

New economic projections through 1990—an overview

BLS has updated its 1978–79 projections for the decade of the 1980's to reflect recent social, political, and economic developments; three scenarios, each based on a unique set of assumptions about the future, provide a range of possible growth paths

RONALD E. KUTSCHER

The economic and employment outlook described in the following articles was constructed as a regular part of the Bureau's medium-term projections program. This program includes a series of closely related projections encompassing the labor force by age, sex, and race;¹ gross national product projections, in total and by major demand and income components; industry output and employment; and occupational requirements, overall and by industry. Estimates are derived through the use of an integrated econometric framework, and are updated by BLS every 2 years.

The following articles are based on three alternative projections to 1990. These scenarios cover a number of alternative assumptions yielding a reasonably broad span of employment and GNP levels for 1990. It is likely, but of course not certain, that the actual course of economic and employment development will fall within such a wide band. Also, while alternative assumptions are used for a few of the more important variables, it was not possible to produce alternatives for all variables. This would quickly have multiplied the number of projections confronting the user, and rapidly expanded the workload entailed in their completion. The three alternatives do not conveniently fall into "high" "medium," or "low" categories. Therefore, users of the projections will find it necessary to review the

underlying assumptions to determine which of the three scenarios seems most appropriate for their purposes.

Brief summary of the projections

Labor force. The Bureau of Labor Statistics developed three labor force growth scenarios for the next decade: a high-growth projection, which assumes rapid growth in the labor force participation of women and the convergence of participation rates for black men and white men under age 65; a middle-growth scenario with the work force expansion attributable mostly to women; and a low-growth path with only moderate increases in the participation of women and with the continuing divergence in male participation between races.² (See table 1.)

Some salient elements of the labor force projections:

- Because of past decline in birth rates, the labor force will grow at decreasing rates throughout the next decade.
- Women's labor force participation is expected to continue to increase. Women should account for 2 of every 3 additions to the labor force over the next decade.
- While the overall birth rate for the United States has been declining since about 1960, this has not been true for blacks and other races. Therefore, representation of these groups in the labor force will increase over the next decade. During 1985–90, their rates of entry will be at least double that for whites, and

Ronald E. Kutscher is Assistant Commissioner for Economic Growth and Employment Projections, Bureau of Labor Statistics.

Table 1. Actual and projected civilian labor force based on three different growth paths, selected years, 1965–1990

Growth path	Actual labor force (in millions)			Projected labor force (in millions)		Annual percent change				Participation rate				
	1965	1975	1979	1985	1990	1965 to 1975	1975 to 1979	1979 to 1985	1985 to 1990	Actual			Projected	
										1965	1975	1979	1985	1990
Total	74.5	92.6	102.9			2.2	2.7			58.9	61.2	63.7		
Middle growth				115.0	122.4			1.9	1.3				66.5	67.9
High growth				118.3	128.4			2.4	1.6				68.4	71.1
Low growth				117.7	117.4			1.4	1.0				64.6	65.2
Men	48.3	55.6	59.5			1.4	1.7			80.7	77.9	77.9		
Middle growth				63.6	65.9			1.1	.7				77.7	77.2
High growth				64.8	68.2			1.4	1.0				79.2	79.9
Low growth				62.5	63.9			.8	.4				76.3	74.9
Women	26.2	43.4	43.4			3.5	4.1			39.3	51.0	51.0		
Middle growth				51.4	56.5			2.9	1.9				56.5	59.6
High growth				53.4	59.9			3.5	2.3				58.7	63.2
Low growth				49.2	53.5			2.1	1.7				54.1	56.4

could be even higher under one of the alternative projections developed.

- The number of young people age 16 to 24 in the labor force will fall by at least 1.5 million over the decade, reflecting the past decline in birth rates.
- The number of people age 55 and over in the labor force will not increase as much as the 25 to 54 category, largely because of trends toward early retirement.

