rugs	53	43	.0	65	.1	−19.5	20.8	−22	−33.3	−.1	.1
Miscellaneous textile goods	53	46	.0	51	.0	−13.9	−5.2	−5	−9.1	.0	.0
Apparel	1,000	808	.7	705	.6	−19.2	−29.5	103	14.6	−1.2	−1.3
Miscellaneous fabricated textile products	185	174	.2	211	.2	−5.9	14.3	−37	−17.7	−.1	.1
Paperboard containers and boxes	197	183	.2	215	.2	−7.2	9.0	−32	−14.8	−.1	.1
Pulp, paper, and paperboard	477	480	.4	473	.4	.7	−.8	7	1.5	.0	.0
Newspapers	440	508	.5	453	.4	15.5	3.0	55	12.2	.4	.1
Periodicals, except newspapers	277	313	.3	341	.3	13.2	23.5	−28	−8.3	.2	.3
Printing	659	785	.7	762	.6	19.1	15.6	23	3.1	.8	.5
Industrial chemicals	305	305	.3	272	.2	−.1	−11.0	33	12.3	.0	−.2
Plastics materials and synthetics	178	162	.1	158	.1	−8.9	−11.3	4	2.7	−.1	−.1
Drugs	206	243	.2	260	.2	18.1	26.1	−17	−6.4	.2	.2
Soap, cleaners, and toilet goods	145	160	.1	152	.1	10.0	4.5	8	5.3	.1	.0
Paints and allied products	62	57	.1	58	.0	−8.1	−6.3	−1	−1.9	.0	.0
Agricultural chemicals	61	61	.1	53	.0	.7	−12.2	8	14.7	.0	.0
Miscellaneous chemical products	92	101	.1	93	.1	9.4	.9	8	8.5	.1	.0
Petroleum and coal product manufacturing	189	175	.2	144	.1	−7.4	−24.0	31	21.8	−.1	−.2
Tires and inner tubes	95	86	.1	83	.1	−9.7	−13.1	3	4.0	−.1	−.1
Rubber products, plastic hose, and footwear	184	132	.1	184	.2	−28.2	.2	−52	−28.4	−.3	.0
Miscellaneous plastics products, n.e.c.[1]	534	707	.6	705	.6	32.4	31.9	2	.3	1.1	.8
Footwear and other leather products	190	140	.1	108	.1	−26.1	−43.0	32	29.5	−.3	−.4
Railroad transportation	376	283	.3	239	.2	−24.7	−36.5	45	18.7	−.6	−.6
Local and interurban passenger transit	270	267	.2	448	.4	−1.2	65.6	−181	−40.3	.0	.8

Table 3. Continued—Wage and salary employment, by industry, 1984 actual and 1995 projected and actual

[Numbers in thousands]

| Industry | 1984 | 1995 | | | | Percent change, 1984–95 | | Numerical error, 1995 | Percent error, 1995 | Share of total growth, 1984–95 | |
| | | Projected | | Actual | | | | | | | |
		Level	Share (percent)	Level	Share (percent)	Projected	Actual			Projected	Actual
Trucking and warehousing	1,317	1,571	1.4	1,879	1.6	19.3	42.6	−308	−16.4	1.6	2.6
Water transportation	190	206	.2	160	.1	8.4	−16.1	47	29.2	.1	−.1
Air transportation	488	574	.5	766	.6	17.6	56.8	−192	−25.0	.6	1.3
Pipelines, except natural gas	19	20	.0	17	.0	4.7	−13.6	4	21.2	.0	.0
Miscellaneous transportation services	253	362	.3	424	.4	43.1	67.4	−62	−14.5	.7	.8
Communications	1,340	1,575	1.4	1,358	1.1	17.5	1.3	217	16.0	1.5	.1
Electric utilities	645	827	.7	585	.5	28.3	−9.3	242	41.5	1.2	−.3
Gas utilities	223	225	.2	189	.2	.8	−15.4	36	19.0	.0	−.2
Water and sanitation	110	121	.1	218	.2	10.0	98.5	−97	−44.6	.1	.5
Wholesale trade	5,568	6,578	5.9	6,324	5.3	18.1	13.6	254	4.0	6.5	3.4
Retail trade, except eating and drinking places	11,131	12,890	11.5	13,617	11.5	15.8	22.3	−727	−5.3	11.4	11.3
Eating and drinking places	5,381	6,659	5.9	7,223	6.1	23.8	34.2	−564	−7.8	8.3	8.4
Banking and brokerages	2,852	3,396	3.0	3,316	2.8	19.1	16.3	80	2.4	3.5	2.1
Insurance	1,765	2,056	1.8	2,243	1.9	16.5	27.1	−187	−8.3	1.9	2.2
Real estate and royalties	1,067	1,288	1.1	1,390	1.2	20.7	30.3	−102	−7.3	1.4	1.5
Lodging places and residential care	1,532	1,955	1.7	2,259	1.9	27.6	47.5	−304	−13.5	2.7	3.3
Beauty and barber shops	341	430	.4	395	.3	26.3	16.0	35	8.8	.6	.2
Personal and repair services, n.e.c.[1]	706	1,160	1.0	881	.7	64.4	24.8	280	31.7	2.9	.8
Advertising	183	227	.2	241	.2	24.0	31.3	−14	−5.6	.3	.3
Miscellaneous business, professional, and social services	7,828	11,501	10.2	13,238	11.1	46.9	69.1	−1,737	−13.1	23.8	24.6
Automotive services	682	864	.8	1,025	.9	26.6	50.3	−161	−15.7	1.2	1.6
Motion pictures and videotape rental	276	243	.2	586	.5	−11.9	112.6	−343	−58.5	−.2	1.4
Amusement and recreation services, n.e.c.[1]	859	1,056	.9	1,474	1.2	23.0	71.7	−418	−28.4	1.3	2.8
Doctors, nursing homes, and miscellaneous health services	3,115	4,796	4.3	5,454	.6	54.0	75.1	−658	−12.1	10.9	10.6
Hospitals	3,004	3,253	2.9	3,816	3.2	8.3	27.0	−563	−14.7	1.6	3.7
Educational, job training, child care, etc.	1,755	1,964	1.7	2,712	2.3	11.9	54.5	−748	−27.6	1.4	4.3
Private households	1,238	1,019	.9	963	.8	−17.7	−22.2	56	5.8	−1.4	−1.3
U.S. Postal Service	703	677	.6	843	.7	−3.7	20.0	−166	−19.7	−.2	.6
Federal Government enterprises, n.e.c.[1]	197	140	.1	194	.2	−29.0	−1.8	−54	−27.6	−.4	.0
General government	14,325	15,429	13.7	17,389	14.6	7.7	21.4	−1,960	−11.3	7.2	13.9
Local government passenger transit	186	209	.2	212	.2	12.4	14.2	−3	−1.6	.1	.1
State and local government enterprises, n.e.c.[1]	536	536	.5	554	.5	.0	3.3	−18	−3.2	.0	.1

[1] n.e.c. = not elsewhere classified.

developed for the temporary help services supply industry. Growth in that industry reflects much of the cost cutting that employers have been implementing over the past several years, as firms replace permanent employees with temporary ones to save on the cost of benefits, yet maintain flexibility in their production operations.

Employment in railroads, air transportation, trucking and warehousing, and local and interurban transit grew faster than projected. The most significant underprojection was for the last of these, as the growth of subway systems took hold during the projection period. Employment in the transportation industries grew faster than projected, as companies converted to "just in time" inventory management more rapidly than was

expected. Electric and gas utilities were both projected to increase, but they decreased, as deregulation apparently had a significant impact on employment. □

Footnotes

[1] Originally, projections were made for 156 industries. Because of changes in the Standard Industrial Classification (SIC) system, however, com-

parability with actual 1995 industries could be accomplished only at a 117-industry level. Data were analyzed just for wage and salary workers, both because of the change in the SIC system and because it would be difficult to establish comparability between the data for these workers, derived from the Current Employment Statistics program, and data on self-employed and unpaid family workers, derived from the Current Population Survey.

Evaluating the 1995 occupational employment projections

Although too conservative, the BLS employment projections to 1995 correctly foresaw most general occupational trends

Carolyn M. Veneri

The Bureau's occupational employment projections captured the majority of the general occupational trends over the 1984–95 period. Some of the most glaring inaccuracies in the projections for detailed occupations reflect the conservative nature of projected growth rates that was identified in previous evaluations. Although the impact of inaccurate industry employment projections on the occupational employment projections was significant, the projections of the changes in the utilization of occupations by industry resulted in the biggest source of projection error, as in past evaluations.

Major occupation groups

The direction of employment change was projected correctly for all nine of the major occupation groups. The absolute projection error was less than 10 percent for eight out of the nine groups and 11.3 percent for professional specialty occupations, the major occupation group with the largest absolute error. (See table 1.)

Projected employment was lower than actual in six major groups: executive, administrative, and managerial occupations; professional specialty occupations; marketing and sales occupations; administrative support occupations, including clerical; services occupations; and operators, fabricators, and laborers. Employment was overestimated for precision production, craft, and repair occupations, and technicians and related support occupations. The latter group's employment was projected the most accurately, at less than 1 percent more than actual employment. The decline in employment was slightly overestimated for agriculture, forestry, fishing, and related occupations.

Not only was the direction of employment change anticipated correctly for all the major groups, but the projected distribution of employment growth among the groups was reasonably accurate.[1] For example, the professional specialty occupation group had the largest absolute numerical error, nearly 2 million, but its share of total employment growth was underprojected by only 3.4 percent. Thus, the projection for total employment—low by about 7.3 million—had an impact on the overall accuracy of the projections.