Economic projections. The three alternative projections for the economy as a whole used differing assumptions for five key variables: (1) fiscal policy, (2) labor force growth, (3) productivity growth, (4) the unemployment rate, and (5) price levels. Each of the alternative assumptions for these variables and the more significant factors considered in arriving at the alternatives are discussed in detail in the subsequent articles. Proper evaluation of the 1990 projections requires careful review of these assumptions.

Among the highlights:

- Use of alternative assumptions yields a GNP for 1990 of between \$1.9 and \$2.2 trillion (in 1972 dollars), a spread of over \$270 billion. The 1980–90 real GNP average growth is 2.5 percent per year at the low end of the alternatives and 3.9 percent at the high end.
- The low-path GNP growth projected for the 1980's is roughly consistent with the experience of the 1970's. The high alternative GNP growth rate is closer to the path of the 1960's.
- Among the assumptions used in developing these alternatives, productivity (output per person-hour) shows the widest variation. The lowest alternative assumes 1980–90 productivity growth of 1.4 percent per year. The highest alternative has assumed annual growth of 2.6 percent.
- Within GNP, the component of demand most sensitive to the alternative assumptions (particularly those related to tax policy) is that for producers' du-

table equipment. In the low-path alternative, this component increases by 4.7 percent annually over the next decade, while in the two high-path scenarios, growth exceeds 8 percent per year. Exports also show a large variation among the alternatives.

- The demand category showing the most change from recent trends is Federal defense purchases, which under each of the three alternatives are assumed to grow at annual rates appreciably greater than in recent years.
- The trend toward a smaller government share of final demand is expected to continue throughout the 1980's in the two high-trend alternatives. In the low-trend projections, the defense purchases component of government demand is expected to grow sharply in real terms during the early 1980's, and then slow slightly after 1985. Defense purchases are projected to stabilize at about 5 percent of GNP over the latter half of the decade.
- In the State and local sector, the largest change from prior trends is expected in the education field. As the baby-boom generation matures, the number of school enrollees should decline over most of the decade. Thus, growth of educational purchases is projected to dampen through 1985, with absolute declines thereafter.

Employment and output

Employment. Between 1955 and 1980, the total number of jobs³ in the economy increased from 68.7 million to 105.6 million, or by about 1.5 million a year; during 1973–80, annual job growth exceeded 2 million. Over the next decade, major changes in employment are assumed under each of the alternatives discussed in these articles. Total employment is expected to increase by an average of 1.6 percent—or 2.2 million jobs—each year between 1980 and 1985 in the low-growth and high-trend II versions. In the high-trend I version, a higher labor force projection, combined with an even more rapid decline in the unemployment rate, yields annual employment growth of 2.4 percent between 1980 and

Uses of projections

A wide range of persons and organizations use the BLS projections. Many are interested in only a particular element, while others use all or most of the projection components.

Labor force estimates. The U.S. Department of Labor, Congress, and the Congressional Budget Office use the labor force projections for analyses in which the future demographic composition of the work force is an important consideration. The Bureau of Economic Analysis and Bureau of the Census of the U.S. Department of Commerce use the detailed labor force estimates for their own projections and analyses. Other executive branch agencies use these data chiefly in EEO studies. In nearly all of the States, BLS labor force projections provide the framework for developing State labor force projections needed for planning purposes.

Private users include market researchers, corporate planners, and others who build macro-models or estimate recruitment needs. And international agencies are supplied the data for information and research.

Projections for the overall economy and by industry. These estimates and their underlying data bases are used by Federal agencies in preparing budget estimates or employment analyses, or as a framework for more detailed models of particular interest to their departments. The latter include projections of the energy situation; environmental developments; housing, transportation, or defense requirements; and capital availability. Also, the U.S. Department of Housing and Urban Development regularly uses the projections in *The Housing Report of the President*, as does the Labor Department's Employment and Training Administration in *The Employment and Training Report of the President*.

Among international users of the overall economic projections are international agencies which monitor the future prospects of the U.S. economy, those interested in research methods, and those specializing in unique historical aspects of the Nation's economic development, such as capital stock by industry, time series on output and employment by industry, or input-output data.