The largest error in the projected share of employment growth was for precision production, craft, and repair occupations. This group's share of total employment growth was overprojected by about 7 percent, in line with its employment being overprojected by 886,000. For each major group, however, the same pattern of projection of employment growth and rprojection of the group's share of employment growth does not necessarily apply. In the case of operators, fabricators, and laborers, for example, employment was slightly underprojected, and the share of employment growth was overprojected. For marketing and sales workers, the projected share of total employment growth was almost identical to the actual share, although the level of employment was underprojected. (See table 1.)

The fastest growing occupation groups had the largest absolute projection errors. Technicians and related support occupations was projected to be the fastest growing group, but was outpaced by four other groups. The two actual leaders, professional specialty occupations and executive, administrative, and managerial occupations, which were both projected to grow faster than average, but not as fast as they really did grow.

Administrative support workers, including clerical workers, made up the largest group of workers in 1984 and also was projected to be, and was in actuality, the largest in 1995, even though it did not grow more slowly than average, as projected. The projection error for this group was 8.3 percent. The group's projected slow growth was based on the anticipated effect of the rapid spread of computerized office equipment. As a result, many clerical occupations were correctly projected to grow slowly or decline. However,

employment increased more rapidly than projected in several large clerical occupations, such as bill and account collectors, adjustment clerks, and teachers' aides and educational assistants.

Projection errors were also relatively large for both service occupations and marketing and sales occupations. Each of these groups grew faster than projected, and together they accounted for a combined employment growth of about 8.1 million jobs, rather than the expected 5.6 million. More than 60 percent of the projection error of 1.1 million for the marketing and sales occupations can be attributed to an underprojection of two occupations: cashiers and retail salespersons. These occupations accounted for an underestimate of almost 700,000 workers.

Projection errors for agriculture, forestry, fishing, and related occupations, and for operators, fabricators, and laborers, were relatively small. Part of this accuracy can be attributed to growth among occupations less affected by technological change, such as transportation and material-moving occupations; nursery workers; and animal caretakers, except farmworkers. Conversely,

precision production, craft, and repair occupations were overprojected by almost a million workers. Because these workers are concentrated in the construction and manufacturing industries, the projected increase in their employment was tied primarily to the projections for those industries.

Professional specialty occupations grew by about 4.7 million over the 1984–95 period, almost 2 million more than projected. Significant errors in the projections for detailed occupations with sizable employment had a substantial impact on the overall projection error for this group. For example, underprojections for five professional specialty occupations—computer systems analysts, engineers, and scientists; college and university faculty; adult and vocational education teachers; registered nurses; and social workers—contributed significantly to the underprojection of professional workers. Underprojection of the five occupations accounted for about 38 percent of underestimated employment for this major group. That the projection error for professional specialty occupations was only 11.3 percent can be attributed to some offsetting of this underprojection

caused by an overprojection of other types of engineers.[2]

Detailed occupations

The evaluation of the 1995 projections covered 348 detailed occupations. Table 2 presents data on the 207 occupations for which 1984 employment was greater than 50,000, ranked by absolute percent error.[3] The absolute percent errors for all 348 averaged about 24 percent. More than three-fifths of the occupations, however, had below-average errors.

The Bureau can evaluate only the projections for occupations that had comparable definitions in surveys used to compile employment data in the base year and the target year of the projections. Consequently, in past evaluations, relatively few occupations could be evaluated, because the classification system changed rather frequently. However, many more occupations maintained comparability between 1984 and 1995 than in past evaluation periods, because the OES survey occupational classification remained very stable over that period. As a result, the number of occupations included in this evaluation is much larger than in past evaluations.[4]

| Table 1. | Employment, by major occupation group, 1984 actual and 1995 projected and actual |

[Numbers in thousands]

Occupation	1984	Employment				Percent change, 1984–95		Numerical error, 1995 (projected minus actual)	Percent error, 1995	Share of total job growth, 1984–95	
		Projected 1995		Actual 1995							
		Level	Share (percent)	Level	Share (percent)	Projected	Actual			Projected	Actual
Total, all occupations	106,729	122,758	100.0	130,009	100.0	15.0	21.8	–7,250	–5.6	100.0	100.0
Executive, administrative, and managerial occupations	9,951	11,933	9.7	13,244	10.2	19.9	33.1	–1,311	–9.9	12.4	14.1
Professional specialty occupations	13,020	15,701	12.8	17,696	13.6	20.6	35.9	–1,995	–11.3	16.7	20.1
Technicians and related support occupations	3,535	4,564	3.7	4,541	3.5	29.1	28.5	23	.5	6.4	4.3
Marketing and sales workers	10,978	13,322	10.9	14,389	11.1	21.3	31.1	–1,068	–7.4	14.6	14.7
Administrative support occupations, including clerical ..	19,670	21,731	17.7	23,710	18.2	10.5	20.5	–1,979	–8.3	12.9	17.4
Service occupations	16,244	19,510	15.9	20,889	16.1	20.1	28.6	–1,379	–6.6	20.4	20.0
Agriculture, forestry, fishing, and related occupations	3,798	3,641	3.0	3,779	2.9	–4.1	–.5	–138	–3.6	–1.0	–.1
Precision production, craft, and repair occupations	13,469	15,110	12.3	14,224	10.9	12.2	5.6	886	6.2	10.2	3.2
Operators, fabricators, and laborers	16,064	17,246	14.0	17,536	13.5	7.4	9.2	–290	–1.7	7.4	6.3

Projection error is inversely related to employment size, as past projection evaluations have indicated. In 1984, fewer than 100,000 workers were employed in each of 211 of the 348 occupations included in the evaluation. These 211 occupations had an average projection error of about 29 percent, whereas 32 occupations with more than 500,000 workers in 1984 had an average error of about 12.2 percent.

The direction of employment change was projected correctly for more than 70 percent of the occupations included in the evaluation. Employment growth was projected for the majority of all the occupations. Of the 231 occupations for which employment actually grew from 1984 to 1995, an increase was projected for all but 16. However, of the 117 occupations for which employment declined, only 37 were projected to decline over the period.

The errors among the occupations included in the evaluation ranged widely. (See table 2.) For example, the difference between projected and actual employment was underestimated by about 42 percent for physicians' assistants and overestimated by about 190 percent for roustabouts. Since roustabouts are primarily concentrated in the oil and gas industry, this projection reveals how the effects of incorrect industry projections can affect the projections for individual occupations.

The last two columns in table 2 present the projected and actual share of the overall employment increase for each of the 207 occupations for which 1984 employment was greater than 50,000. Although there are some notable exceptions, the projected shares for the detailed occupations, like those for the major groups, are relatively accurate.

Sources of error

Errors in the projections for the detailed occupations included in the evaluation can ultimately be traced back to errors in assumptions or judgment, resulting in incorrectly projected changes in staffing patterns, industry projections, or a

combination of both. In order to identify the sources of error, two simulated matrices were created. The first of these was generated by multiplying the projected 1995 staffing patterns of industries by actual 1995 industry employment. The second was produced by multiplying the actual 1995 staffing patterns by projected employment by industry. The first simulation reveals the outcome if the Bureau had projected perfect industry employment totals and the second the outcome if it had projected perfect occupational staffing patterns. Table 2 presents projection errors from the two simulated matrices created to analyze these effects.

In viewing the projection levels and errors for the detailed occupations, it is possible to identify the effects analytical judgments had on the individual projections. Analyses of underlying trends or impacts of technological change were used in developing both the industry projections and the projected staffing patterns of industries. As mentioned in Arthur Andreassen's contribution to this article, industry employment projections were affected by unanticipated economic changes.[5] Employment in manufacturing, for example, did not increase as projected, but declined because of a number of factors, including a reduction in defense spending, rapid growth of imports, and a trend toward outsourcing all types of services. In contrast, employment in services grew at a much faster rate than projected.

The effect of industry errors on occupational employment may be clearly seen in an example taken from table 2. Earlier, it was mentioned that one of the largest projection errors occurred for roustabouts, around 190 percent. Examining the projection errors from both simulations, one can see clearly that the error is attributable more to incorrect industry projections for the related oil and gas industries than to the projected staffing pattern: the error in the simulation using actual staffing patterns and projected industry totals is 115 percent, while it is only 38 percent with actual industry totals and projected staffing patterns.

Job clusters. In investigating sources of projection error, it is helpful to examine groups of related occupations, or job clusters. A number of such clusters have been selected for closer examination in this section because they show large projection errors or highlight specific sources of error. For example, the underprojection of the education industry affected the projections for education-related occupations. This conclusion is supported by a review of the two simulated matrices for the projection errors for college and university faculty and teachers' aides and educational assistants. Between 1984 and 1995, the employment of college and university faculty was projected to decline about 14 percent, whereas it actually increased approximately 12 percent. The projected decline was based primarily on the U.S. Department of Education's National Center for Education Statistics' projected drop in college enrollments, reflecting the shrinking population of 18- to 24-year-olds. Enrollment rates, however, increased during the 1980s, as colleges accepted greater numbers of older individuals and enrollment rates of students of traditional college age rose more rapidly than expected.