State and local governments, area planning councils, corporations, outside research organizations, and universities also use the BLS data for planning purposes, as input to more specific models by locality or industry, or as a means to evaluate projections developed by themselves or by others.

Occupational projections. This information is used in preparing the Bureau's *Occupational Outlook Handbook*, a tool for career guidance; education planning; policy and program analysis, evaluation, and development by government and private organizations; and research conducted by other organizations. The Survey of Career Information Systems in Secondary Schools, a National Institute of Education

study conducted by the Education Testing Service of Princeton, N.J., revealed the *Handbook* to be the most frequently chosen resource of counselors and secondary school students. The *Handbook* is used primarily in high schools, but is also of value to elementary schools, colleges, vocational schools, public employment offices, placement services for members of the Armed Forces returning to civilian life, organizations which help the economically disadvantaged, and vocational rehabilitation facilities.

National occupational employment data and projections are used at all levels of government, and by others, to formulate education plans. Included are such agencies as the National Science Foundation, and the Administration on Aging, which provide Federal funds for specialized education and training to ensure themselves of an adequate supply of qualified workers. At times such agencies have contracted with the Bureau to do special studies in these areas. Conversely, the Office of Management and Budget has relied on BLS occupational projections to evaluate the training plans of other agencies. And educational institutions and State agencies engaged in planning college-level programs also use the data.

The national data are an input to State and area projections. Such subnational estimates are being used by government bodies to plan vocational education and CETA training requirements. In fact, nearly all States currently develop their own occupational projections based on a national industry-occupation matrix.

BLS data are an integral part of other types of occupational research conducted by private organizations, non-profit organizations, universities, and government agencies. The industry-occupation matrix provides the needed occupational projections for industry scenarios developed by others. Organizations which prepare vocational guidance materials also rely upon BLS research underlying the *Occupational Outlook Handbook*.

Private employers use the Bureau's occupational projections for a variety of planning functions, including the construction of personnel policies which anticipate possible labor shortages. And, producers of machinery operated by workers in specific occupations may find the industry-occupation matrix a valuable tool for identifying potential product markets.

THE INDIVIDUAL ELEMENTS of the projections—labor force, GNP, industry output and employment, and occupational requirements—may also be integrated into a consistent analytical framework which makes possible use of the entire system. A set of analyses recently prepared for the National Science Foundation relied on this approach to determine the implications of increasing defense expenditures and synthetic energy production for the supply of and demand for scientists and engineers. (See *Science and Engineering Education for the 1980's and Beyond* (Washington, National Science Foundation and the U.S. Department of Education, 1980)).

1985, or slightly fewer than 2.7 million jobs a year.

In all alternatives, the rate of employment growth slows in the latter half of the decade, to 1.4, 1.9, and 1.5 percent, respectively, for the low, high-trend I, and high-trend II models. This reflects the projected slowdown in labor force growth after 1985.

Further important highlights:

- State and local government employment is expected to grow less rapidly than total employment, largely as a result of contraction in public education.
- As in the past, the "other services" sector is expected to experience the fastest employment growth. By 1990, "other service" industries will account for over 22 percent of all jobs in the economy in each of the three alternative scenarios. Leading the advance among service industries will be health care.
- The largest number of new jobs projected for any sector over the next decade will be in the trade sector, primarily because of its initial large size. Between 5 and 7.2 million new jobs are projected for wholesale and retail establishments between 1979 and 1990.
- Manufacturing jobs will grow by 0.8 percent a year during 1979-90 in the low-trend version and 1.6 percent in high-trend I, slower than the rates projected for total jobs but faster than recent growth in the sector. The turnaround in the rate of manufacturing job formation will be more pronounced for durable goods manufacturing than for nondurables, reflecting assumptions of strong demand for consumer durables, defense hardware, and for producers' durable equipment, especially in the high-trend versions.
- Five of the 10 industries with the greatest projected rates of employment loss are in the nondurable manufacturing sector, reflecting either falling demand or rapid productivity growth.

Output. Projections of final demand by industry were multiplied by an input-output table to yield projections of the domestic output needed for each industry to meet that final demand. This analysis indicates:

- Agricultural output will continue to decline in relative importance throughout the next decade, reflecting slow growth in food purchases. This slowdown will affect almost all of the food industries and indirectly, the agricultural industries.
- Although the nondurable goods manufacturing sector is expected to show only moderate overall growth, several of its component industries should experience faster-than-average output growth. These include the chemical products, drugs, apparel, and printing and publishing industries.
- Among specific industries in the durable manufac-

turing sector likely to enjoy substantial output growth are computers; optical equipment; construction, mining, and oilfield machinery; typewriters and other office machines; electronic components; material handling equipment; photographic equipment; and medical and dental instruments.

- Historically, the services sector has been increasing its share of total private output, but during the 1980's, its growth should approach that of the private economy as a whole, keeping its share constant.
- Output of the mining sector is expected to halt its historical decline as a share of the total private economy, as the expected rapid increase in coal production outweighs minimal output growth in crude oil production and absolute declines in copper mining and nonferrous ores mining.

Occupational data

The more important occupational trends:

- The shares of total employment accounted for by white-collar jobs and blue-collar jobs do not change substantially over the projected period under any of the alternative projections. The white-collar share increases from 49.8 percent in 1978 to between 50.6 and 50.9 percent by 1990, and the blue-collar share changes from 31.8 percent in 1978 to between 32 and 31.5 percent in 1990.
- Service occupations continue to be the fastest growing major occupational category and should account for almost 16 percent of all jobs in 1990.
- Job growth in blue-collar occupations is affected relatively more by differences among the three alternative scenarios than growth in other occupational categories. Blue-collar occupations are sensitive to high-trend I assumptions because they are concentrated in manufacturing industries, and the demand for manufactured goods is relatively greater in this version of the economy. Demand for manufactured goods is also greater in the high-trend II scenario, but the need for additional blue-collar workers is moderated by assumed higher productivity gains.
- Over the past two decades, the professional and technical category has been one of the fastest growing occupational groups. Although employment is projected to continue to increase faster than employment in all occupations in each of the alternative scenarios, the differential rate of growth is narrowed.
- Employment of managers and administrators is projected to grow somewhat more slowly than overall employment during 1978-90 in each scenario.
- Employment of clerical workers is projected to grow faster than the average rate of employment growth in each of the alternative versions. Only the number of service workers is expected to grow faster.

- Employment in the craft and kindred worker group increases at about the average rate for all occupations in each of the scenarios. Most of this growth is expected before 1985.

Impact of assumptions

A review of the sensitivity of the projections to changes in the assumptions revealed that changes, especially in tax policy, showed the largest impact on the producer durable demand component of GNP, the durable goods manufacturing industries, and a group of blue-collar occupations principally found in the durable manufacturing industries. The results here are very consistent throughout the durable goods sector. However, it would clearly not be warranted from these results to assume that the same sector, industries, and occupations would be heavily impacted by changes in other sets of assumptions. The expectation would be that these changes would be felt by differing combinations of industries and occupations.

Evaluation of past projections

A regular part of the BLS program is the evaluation of projections when the target year has been reached. These reviews provide the BLS projections staff with insights into the causes of differences between projected and actual values, such as unwarranted assumptions, errors in historical data, or methodological problems. They also give users an idea of the uncertainties attached to any projections. A brief discussion of the results of these evaluations follows:

Labor force. All of the projections made by BLS in the 1952–70 period underestimated the actual labor force (age 14 and over) in 1975.⁴ All projections also underestimated the actual 1970 labor force, although the 1956 and 1959 estimates were close. For the target years of 1960 and 1965, however, BLS was reasonably accurate, and the misses fell both below and above the true levels.