Due to similar misconceptions about enrollments in higher education, the employment of adult and vocational education teachers also was significantly under-projected. However, the absolute percent error for adult and vocational education teachers is actually larger in the simulation using the projected staffing patterns and actual 1995 industry totals than in the simulation using actual staffing patterns and projected industry employment. (See table 3.) This indicates that the error in the projections for adult and vocational education teachers was in fact more the result of the underlying assumptions or judgments that went into determining the utilization of the workers in the education industry, rather than a result of the projection for the education industry. Although moderately rising demand for adult education was anticipated, the declining population of 18- to 22-year-olds

| Table 2. | Employment, by occupation, 1984 actual and 1995 projected and actual | | | | | | |

[Numbers in thousands]

Occupation	Total employment					Percent change, 1984–95	
	1984	Projected 1995		Actual 1995		Projected	Actual
		Level	Share (percent)	Level	Share (percent)		
Total, all occupations	106,729	122,758	100.00	130,009	100.00	15.0	21.8
Cooks, institution or cafeteria	361	426	.35	426	.33	18.0	18.1
Aircraft mechanics	82	98	.08	98	.08	19.7	19.8
Mail clerks, except mail machine operators and postal service	126	132	.11	132	.10	5.3	5.2
Supervisors of blue–collar workers	1,794	1,931	1.57	1,925	1.48	7.6	7.3
Butchers and meatcutters	229	220	.18	219	.17	−4.1	−4.5
Crushing and mixing machine operators and tenders	133	137	.11	138	.11	3.5	4.0
Highway maintenance workers	159	167	.14	168	.13	5.0	5.7
Cannery workers	74	72	.06	72	.06	−3.4	−2.8
Farmers	1,312	1,240	1.01	1,231	.95	−5.5	−6.2
Stock clerks	1,707	1,800	1.47	1,815	1.40	5.5	6.3
Industrial machinery mechanics	438	465	.38	470	.36	6.3	7.3
Secretaries	3,050	3,369	2.74	3,403	2.62	10.5	11.6
Pharmacists	157	174	.14	172	.13	10.7	9.6
Loan and credit clerks	146	172	.14	174	.13	17.5	19.2
Bus drivers, except school	138	156	.13	158	.12	13.3	14.9
Tire repairers and changers	80	90	.07	91	.07	12.8	14.5
Guards	680	903	.74	917	.71	32.8	34.9
Brokers, real estate	58	68	.06	69	.05	16.2	18.1
Supervisors of police and detectives	80	89	.07	88	.07	11.3	9.3
Purchasing agents, except wholesale, retail, and farm products	183	216	.18	220	.17	18.2	20.6
Bookkeeping, accounting, and auditing clerks	2,019	2,158	1.76	2,217	1.71	6.9	9.8
Order clerks for materials, merchandise, and service	263	315	.26	324	.25	19.9	23.3
Public relations specialists and publicity writers	83	108	.09	112	.09	30.9	34.6
Cabinetmakers and bench carpenters	104	124	.10	127	.10	18.7	22.1
Welders and cutters	291	330	.27	340	.26	13.5	16.9
Dental assistants	149	191	.16	197	.15	28.0	31.9
Dispatchers, except police, fire, and ambulance	118	142	.12	146	.11	19.7	23.5
Waiters and waitresses	1,570	1,978	1.61	1,916	1.47	25.9	22.0
Drywall installers and finishers	117	129	.11	125	.10	10.2	6.8
Pressing machine operators and tenders, textile, garment, and related	89	80	.07	78	.06	−10.3	−13.1
Stenographers	172	101	.08	105	.08	−41.2	39.2
Numerical control machine tool operators and tenders, metal/plastic	58	74	.06	77	.06	28.7	33.1
Pipelayers and pipelaying fitters	53	59	.05	57	.04	12.9	9.0
Food counter, fountain, and related workers	1,377	1,627	1.33	1,692	1.30	18.2	22.9
Paralegals	54	105	.09	110	.08	96.2	104.2
Licensed practical nurses	593	695	.57	724	.56	17.3	22.1
Machine-forming operators and tenders, metal and plastic	174	170	.14	177	.14	−2.2	1.9
Bank tellers	497	522	.43	545	.42	5.1	9.7
Machine builders and other precision machine assemblers	53	63	.05	61	.05	20.5	15.6
Medical assistants	126	204	.17	214	.16	62.5	70.6
Electricians	511	592	.48	565	.43	15.9	10.5
Truck drivers, light and heavy	2,123	2,511	2.05	2,648	2.04	18.3	24.7
Photographers	92	121	.10	115	.09	31.6	25.1
Production, planning, and expediting clerks	210	230	.19	243	.19	9.6	15.9
Packaging and filling machine operators and tenders	298	314	.26	333	.26	5.4	11.9
Textile drawout and winding machine operators and tenders	237	199	.16	188	.14	−15.9	−20.6
Sewing machine operators, nongarment ...	137	137	.11	130	.10	.4	−5.2

Table 2. Continued—Employment, by occupation, 1984 actual and 1995 projected and actual

[Numbers in thousands]

Occupation	1984	Projected 1995		Actual 1995		Percent change, 1984–95	
		Level	Share (percent)	Level	Share (percent)	Projected	Actual
Carpet installers	64	75	.06	70	.05	15.8	9.3
Salespersons, retail	3,284	3,729	3.04	3,970	3.05	13.6	20.9
Heating, air-conditioning, and refrigeration							
mechanics and installers	209	247	.20	233	.18	18.0	11.1
Police patrol officers	334	378	.31	403	.31	13.1	20.7
Janitors and cleaners, including							
maids/houskeeping cleaners	2,449	2,890	2.35	3,086	2.37	18.0	26.0
Extruding and forming machine setters,							
operators, and tenders	104	110	.09	103	.08	5.6	−.8
Carpenters	940	1,029	.84	965	.74	9.5	2.7
Travel agents	94	138	.11	129	.10	46.5	37.3
Sheet metal workers and duct installers	215	246	.20	230	.18	14.3	7.0
Employment interviewers, private or public							
employment service	63	89	.07	83	.06	39.5	30.1
Cost estimators	143	171	.14	184	.14	19.2	28.5
Central office and PBX installers							
and repairers	77	86	.07	80	.06	11.4	3.8
Insulation workers	53	60	.05	65	.05	12.9	21.9
Chemists	84	89	.07	96	.07	5.6	14.0
Personnel clerks, except payroll							
and timekeeping	115	135	.11	125	.10	16.5	8.2
Helpers, construction trades	466	484	.39	525	.40	3.8	12.5
Librarians, professional	128	139	.11	152	.12	8.5	18.2
Chemical equipment controllers,							
operators, and tenders	77	79	.06	73	.06	3.1	−5.1
Police detectives and investigators	55	60	.05	66	.05	10.1	20.8
Plastic molding machine operators							
and tenders, setters,							
and setup operators	142	185	.15	169	.13	29.6	18.9
Registered nurses	1,326	1,758	1.43	1,937	1.49	32.6	46.1
Maintenance repairers, general utility	999	1,173	.96	1,294	1.00	17.4	29.5
Physicians	487	600	.49	548	.42	23.2	12.6
Painters and paperhangers, construction							
and maintenance	368	384	.31	424	.33	4.3	15.2
Refuse collectors	106	125	.10	114	.09	17.9	7.0
Welfare eligibility workers							
and interviewers	82	94	.08	105	.08	15.0	28.1
Concrete and terrazzo finishers	100	117	.10	130	.10	17.0	30.4
Mobile heavy equipment mechanics	102	119	.10	107	.08	16.6	5.6
New-accounts clerks, banking	87	99	.08	111	.09	14.4	27.7
Data entry keyers, except composing	369	370	.30	414	.32	.4	12.3
Institutional cleaning supervisors	108	141	.12	128	.10	30.9	18.2
Taxi drivers and chauffeurs	84	95	.08	107	.08	12.9	26.7
Sewing machine operators, garment	673	568	.46	511	.39	−15.7	−24.1
Payroll and timekeeping clerks	192	182	.15	163	.13	−5.6	−15.2
Artists and commercial artists	184	240	.20	272	.21	30.2	47.3
Combination machine tool setters,							
setup operators, operators, and tenders	95	122	.10	109	.08	28.1	14.8
Cooks, restaurant	485	630	.51	714	.55	29.9	47.0
Respiratory therapists	53	64	.05	73	.06	20.6	36.6
Machine feeders and offbearers	278	296	.24	265	.20	6.6	−4.7
Lawyers	527	722	.59	645	.50	37.1	22.6
Firefighters	214	247	.20	220	.17	15.3	2.9
Machinists	386	424	.35	378	.29	9.7	−2.1
Clinical lab technologists							
and technicians	231	245	.20	279	.21	6.0	20.6
Aircraft pilots and flight engineers	66	82	.07	93	.07	24.0	41.2
Hairdressers, hairstylists,							
and cosmetologists	525	687	.56	611	.47	30.8	16.4
Food preparation workers	879	1,078	.88	1,230	.95	22.6	39.9
Home appliance and power tool repairers .	75	86	.07	77	.06	15.2	2.3
Child care workers, private household	401	347	.28	308	.24	−13.5	−23.2
Cutting and slicing machine setters,							
operators, and tenders	82	81	.07	94	.07	−.7	14.4

Table 2. Continued—Employment, by occupation, 1984 actual and 1995 projected and actual

[Numbers in thousands]