As in previous years, the labor force projections made in 1973 were based on the extrapolation of past trends in work force participation. The 1973 projection called for a civilian labor force (age 16 and over) of 99.8 million in 1980 and 110.6 million in 1990. By 1975, however, it was evident that underestimates could again be expected. The participation rate of women was projected to be 45.5 percent in 1990, but by 1975 the rate had already hit 46.3 percent, and in 1976 it reached 47.3 percent. The rate of men also was predicted to change very little. By 1980, it was expected to be 78.7 percent and in both 1985 and 1990, 79.1 percent. But by 1976, the male civilian labor force participation rate had already dropped to 77.5 percent.

BLS revised these projections in 1976. Although the

general principle of extrapolating long-term trends in work activity was retained, the methodology was modified to reduce the amount of tapering⁵ applied to the projected labor force rates. This had the effect of raising the projected rates for women and lowering those for men. The combined effect was an increase in the overall projection for 1980 of 2 million workers—2.6 million more women and 600,000 fewer men than computed in 1973.

Economic and industry trends. In the mid-1960's, the Bureau first published projections of gross national product, output by industry, and industry employment for the year 1970.⁶ The basic model assumed a full employment economy with only 4 percent unemployment. Other assumptions were that the Vietnam war would have ended and that a housing boom would be underway. Total GNP was calculated from estimates of labor force growth, hours of work, and labor productivity.

The projections of GNP and employment were within 4 percent of the actual levels for 1970. However, errors in the distribution of final demand, output for 81 industries, and employment for 74 industries fell within a broader range, with most of the larger discrepancies occurring in the smaller sectors. The absolute difference between actual and projected employment for each of 74 different industries averaged 76,800 jobs, or 10.3 percent, but the Bureau correctly anticipated the direction of change in 63 of the industries. And, when the errors were weighted by employment in each industry, the average absolute difference dropped to 8.1 percent.

The largest source of error in the industry employment data proved to be estimates of employment-output ratios or productivity by industry. Second in importance were inaccuracies in the projections of input-output coefficients, while final demand estimates contributed the least to industry employment errors.

For many of the variables used in the BLS methodology, it is difficult to draw a distinction between those “projected” and those “assumed.” No well-specified model (except the Houthakker-Taylor model for the distribution of personal consumption expenditures) was used for the 1970 projections, and variables were in general projected from extrapolation of past trends modified to account for expected changes.

Events of 1970 negated the basic assumption of a full employment economy. The onset of recession brought the average unemployment rate to 5.1 percent, compared with less than 4 percent during the preceding 4 years. Moreover, military involvement in Vietnam had not ended, and the housing boom did not materialize until 1971–72. The 1970 downturn undoubtedly distorted the projections in the aggregate as well as at the industry level.

One of the conclusions drawn from the 1970

evaluation was that, because the BLS projections are for the medium term and do not take account of cyclical fluctuations, it might be more useful to specify ranges for future output and employment. This is particularly true for those industries most susceptible to fluctuations, such as some durable goods industries or construction.

Another recommendation arising from this review was to prepare more alternative scenarios, varying the assumptions for each case. Particularly, more accurate projections may result from broadening the range of values that key exogenous variables can assume. The benefits of the review of the 1970 economic and employment projections were such that the procedure became a regular part of the projections program.

Projections for the 1975 economy, prepared in 1971, were designed to reflect steady medium-term growth and could not anticipate the sharp deviation from the

path brought on by the 1974–75 recession.⁷ Thus, the high-productivity, full employment assumptions of the 1975 projections resulted in a large percentage error in “supply gross national product”—the projected level of economic resources. This error, in turn, biased the equations of the econometric model used for simulating levels of demand and passed high estimates of final demand through the projection process, ultimately distorting projected levels of industry employment.