Occupation	Total employment					Percent change, 1984–95	
	1984	Projected 1995		Actual 1995		Projected	Actual
		Level	Share (percent)	Level	Share (percent)		
Bus drivers, school	311	364	.30	420	.32	17.2	35.0
Writers and editors, including technical writers	194	246	.20	284	.22	26.9	46.5
Library assistants and bookmobile drivers	97	107	.09	123	.09	9.7	26.6
Insurance sales workers	425	474	.39	415	.32	11.4	−2.5
Wholesale and retail buyers, except farm products	189	214	.17	187	.14	13.2	−1.2
Cashiers	2,016	2,627	2.14	3,080	2.37	30.3	52.8
Insurance adjusters, examiners, and investigators	109	138	.11	162	.12	26.7	48.9
Science and mathematics technicians	233	268	.22	233	.18	15.3	.1
Automotive body and related repairers	202	243	.20	210	.16	19.9	3.9
Bricklayers and stonemasons	154	170	.14	148	.11	10.6	−4.2
Cleaners and servants, private household	532	409	.33	484	.37	−23.1	−9.1
Personnel, training, and labor relations specialists	221	262	.21	310	.24	18.5	40.2
Underwriters	90	112	.09	97	.07	24.1	7.4
Woodworking machine operators and tenders, setters, and setup operators	72	77	.06	67	.05	6.7	−7.8
Inspectors and compliance officers, except construction	120	133	.11	158	.12	10.9	32.2
Machine assemblers	51	61	.05	53	.04	19.8	2.9
Hotel desk clerks	97	115	.09	137	.11	18.3	41.6
Drafters	326	367	.30	315	.24	12.7	−3.5
Plumbers, pipefitters, and steamfitters	384	442	.36	378	.29	14.9	−1.7
Farm managers	164	180	.15	154	.12	9.8	−6.1
Gardeners and groundskeepers, except farm	597	639	.52	545	.42	7.0	−8.8
Physical therapists	59	86	.07	104	.08	45.3	76.6
Designers	198	252	.21	307	.24	27.7	55.5
Brokerage clerks	51	60	.05	73	.06	18.0	43.7
Automotive mechanics	706	859	.70	728	.56	21.6	3.1
Dental hygienists	83	107	.09	130	.10	28.7	56.9
Bus and truck mechanics and diesel engine specialists	256	309	.25	262	.20	20.4	2.0
Water and liquid waste treatment plant and systems operators	71	79	.06	97	.07	11.6	36.8
Inspectors, testers, and graders, precision	701	791	.64	668	.51	13.0	−4.6
Drivers/salesworkers	253	276	.23	339	.26	9.2	33.9
Cooks, short order and fast food	543	637	.52	785	.60	17.3	44.6
Order fillers, wholesale and retail sales	188	182	.15	225	.17	−3.1	19.6
Roofers	137	156	.13	131	.10	13.5	−4.6
Counselors	116	135	.11	168	.13	16.0	44.8
Office machine and cash register servicers	53	70	.06	58	.04	31.8	9.9
Laundry and drycleaning machine operators and tenders, except pressing	130	145	.12	182	.14	11.5	39.2
Millwrights	87	94	.08	78	.06	7.0	−10.9
Customer service representatives, utilities	104	122	.10	152	.12	16.7	45.9
Industrial truck and tractor operators	426	381	.31	477	.37	−10.6	11.8
Upholsterers	68	77	.06	64	.05	11.9	−6.8
Hosts and hostesses, restaurant/lounge/ coffee shop	158	203	.17	255	.20	28.5	61.4
Reservation and transportation ticket agents and travel clerks	106	115	.09	145	.11	9.0	37.0
File clerks	223	231	.19	292	.22	3.4	30.6
Recreation workers	154	180	.15	228	.18	16.8	47.7
Psychologists	92	110	.09	139	.11	19.8	51.5
Electronics repairers, commercial and industrial equipment	77	91	.07	76	.06	18.4	−2.3
Bartenders	366	466	.38	385	.30	27.4	5.1
Statistical clerks	69	60	.05	77	.06	−12.6	11.4

Occupation	Total employment					Percent change, 1984–95	
	1984	Projected 1995		Actual 1995			
		Level	Share (percent)	Level	Share (percent)	Projected	Actual
Dentists	160	200	.16	165	.13	25.1	2.9
Tool and die makers	165	178	.15	146	.11	8.3	−11.2
Radiologic technologists and technicians ..	109	134	.11	172	.13	23.2	58.0
Musicians	184	208	.17	267	.21	13.0	45.2
Accountants and auditors	902	1,213	.99	991	.76	34.5	9.8
Producers, directors, actors, and entertainers	61	76	.06	98	.08	23.6	59.7
Amusement and recreation attendants	179	218	.18	282	.22	21.6	57.2
Head sawyers and saw machine operators and tenders, setters, and setup operators	75	80	.07	65	.05	6.6	−13.1
College and university faculty	758	654	.53	848	.65	−13.8	11.8
Paper goods machine setters and setup operators	60	63	.05	51	.04	4.4	−15.1
Sales agents, real estate	290	332	.27	270	.21	14.2	−7.2
Dispatchers, police, fire, and ambulance ...	58	64	.05	84	.06	10.5	43.6
Duplicating, mail, and other office machine operators	152	175	.14	230	.18	15.5	51.4
Punch machine setters and setup operators, metal and plastic	63	61	.05	49	.04	−2.7	−21.4
Flight attendants	68	83	.07	109	.08	21.0	59.7
Chemical engineers	52	64	.05	51	.04	21.8	−2.3
Farm workers	1,002	863	.70	692	.53	−13.8	−30.9
Postal mail carriers	240	248	.20	330	.25	3.3	37.9
Radio and television announcers and newscasters	58	64	.05	50	.04	9.9	−12.6
Social workers	342	419	.34	570	.44	22.5	66.6
Barbers	75	83	.07	65	.05	9.8	−13.4
Station installers and repairers, telephone	58	47	.04	37	.03	−18.1	−35.6
Insurance claims clerks	78	87	.07	120	.09	12.4	54.9
Teachers' aides and educational assistants	594	700	.57	966	.74	17.9	62.8
Sheriffs and deputy sheriffs	61	62	.05	86	.07	2.9	42.3
Messengers	90	100	.08	139	.11	11.2	54.6
Correction officers	167	225	.18	314	.24	34.5	87.7
Civil engineers, including traffic engineers	188	243	.20	188	.14	29.4	.1
Telephone and cable television line installers and repairers	123	140	.11	198	.15	14.1	61.8
Textile machine setters and setup operators	58	49	.04	38	.03	−15.4	−34.7
Industrial engineers, except safety engineers	117	152	.12	116	.09	30.0	−.3
Vehicle washers and equipment cleaners	165	177	.14	254	.20	7.4	54.5
Computer operators, except peripheral equipment	241	350	.29	267	.21	45.5	11.1
Machine tool cutting operators and tenders, metal and plastic	172	164	.13	125	.10	−4.6	−27.4
Child care workers	511	563	.46	821	.63	10.1	60.5
Nursery workers	54	58	.05	85	.07	6.9	55.8
Mechanical engineers	231	309	.25	233	.18	33.6	1.0
Meat, poultry, and fish cutters and trimmers, hand	98	93	.08	138	.11	−4.3	41.5
Lathe machine tool setters and setup operators, metal and plastic	99	98	.08	74	.06	−.5	−25.0
Grinding machine setters and setup operators, metal and plastic	89	87	.07	64	.05	−2.2	−28.1
Drill machine tool setters and setup operators, metal and plastic	65	64	.05	47	.04	−.7	−27.4
Electrical and electronic assemblers	256	300	.24	218	.17	17.0	−15.0
Data-processing equipment repairers	61	106	.09	77	.06	72.8	24.8
Switchboard operators	256	330	.27	238	.18	29.1	−7.0
Electrical and electronic equipment assemblers, precision	175	205	.17	148	.11	17.5	−15.4

Table 2. Continued—Employment, by occupation, 1984 actual and 1995 projected and actual

[Numbers in thousands]

| Table 2. | Continued—Employment, by occupation, 1984 actual and 1995 projected and actual |

[Numbers in thousands]

Occupation	Total employment					Percent change, 1984–95	
	1984	Projected 1995		Actual 1995		Projected	Actual
		Level	Share (percent)	Level	Share (percent)		
Animal caretakers, except farm	71	75	.06	124	.10	6.2	75.0
Computer programmers	440	782	.64	559	.43	77.6	26.9
Adult and vocational education teachers ...	303	352	.29	587	.45	15.9	93.6
Computer systems analysts, engineers, and scientists	306	503	.41	860	.66	64.4	180.8
Structural and reinforcing metal workers ...	77	91	.07	63	.05	17.8	−17.8
Typists and word processors	922	954	.78	662	.51	3.5	−28.1
Bill and account collectors	112	144	.12	259	.20	28.4	131.1
Electrical and electronic technicians/ technologists	310	460	.37	316	.24	48.4	2.0
Welding machine setters, operators, and tenders	131	157	.13	107	.08	19.9	−18.1
Reporters and correspondents	69	83	.07	57	.04	19.9	−18.2
Custom tailors and sewers	112	123	.10	83	.06	10.5	−26.1
Emergency medical technicians	62	66	.05	140	.11	5.3	124.5
Electromechanical equipment assemblers, precision	61	75	.06	48	.04	24.0	−20.0
Adjustment clerks	130	158	.13	384	.30	21.9	196.0
Precision instrument repairers	57	65	.05	39	.03	13.4	−31.3
Service station attendants	289	287	.23	167	.13	−.8	−42.1
Electrical and electronics engineers	399	607	.49	353	.27	52.2	−11.4
Roustabouts	78	79	.06	27	.02	1.1	−65.2

	Numerical error, 1995 (projected minus actual)	Absolute percent error, 1995	Absolute percent error, 1995		Share of total job growth, 1984–95	
			Actual industry totals to projected staffing pattern	Actual staffing pattern to projected industry totals	Projected	Actual
Total, all occupations	−7,250	5.6	0.0	5.6	100.00	100.00
Cooks, institution or cafeteria	0	.1	22.4	17.8	.41	.28
Aircraft mechanics	0	.1	14.6	13.4	.10	.07
Mail clerks, except mail machine operators and postal service	0	.1	6.5	6.6	.04	.03
Supervisors of blue-collar workers	6	.3	1.3	1.7	.85	.56
Butchers and meatcutters	1	.4	13.5	10.9	−.06	−.04
Crushing and mixing machine operators and tenders	−1	.5	1.0	2.0	.03	.02
Highway maintenance workers	−1	.6	13.0	12.0	.05	.04
Cannery workers	0	.6	11.1	10.8	−.02	−.01
Farmers	9	.7	8.8	3.8	−.45	−.35
Stock clerks	−15	.8	2.0	3.2	.58	.46
Industrial machinery mechanics	−5	1.0	5.9	6.8	.17	.14
Secretaries	−34	1.0	4.5	6.0	2.00	1.52
Pharmacists	2	1.0	2.7	5.5	.10	.06
Loan and credit clerks	−2	1.4	7.7	7.9	.16	.12
Bus drivers, except school	−2	1.4	30.2	24.7	.11	.09
Tire repairers and changers	−1	1.5	4.2	5.8	.06	.05
Guards	−14	1.5	11.1	11.5	1.39	1.02
Brokers, real estate	−1	1.6	47.3	10.5	.06	.05
Supervisors of police and detectives	2	1.8	14.9	10.7	.06	.03
Purchasing agents, except wholesale, retail, and farm products	−4	2.0	8.6	9.0	.21	.16
Bookkeeping, accounting, and auditing clerks	−59	2.7	1.0	3.8	.87	.85
Order clerks for materials, merchandise, and service	−9	2.8	4.2	.6	.33	.26
Public relations specialists and publicity writers	−3	2.8	10.1	11.5	.16	.12
Cabinetmakers and bench carpenters	−4	2.8	2.5	2.7	.12	.10
Welders and cutters	−10	2.8	12.4	10.8	.25	.21
Dental assistants	−6	3.0	9.8	12.1	.26	.20
Dispatchers, except police, fire, and ambulance	−5	3.1	4.4	8.6	.15	.12

			Absolute percent error, 1995		Share of total job growth, 1984–95	
Occupation	**Numerical error,1995 (projected minus actual)**	**Absolute percent error, 1995**	**Actual industry totals to projected staffing pattern**	**Actual staffing pattern to projected industry totals**	**Projected**	**Actual**
Waiters and waitresses	61	3.2	15.2	10.1	2.54	1.49
Drywall installers and finishers	4	3.2	8.6	3.9	.07	.03
Pressing machine operators and tenders, textile, garment, and related	3	3.2	15.7	15.2	−.06	−.05
Stenographers	−3	3.3	3.4	7.8	−.44	−.29
Numerical control machine tool operators and tenders, metal/plastic	−3	3.3	20.9	19.9	.10	.08
Pipelayers and pipelaying fitters	2	3.6	1.6	5.2	.04	.02
Food counter, fountain, and related workers	−65	3.8	6.5	9.9	1.56	1.35
Paralegals	−4	3.9	20.7	10.9	.32	.24
Licensed practical nurses	−29	4.0	10.0	12.6	.64	.56
Machine-forming operators and tenders, metal and plastic	−7	4.0	13.4	7.2	−.02	.01
Bank tellers	−23	4.2	12.2	8.7	.16	.21
Machine builders and other precision machine assemblers	3	4.3	14.3	20.8	.07	.04
Medical assistants	−10	4.7	8.2	12.4	.49	.38
Electricians	27	4.8	11.6	5.5	.51	.23
Truck drivers, light and heavy	−137	5.2	4.1	8.4	2.42	2.26
Photographers	6	5.2	10.1	3.1	.18	.10
Production, planning, and expediting clerks	−13	5.5	17.9	13.0	.13	.14
Packaging and filling machine operators and tenders	−19	5.8	5.0	2.6	.10	.15
Textile drawout and winding machine operators and tenders	11	5.9	11.0	4.7	−.24	−.21
Sewing machine operators, nongarment ...	8	5.9	11.2	2.4	.00	−.03
Carpet installers	4	5.9	20.2	9.2	.06	.03
Salespersons, retail	−241	6.1	1.6	4.6	2.78	2.95
Heating, air-conditioning, and refrigeration mechanics and installers	14	6.2	12.1	5.6	.23	.10
Police patrol officers	−25	6.3	7.0	12.0	.27	.30
Janitors and cleaners, including maids/ housekeeping cleaners	−196	6.3	6.7	12.6	2.75	2.74
Extruding and forming machine setters, operators, and tenders	7	6.4	8.7	3.0	.04	.00
Carpenters	64	6.6	12.2	3.8	.56	.11
Travel agents	9	6.7	14.1	9.5	.27	.15
Sheet metal workers and duct installers	16	6.8	2.6	4.5	.19	.06
Employment interviewers, private or public employment service	6	7.2	23.0	13.3	.16	.08
Cost estimators	−13	7.3	7.3	.3	.17	.18
Central office and PBX installers and repairers	6	7.3	9.1	17.8	.05	.01
Insulation workers	−5	7.4	4.7	3.4	.04	.05
Chemists	−7	7.4	2.6	11.3	.03	.05
Personnel clerks, except payroll and timekeeping	10	7.7	7.9	.7	.12	.04
Helpers, construction trades	−41	7.8	6.1	.4	.11	.25
Librarians, professional	−13	8.2	9.6	16.0	.07	.10
Chemical equipment controllers, operators, and tenders	6	8.6	1.4	9.6	.01	−.02
Police detectives and investigators	−6	8.9	.1	7.5	.03	.05
Plastic molding machine operators and tenders, setters, and setup operators	15	9.0	6.7	2.7	.26	.12
Registered nurses	−179	9.2	3.7	12.3	2.70	2.63
Maintenance repairers, general utility	−121	9.4	5.5	7.4	1.08	1.27
Physicians	52	9.4	22.3	9.5	.70	.26
Painters and paperhangers, construction and maintenance	−40	9.5	2.3	5.8	.10	.24
Refuse collectors	12	10.2	46.4	22.8	.12	.03
Welfare eligibility workers and interviewers	−11	10.2	2.2	8.3	.08	.10
Concrete and terrazzo finishers	−13	10.3	2.0	8.3	.11	.13

| Table 2. | Continued—Employment, by occupation, 1984 actual and 1995 projected and actual |

[Numbers in thousands]

Occupation	Numerical error, 1995 (projected minus actual)	Absolute percent error, 1995	Absolute percent error, 1995		Share of total job growth, 1984–95	
			Actual industry totals to projected staffing pattern	Actual staffing pattern to projected industry totals	Projected	Actual
Mobile heavy equipment mechanics	11	10.4	8.1	3.6	.11	.02
New accounts clerks, banking	−12	10.4	17.7	9.0	.08	.10
Data entry keyers, except composing	−44	10.7	4.6	7.9	.01	.20
Institutional cleaning supervisors	14	10.8	28.8	12.8	.21	.08
Taxi drivers and chauffeurs	−12	10.8	6.0	18.0	.07	.10
Sewing machine operators, garment	57	11.1	2.7	9.2	−.66	−.70
Payroll and timekeeping clerks	19	11.4	16.7	3.7	−.07	−.13
Artists and commercial artists	−31	11.6	2.7	5.7	.35	.37
Combination machine tool setters, setup operators, operators, and tenders	13	11.6	3.8	13.7	.17	.06
Cooks, restaurant	−83	11.7	4.2	9.4	.90	.98
Respiratory therapists	−9	11.7	.8	12.2	.07	.08
Machine feeders and offbearers	31	11.8	11.7	.8	.11	−.06
Lawyers	76	11.8	9.5	3.8	1.22	.51
Firefighters	27	12.1	27.7	12.1	.20	.03
Machinists	46	12.1	.4	11.9	.23	−.04
Clinical lab technologists and technicians	−34	12.1	2.3	12.7	.09	.21
Aircraft pilots and flight engineers	−11	12.2	15.5	24.6	.10	.12
Hairdressers, hairstylists, and cosmetologists	75	12.3	13.5	.2	1.01	.37
Food preparation workers	−152	12.4	.0	11.5	1.24	1.51
Home appliance and power tool repairers	10	12.6	16.2	.0	.07	.01
Child care workers, private household	39	12.7	6.4	5.9	−.34	−.40
Cutting and slicing machine setters, operators, and tenders	−12	13.2	10.9	1.9	.00	.05
Bus drivers, school	−55	13.2	14.6	23.8	.33	.47
Writers and editors, including technical writers	−38	13.4	6.9	1.0	.33	.39
Library assistants and bookmobile drivers	−16	13.4	2.8	15.4	.06	.11
Insurance sales workers	59	14.2	23.5	6.1	.30	−.05
Wholesale and retail buyers, except farm products	27	14.6	18.2	1.6	.16	−.01
Cashiers	−453	14.7	8.8	7.1	3.81	4.57
Insurance adjusters, examiners, and investigators	−24	14.9	12.1	3.7	.18	.23
Science and mathematics technicians	35	15.2	25.3	9.3	.22	.00
Automotive body and related repairers	32	15.4	24.4	5.9	.25	.03
Bricklayers and stonemasons	23	15.4	20.7	3.3	.10	−.03
Cleaners and servants, private household	−75	15.4	20.1	5.9	−.77	−.21
Personnel, training, and labor relations specialists	−48	15.5	15.5	.7	.26	.38
Underwriters	15	15.6	19.4	1.3	.14	.03
Woodworking machine operators and tenders, setters, and setup operators	10	15.7	15.9	.8	.03	−.02
Inspectors and compliance officers, except construction	−26	16.1	11.3	5.1	.08	.17
Machine assemblers	9	16.4	2.4	21.7	.06	.01
Hotel desk clerks	−23	16.5	8.6	8.6	.11	.17
Drafters	53	16.8	3.4	10.9	.26	−.05
Plumbers, pipefitters, and steamfitters	64	16.9	21.7	3.6	.36	−.03
Farm managers	26	17.0	17.9	.8	.10	−.04
Gardeners and groundskeepers, except farm	94	17.2	36.2	14.1	.26	−.22
Physical therapists	−19	17.8	6.6	12.2	.17	.19
Designers	−55	17.9	4.9	4.3	.34	.47
Brokerage clerks	−13	17.9	11.2	6.4	.06	.10
Automotive mechanics	131	17.9	28.9	7.9	.95	.09
Dental hygienists	−23	18.0	6.5	12.2	.15	.20
Bus and truck mechanics and diesel engine specialists	47	18.1	28.0	7.4	.33	.02
Water and liquid waste treatment plant and systems operators	−18	18.4	5.2	13.8	.05	.11

Table 2.	Continued—Employment, by occupation, 1984 actual and 1995 projected and actual					

[Numbers in thousands]

Occupation	Numerical error, 1995 (projected minus actual)	Absolute percent error, 1995	Absolute percent error, 1995		Share of total job growth, 1984–95	
			Actual industry totals to projected staffing pattern	Actual staffing pattern to projected industry totals	Projected	Actual
Inspectors, testers, and graders, precision	123	18.4	5.2	9.0	.57	−.14
Driver/salesworkers	−63	18.5	15.6	6.9	.15	.37
Cooks, short order and fast food	−148	18.9	9.3	9.4	.58	1.04
Order fillers, wholesale and retail sales	−43	19.0	18.1	.8	−.04	.16
Roofers	25	19.0	24.7	3.4	.12	−.03
Counselors	−34	19.9	1.9	17.3	.12	.22
Office machine and cash register servicers	12	19.9	18.8	4.5	.11	.02
Laundry and drycleaning machine operators and tenders, except pressing	−36	19.9	5.0	14.9	.09	.22
Millwrights	16	20.0	15.1	3.6	.04	−.04
Customer service representatives, utilities	−31	20.0	31.5	16.5	.11	.21
Industrial truck and tractor operators	−96	20.1	18.4	2.7	−.28	.22
Upholsterers	13	20.1	16.8	5.6	.05	−.02
Hosts and hostesses, restaurant/lounge/ coffee shop	−52	20.3	12.3	10.7	.28	.42
Reservation and transportation ticket agents and travel clerks	−30	20.5	4.8	22.2	.06	.17
File clerks	−61	20.8	16.0	6.8	.05	.29
Recreation workers	−48	20.9	4.1	15.2	.16	.32
Psychologists	−29	21.0	6.5	11.6	.11	.20
Electronics repairers, commercial and industrial equipment	16	21.1	15.3	4.4	.09	−.01
Bartenders	82	21.2	35.7	10.9	.62	.08
Statistical clerks	−17	21.5	16.0	9.2	−.05	.03
Dentists	35	21.5	34.9	8.5	.25	.02
Tool and die makers	32	21.9	7.8	12.2	.08	−.08
Radiologic technologists and technicians ..	−38	22.0	11.4	11.9	.16	.27
Musicians	−59	22.2	2.4	22.1	.15	.36
Accountants and auditors	223	22.5	23.0	.0	1.94	.38
Producers, directors, actors, and entertainers	−22	22.6	2.2	12.6	.09	.16
Amusement and recreation attendants	−64	22.7	1.0	21.4	.24	.44
Head sawyers and saw machine operators and tenders, setters, and setup operators	15	22.7	22.6	1.2	.03	−.04
College and university faculty	−194	22.8	4.9	18.8	−.65	.38
Paper goods machine setters and setup operators	12	23.0	27.7	3.7	.02	−.04
Sales agents, real estate	62	23.1	34.1	5.6	.26	−.09
Dispatchers, police, fire, and ambulance ...	−19	23.1	10.8	13.9	.04	.11
Duplicating, mail, and other office machine operators	−55	23.7	21.0	9.1	.15	.34
Punch machine setters and setup operators, metal and plastic	12	23.9	7.6	12.9	−.01	−.06
Flight attendants	−26	24.2	3.9	27.1	.09	.18
Chemical engineers	13	24.6	15.3	9.2	.07	−.01
Farm workers	171	24.7	11.7	6.7	−.87	−1.33
Postal mail carriers	−83	25.1	6.6	19.7	.05	.39
Radio and television announcers and newscasters	13	25.8	10.2	17.4	.04	−.03
Social workers	−151	26.5	10.5	15.9	.48	.98
Barbers	17	26.8	30.2	2.1	.05	−.04
Station installers and repairers, telephone	10	27.1	7.6	18.1	−.07	−.09
Insurance claims clerks	−33	27.5	22.1	8.7	.06	.18
Teachers' aides and educational assistants	−266	27.6	7.6	20.8	.66	1.60
Sheriffs and deputy sheriffs	−24	27.7	17.0	12.9	.01	.11
Messengers	−39	28.1	23.8	5.6	.06	.21
Correction officers	−89	28.3	20.0	10.3	.36	.63
Civil engineers, including traffic engineers	55	29.3	22.9	4.9	.34	.00

Table 2. Continued—Employment, by occupation, 1984 actual and 1995 projected and actual

[Numbers in thousands]

Occupation	Numerical error, 1995 (projected minus actual)	Absolute percent error, 1995	Absolute percent error, 1995		Share of total job growth, 1984–95	
			Actual industry totals to projected staffing pattern	Actual staffing pattern to projected industry totals	Projected	Actual
Telephone and cable television line installers and repairers	−59	29.5	38.1	13.7	.11	.33
Textile machine setters and setup operators	11	29.6	39.1	4.9	−.06	−.09
Industrial engineers, except safety engineers	35	30.5	4.9	21.0	.22	.00
Vehicle washers and equipment cleaners .	−78	30.5	2.6	29.0	.08	.39
Computer operators, except peripheral equipment	83	31.0	35.3	1.6	.68	.11
Machine tool cutting operators and tenders, metal and plastic	39	31.4	17.8	10.4	−.05	−.20
Child care workers	−258	31.4	19.1	15.5	.32	1.33
Nursery workers	−27	31.4	16.3	16.1	.02	.13
Mechanical engineers	75	32.3	14.5	14.8	.48	.01
Meat, poultry, and fish cutters and trimmers, hand	−45	32.4	6.0	27.9	−.03	.17
Lathe machine tool setters and setup operators, metal and plastic	24	32.6	13.0	15.4	.00	−.11
Grinding machine setters and setup operators, metal and plastic	23	36.1	21.0	13.3	−.01	−.11
Drill machine tool setters and setup operators, metal and plastic	17	36.8	16.6	17.2	.00	−.08
Electrical and electronic assemblers	82	37.6	4.6	43.0	.27	−.16
Data-processing equipment repairers	29	38.5	33.2	3.1	.28	.07
Switchboard operators	92	38.9	48.9	7.4	.46	−.08
Electrical and electronic equipment assemblers, precision	57	38.9	6.8	48.7	.19	−.12
Animal caretakers, except farm	−49	39.3	13.2	22.4	.03	.23
Computer programmers	223	40.0	46.2	3.3	2.13	.51
Adult and vocational education teachers ...	−235	40.1	26.4	15.1	.30	1.22
Computer systems analysts, engineers, and scientists	−356	41.5	39.8	3.6	1.23	2.38
Structural and reinforcing metal workers ...	27	43.3	47.6	2.8	.09	−.06
Typists and word processors	292	44.0	55.5	8.2	.20	−1.11
Bill and account collectors	−115	44.5	42.5	3.1	.20	.63
Electrical and electronic technicians/ technologists	144	45.5	25.7	17.7	.94	.03
Welding machine setters, operators, and tenders	50	46.3	29.6	13.8	.16	−.10
Reporters and correspondents	26	46.6	16.6	10.9	.09	−.05
Custom tailors and sewers	41	49.4	47.9	3.2	.07	−.12
Emergency medical technicians	−74	53.1	39.0	23.1	.02	.33
Electromechanical equipment assemblers, precision	27	55.1	.7	42.3	.09	−.05
Adjustment clerks	−226	58.8	59.5	.4	.18	1.09
Precision instrument repairers	26	65.0	21.4	22.4	.05	−.08
Service station attendants	120	71.4	85.6	16.3	−.01	−.52
Electrical and electronics engineers	253	71.8	41.4	20.2	1.30	−.20
Roustabouts	52	190.1	37.6	114.6	.01	−.22

was expected to lead to declining demand for vocational education and training. However, the growing number of both entry-level and experienced workers in need of vocational training or retraining in order to update job skills and keep up with rapidly changing technology had more of an impact on demand for these teachers than was anticipated.

Likewise, errors in projections for computer-related occupations were a significant factor contributing to the underestimate of employment for professional specialty occupations.[6] A closer examination of the simulated matrices for certain others reveals the cause of the errors to be largely a result of incorrect assumptions behind the projections of

the utilization of these workers by industry. (See table 4.) In the case of computer programmers, highly significant increases were projected across all industries as improvements in computer hardware and software made the technology more versatile, cheaper, and easier to use. But it was precisely these improvements that led to more moder-

ate growth, as computer users, other computer professionals, and automation were able to take over many of the tasks previously performed only by programmers. Similarly, moderate increases were expected for computer operators and operators of peripheral electronic data-processing equipment across all industries as computer usage rose throughout the economy. However, expanding technologies not only reduced both the size and cost of computer equipment, but also automated the tasks previously performed by numerous operators.

In contrast to the increases in employment projected for programmers, significant *decreases* were projected across all industries for data entry keyers, except composing, as a result of anticipated technological change. Although the trend was correctly anticipated, technology appears to have had an even greater impact on these workers than was projected. Virtually the entire error in the projections for data entry keyers, composing, can be attributed to incorrect staffing patterns.

Overall industry employment for health services was significantly underestimated for hospitals, as well as doctors, nursing homes, and miscellaneous health services. Absolute errors for health-related occupations ranged from 53 percent for emergency medical technicians to 1 percent for pharmacists. Although the industry projections had a profound impact on estimated employment for these occupations, much of the error in the individual health-related occupations also can be attributed to errors in staffing patterns. (See table 5.) For example, the 1984 projection of a growing demand for physicians' assistants was realized as the health care industry began to focus more and more on cost containment. The Bureau projected the employment of physicians' assistants to increase moderately in hospitals and significantly in outpatient care facilities. However, the projection was too conservative. Similarly, the im-

pact of a growing demand for rehabilitation and long-term care services was underestimated, as the employment of occupational therapists, projected to grow much faster than average at 36 percent, grew by a phenomenal 159 percent. In the case of licensed practical nurses, the projection was relatively accurate, off by only 4 percent, a result of both underprojected industry totals for health services and incorrect staffing patterns, which offset each other. Along with changes in patient care requirements, the trend toward a reliance on nursing personnel with higher levels of clinical skill was expected to slow growth among licensed practical nurses. However, rapid industry growth in

health services and an aging population spurred more demand than was originally expected in nursing homes and residential care facilities.

The BLS evaluation of industry projections also revealed that employment in manufacturing was projected to increase over the 1984–95 period, rather than decline. As a result, the majority of the occupations with declining employment that were projected to increase are in manufacturing and include engineers, precision production workers, machine operators and tenders, and handworkers and fabricators. For example, the employment of workers concentrated in industries that manufacture computer and office equipment, electrical industrial

Table 3.	Sources of projection error for education-related occupations, 1995, and projected and actual share of total job growth, 1984–95				
Occupation	Absolute percent error	Absolute percent error (actual industry totals to projected staffing pattern)	Absolute percent error (actual staffing pattern to projected industry totals)	Share of total job growth	
				Projected	Actual
College and university faculty	22.8	4.9	18.8	−0.65	0.38
Adult and vocational education teachers	40.1	26.4	15.1	.30	1.22
Teachers' aides and educational assistants	27.6	7.6	20.8	.66	1.60

Table 4.	Sources of projection error for computer-related occupations, 1995, and projected and actual share of total job growth, 1984–95				
Occupation	Absolute percent error	Absolute percent error (actual industry totals to projected staffing pattern)	Absolute percent error (actual staffing pattern to projected industry totals)	Share of total job growth	
				Projected	Actual
Computer programmers	40.0	46.2	3.3	2.13	0.51
Computer operators, except of peripheral equipment	31.0	35.3	1.6	.68	.11
Operators of peripheral electronic data-processing equipment	100.7	108.4	4.2	.12	−.05
Data entry keyers, except composing	10.7	4.6	7.9	.01	.20
Data entry keyers, composing	79.8	79.9	5.3	.06	−.03

apparatus, electronic components and accessories, and aerospace components, such as those workers in occupations listed in table 6, was projected to grow slightly when, in fact, it fell from 1984 to 1995. As indicated in the table, the projected industry totals were the major factor contributing to the error for these occupations.

Implications for future analyses

The most recent occupational projections to be evaluated were those ending in the year 1990. Looking at the major occupational groups, we can readily see that the projections for 1995 appear more accurate overall than do the 1990 projections. No major group was off by more than in the past, and the largest absolute error for a major group was only 11.3 percent, compared with 22 percent in 1990 for the group, marketing and sales occupations. It is important to remember, however, that projections on such an aggregate scale are, by their nature, uncertain. Because individual occupations, and not major groups, are analyzed, errors are compounded as these occupations are combined. The detailed occupations that make up each group can be large enough that any error in their individual projection can affect the outcome for the overall major group.

In developing the detailed 1984–95 occupational projections, analysts reviewed all available data from both the OES survey and the Current Population Survey (CPS) and projected changes in the occupation-industry cells accordingly, bringing knowledge gained through experience and through studies undertaken in preparing the *Occupational Outlook Handbook*. As a result, numerous changes were made to the occupational coefficients—changes affecting the proportion of an occupation within each industry—as analytical judgments were translated into numerical estimates. A BLS bulletin indicates that, in order to maintain consistency among judgments of the analysts,

the following guidelines for increasing or decreasing coefficients were implemented to develop the initial projected coefficients for all occupations across all industries:[7] small change—1 to 4 percent; moderate change—5 to 9 percent; significant change—10 to 20 percent; and very significant change—20 or more percent. The evaluation of the 1984–95 projections has provided analysts the first chance to look back at their work.

Prior to the current evaluation, every BLS evaluation of its occupational projections revealed the projections to be conservative. As the analysis of both individual projections for detailed occupations and percent-change ranges in the *Occupational Outlook Handbook* indicate, the 1984–95 projections are also on the conservative side. The majority of the projections were clustered around average growth, when, in actuality, more occupations appear to have grown much faster than the average or to have declined. The inherent conservatism contributed to overall errors in staffing patterns as well, and part of the reason appears to have been that analysts were too conservative in projecting the matrix coefficients. This trend toward conservatism is recognized by the Bureau, and since 1984, guidelines for projecting the changes in the occupational co-

Table 5.	Sources of projection error for health-related occupations, 1995, and projected and actual share of total job growth, 1984–95				
Occupation	Absolute percent error	Absolute percent error (actual industry totals to projected staffing pattern)	Absolute percent error (actual staffing pattern to projected industry totals)	Share of total job growth	
				Projected	Actual
Physicians' assistants	42.4	34.7	11.4	0.07	0.16
Occupational therapists	47.4	39.9	13.0	.05	.15
Occupational therapy assistants and aides	41.9	33.8	13.6	.01	.03
Emergency medical technicians	53.1	39.0	23.1	.02	.33
Licensed practical nurses	4.0	10.0	12.6	.64	.56

Table 6.	Sources of projection error for production workers, 1995, and projected and actual share of total job growth, 1984–95				
Occupation	Absolute percent error	Absolute percent error (actual industry totals to projected staffing pattern)	Absolute percent error (actual staffing pattern to projected industry totals)	Share of total job growth	
				Projected	Actual
Aircraft assemblers, precision	27.1	16.0	52.1	0.02	−0.01
Electrical and electronic equipment assemblers, precision	38.9	6.8	48.7	.19	−.12
Electromechanical equipment assemblers, precision	55.1	.7	42.3	.09	−.05
Electrical and electronic assemblers	37.6	4.6	43.0	.27	−.16

efficients have been revised. For example, in developing the most recent round of projections from 1994 to 2005, the Bureau set forth the following guidelines for interpreting the projected range of changes in the coefficients: small change—10 percent; moderate change—20 percent; significant change—35 percent; and very significant change—50 percent or more. Expanding the range for identifying small, moderate, and large changes should clearly have an impact on the conservatism inherent in the methodology.

With the help of the simulated matrices prepared for the current evaluation, however, it has been possible to pinpoint the *major* source of error for each detailed occupation. Although the impact of good industry projections on developing good occupational projections cannot be underestimated, the chief weakness appears to be in projecting staffing patterns. In the simulated matrix for which the projected staffing patterns were applied to actual 1995 industry totals, the sum of the absolute errors, weighted by 1995 employment, was 7.7 percent. By contrast, in the matrix for which actual 1995 staffing patterns were applied to projected 1995 industry totals, the sum of the absolute errors, weighted by 1995 employment, dropped to 5.6 percent.

In addition to the influence of conservative coefficient change factors on the projections, the impacts of features such as technological change and trends that were not fully realized contributed significantly to errors in staffing patterns. Incorrect analytical judgments relating to the rate and impact of technological change and to trends such as outsourcing and the growth of temporary help agencies played a large role in this regard. The analysis behind the projection for typists is a case in point. As mentioned by Neal Rosenthal in the introduction to this article, the use of computers and word-processing equipment was expected to have a negative impact on the employment of typists and word

processors across all industries. But because it was assumed that a very large number of establishments were already using such equipment, and because future technological advances in computing technology were not fully realized at the time, the declining trend in the employment of typists and word processors was not expected to accelerate. The analysis wound up underestimating the impact of changing technology, as actual employment in 1995 fell short of projected employment by more than 290 thousand workers.

Similar to unforeseeable events such as the reduction in defense spending resulting from the breakup of the Soviet Union, changes brought about by technology are becoming harder to predict. For example, the impact of Internet technology is nowhere near being fully realized today, just as the expansion of computer technology into both the home and the workplace, as well as the impact of the personal computer, was recognized, but not fully accounted for, in past projection cycles. □

Footnotes

[1] In discussing the accuracy of the projected distribution of employment growth among major groups, it is worth addressing a claim made by John H. Bishop in a recent article evaluating the accuracy of BLS projections that "The BLS systematically under-projects the growth of skilled jobs and over-projects the growth of unskilled jobs" (John H. Bishop, "Is the Market for College Graduates Headed for a Bust? Demand and Supply Responses to Rising College Wage Premiums," *New England Economic Review*, May–June 1996, pp. 115–34, quote from p. 123). In his comparison of projected and actual growth for the major occupational groups from 1984 to 1995, Bishop concluded that BLS projected shares of employment growth for professional, technical, and managerial jobs, and for operative, laborer, and service jobs were "far off the mark." If we examine the projected and actual shares of employment growth presented in table 1, however, this does not appear to be the case. Using Current Population Survey-(CPS) based data as the "actual" data to compare with the projections, rather than data based on the Occupational Employment Statistics (OES) survey, which the Bureau uses in developing its projections, Bishop concluded that, from 1984 to 1995, professional, technical, and managerial jobs accounted for 58.3 percent of employment growth,

and operative, laborer, and service jobs accounted for 15.9 percent. However, OES-survey-based data paint a different picture. The problem is that the two data sources are not comparable when one estimates employment growth shares for the major occupational groups. BLS industry-occupation data (see table 1) indicate that professional, technical, and managerial jobs actually accounted for only 38.5 percent of employment growth from 1984 to 1995, which is much closer to the projected 35.5 percent. Likewise, operative, laborer, and service jobs accounted for 26.3 percent, only slightly lower than the projected 27.8 percent. (See John H. Bishop and Shani Carter, "How accurate are recent BLS occupational projections?" *Monthly Labor Review*, October 1991, pp. 37–43; and John H. Bishop and Shani Carter, "The Worsening Shortage of College-Graduate Workers," *Educational Evaluation and Policy Analysis*, Fall 1991, pp. 221–46, as well as Bishop, "The Market for College Graduates.")

[2] More details on assumptions leading to the overprojection of engineers are presented in *Occupational Outlook Quarterly* (Bureau of Labor Statistics, Fall 1997).

[3] Details on all 348 occupations included in the evaluation are available from the Office of Employment Projections. Data comparing employment, percent changes, and employment growth categories for all 348 occupations included in the evaluation appear in the Fall 1997 *Occupational Outlook Quarterly*.

[4] Only 132 occupations were covered in the evaluation of the 1990 projections. (See Neal H. Rosenthal, "Evaluating the 1990 projections of occupational employment," *Monthly Labor Review*, August 1992, pp. 32–48.)

[5] See pages 9–15, this issue.

[6] The detailed professional occupation with the largest underestimate of employment was computer engineers, scientists, and systems analysts. So as not to lose a group with significant employment change in the evaluation, the three occupations were combined in order to accommodate the change in the occupational classification when computer engineers and the residual, all other computer scientists, were added to the OES survey in 1989. Though it is not classification pure—that is to say, a change occurred with the addition of computer engineers in 1989—the combined group is assumed to account for the same group of workers for which projections were developed in 1984. The OES survey definition of what computer engineers do is "Analyze data processing requirements to plan EDP system to provide system capabilities required for projected work loads. Plan layout and installation of new systems or modifications of existing system. May set up and control analog or hybrid computer systems to solve scientific or engineering problems" (*Occupational Employment Statistics Dictionary of Occupations: 1988–1996* (Bureau of Labor Statistics, September 1995)). Because the title "computer engineer" is often interpreted to denote engineers who design computer hardware, it is likely that some workers in the group were being collected as part of all other engineers or as electrical and electronics engineers. However,

the historical time series does not reveal any great shift in employment when the separate title was added, indicating that computer engineers were already distributed between electrical and electronics engineers and other computer professionals. CPS data show a similar trend, and there is no separate category for computer engineers.

Some shift in employment away from engineers probably accounts for a portion of the growth in this occupation. Nonetheless, even with the addition of the title "computer engineer," the remarkable growth of computer-related occupations was underestimated, in large part due to the unanticipated rapid advancement of computing technology, particularly the expansion of personal computers. Over the 1984–95 period, the employment of computer systems analysts and scientists was projected to increase 64 percent, making this occupation one of the 10 projected fastest growing ones. However, employment actually increased 181 percent over the period.

[7] See *Employment Projections for 1995: Data and Methods*, Bulletin 2253 (Bureau of Labor Statistics, April 1986).

Technical note

Framework of the projections. The 1984–95 projections of occupational employment were developed within the framework of an industry-occupation matrix containing 378 industries and more than 500 occupations. Data used to develop the 1984 matrix and projected 1995 matrix came from a variety of sources. For industries covered by the Occupational Employment Statistics (OES) survey, the most current survey data were used to develop the occupational distribution or staffing patterns for estimating 1984 wage and salary employment. Employment by occupation in each industry was derived by multiplying the occupational distribution of employment by 1984 wage and salary worker employment for each industry, each of which was obtained from the BLS Current Employment Statistics (CES) survey. Both the CES and OES surveys are surveys of business establishments, covering only wage and salary workers. The 1984 CPS data were used to develop the occupational distribution patterns for workers in agriculture and private households, as well as to develop economywide estimates of self-employed and unpaid family workers by occupation. Occupational distribution patterns for the Federal Government were developed from data compiled by the Office of Personnel Management. Data from the National Center For Education Statistics (NCES) were used for teachers, and data from other independent sources were utilized for select occupations.[1]

The most recent OES survey data available for developing the 1984 matrix came from 1991 for mining, construction, finance, insurance, real estate, and services, other than hospitals and education; from 1982 for trade, transportation, communications, public utilities, and State and local governments; and from 1983 for manufacturing industries and hospitals. The OES survey occupational classification system was revised significantly in 1983, to make it compatible with the newly released Standard Occupational Classification. As a result, only the 1983 survey of manufacturing and hospitals conformed to the 1983 classification, so BLS analysts "forced" the 1981 and 1982 data into the new 1983 configuration.[2] However, some occupations were split into more than one occupation or had not been previously identified separately. One of the difficulties in evaluating the 1984–95 set of projections results from the 1984 matrix being constructed with OES survey data collected prior to 1983. The Bureau has developed a national industry-occupation matrix time series covering the 1983–95 period. The series is as consistent as possible with the occupational classification used in the 1994 matrix, which was the most current matrix available when the historical time series were developed.[3] The actual 1995 employment data used for purposes of the current evaluation were taken from that time series. The 1986 matrix, the first matrix in which all of the OES survey data came from surveys conducted after 1983, was used to develop the 1984 data. For this reason, the original 1984–95 published matrix data were not comparable to the actual 1984 and 1995 data published in the historical time series.

In order to reconcile the projected matrix with the historical time series for the purpose of the evaluation, simulated 1984–95 projections were created. To develop these projections, each employment cell coefficient (percent of industry employment accounted for by the occupation) in the 1984 matrix in the historical time series was multiplied by the 1984–95 percent change in that coefficient (change factor) in the original 1984 and 1995 matrices, and the resulting distribution of occupational employment by industry was then benchmarked to the projected industry employment in the original 1995 industry projections. In the resulting simulated projections for most occupations, the projected 1984–95 percent changes remained the same or were very close to the original projections, but the data were defined consistently with the historical time series. The employment of self-employed and unpaid family workers was taken directly from the original published 1984–95 projections, because the CPS data in 1984 were comparable to the CPS data in 1995, with some minor exceptions. Occupations in the historical matrix that did not appear in the original 1984–95 projections matrix were aggregated into the appropriate residuals; for example, loan interviewers were aggregated into the "all other clerical occupations" residual.

Once the data were prepared, the next task was to select the occupations for evaluation. Occupations were selected only if they met certain criteria. To begin with, all residual occupations were dropped from the evaluation, because occupations for which there were only aggregated data were not necessarily comparable, as indicated in the preceding paragraph. Of the remaining detailed occupations, only those for which the definition remained comparable over the projection period were included. Occupations also were dropped if examination of the historical time series indicated inconsistencies with logical expectations for the year-to-year total employment trend. Because occupations covered in the OES surveys changed over time as improvements in the quality of the survey were made, problems occurred in the development of comparable time series. In order to make the historical time series as consistent as possible with the 1994 matrix, a number of steps were taken to achieve uniformity over time.[4] For example, occupations appearing in an earlier matrix that were collapsed in the 1994 matrix were also collapsed in the time series. Finally, seven occupations were eliminated because the base-year numbers from the original 1984 published matrix were so different from those in the historical 1984 matrix, that they did not appear comparable. Consequently, additional occupations were eliminated because the difference in employment between the original 1984 published matrix and the 1984 historical matrix was too large, based on certain criteria.[5]

Other data errors. The discussion in the text of the article, as well as in this technical note, has focused on errors in individual projections that can be traced back to incorrectly anticipated changes in staffing patterns or incorrect industry projections. Also, comparability problems stemming from inconsistencies in the classification system over time were highlighted. However, it is important to bear in mind that other data problems exist and that differences in actual and pro-

jected employment levels are not always due to projection errors. Consequently, real employment trends in an occupation may not necessarily be measured by comparable surveys 10 years apart. And although survey data are generally considered reliable, sampling and response errors certainly had an impact on the data in both the initial and the terminal years of the projection period evaluated. □

Footnote to the technical note

[1] Prior to 1990, NCES data were used for preschool teachers and kindergarten and elementary school teachers. However, in the 1990, 1992, and 1994 matrices, OES survey data were employed for these occupations, but the OES classification broke teachers up into elementary school teachers, on the one hand, and preschool and kindergarten teachers, on the other. Similar difficulties were encountered with higher education teachers. For these reasons, employment data for elementary school teachers and preschool and kindergarten teachers were rolled up in the historical time series, but dropped from the current evaluation.

[2] A comprehensive methodological statement outlining BLS data sources and procedures is published in *Employment Projections for 1995*.

[3] For more information on the methodology used to develop the projections, see the appendix to the series of articles under "Employment Outlook: 1994–2005," *Monthly Labor Review*, November 1995, pp. 85–87; and BLS *Handbook of Methods*, Bulletin 2490 (Bureau of Labor Statistics, April 1997).

[4] For a more comprehensive methodological statement, *The National Industry-Occupation Employment Matrix: 1983–1995 Time Series*, a technical note available from the Office of Employment Projections.

[5] Specifically, occupations were dropped if the original 1984 level of employment differed by more than 40,000, but less than 100,000, from the actual 1984 level in the historical matrix, and the percent difference in 1984 employment was more than 50 percent; or if the original 1984 level of employment differed by more than 100,000 from the actual 1984 level in the historical matrix, and the percent difference in 1984 employment was more than 30 percent.

Errata

In the article, "Employment trends in textiles and apparel, 1973–2005," *Monthly Labor Review,* August 1997, table 6 (page 33) is mislabeled. The title should be (correction in italics):

Table 6. Employment in the *apparel* industry: 1983, 1994, 2005

Also, in the table, the total for all occupations in 1983 is 1,163 (in thousands).