The 1975 evaluation of the projection methodology also revealed weakness in the estimation of demand components of GNP.⁸ Equations used to derive the investment and import levels were found to be particularly poor, while those related to personal income, personal consumption expenditures, and government purchases performed well. The final demand industry distributions were quite inaccurate, due mainly to

Brief history of Bureau of Labor Statistics projections

In November 1979, BLS projection work, previously spread among three Bureau organizations, was brought together under the umbrella of the Office of Economic Growth and Employment Projections. While previous interoffice efforts had been coordinated, the organizational change made possible an even closer integration of the projections for various aspects of the economy. The projections in this issue are the first developed after this organizational change.

Labor force. Over the years, the Bureau has developed projections for each of the major subsets of the current projections. Labor force estimates were first produced in 1959. Since that time, seven sets of these projections have been published.

Industry output and employment projections. In 1963, the Bureau began construction of a medium-term economic projections model. Incorporating the input-output tables then being developed by the Bureau of Economic Analysis of the U.S. Department of Commerce, this model was designed to produce industry output and employment projections 5 to 15 years into the future. Since that time, the BLS Economic Growth Model has undergone several changes in response to the need for more accurate and detailed data. Various versions of this model have been used to develop a series of seven sets of projections.

The current version of the Economic Growth Model is a system of equations and identities linked at selected points by various economic, econometric, mathematical, and programming techniques to simulate the U.S. economy. Given an explicit set of assumed values for certain target variables, this model generates industry output and employment projections. A key feature is the interlinking of input-output analysis with other econometric techniques.

Occupational outlook. This facet of the program originated with a report of the Advisory Committee on Education

appointed by President Franklin D. Roosevelt. In 1938, the committee recommended the establishment of an occupational outlook service within the Bureau of Labor Statistics to conduct employment studies and provide career guidance information for individuals and for vocational counselors and planners. Accordingly, the Occupational Outlook Service was organized under a specific authorization of the Congress in 1941. Preliminary studies were begun that year, but it was not until after World War II that the staff was able to focus on the publication of reports for use in career guidance. In mid-1946, a manual of occupational outlook information was prepared for use in the Veterans Administration counseling and rehabilitation program.

The first edition of the *Occupational Outlook Handbook* was published in 1949 in response to a formal resolution by the National Vocational Guidance Association and the requests of other groups and individuals that Congress authorize the development of career guidance information for sale. The public response was favorable to this first *Handbook*, and in 1951, the Bureau decided to issue a revised and enlarged edition, with the backing of the Veterans Administration.

After the end of hostilities in Korea, there was heightened public recognition of the key role of vocational guidance in channeling workers into essential occupations and effectively using the Nation's labor resources. As a result, in 1955, Congress provided continuing authorization for regular publication of the *Occupational Outlook Handbook* and related materials. In 1957, the third edition of the *Handbook* was published and a companion piece, the *Occupational Outlook Quarterly*, was introduced to report on new occupations and describe changes in the employment situation in established career fields. The 1982–83 *Handbook*, currently in preparation, will be the 15th edition, and should be available in late spring of 1982. The projections discussed in this issue of the *Review* will form the basis for the new *Handbook*.

judgmental error. Projected industry outputs were distorted more by errors in the estimates of final demand than by inaccuracies in the input-output table employed in the projection process. However, industry productivity factors also were wide of the mark, offsetting the demand error in such a way that relative accuracy in the industry employment projections resulted.

Projections of the labor force and employment for 1975 fell within 4 percent of the realized levels. GNP was overestimated by 15.4 percent. Errors for detailed industry final demand, output, and employment fell within a broader range, but, for the most part, the larger percentage errors occurred among the smaller sectors.

Employment was overestimated for three-quarters of the industries studied, reflecting the severity of the 1975 recession. The largest percent errors were recorded for the durable manufacturing and mining industries, while the largest numerical errors occurred within the construction, trade, and service industries, the three largest economic sectors. The absolute difference between actual and projected employment for each of the 71 industries studied averaged 8 percent of total employment for these industries.

Total employment for 1975 was overprojected by about 3.5 percent, although discrepancies varied widely by industry. The overprojection of GNP led to an overestimate of industry outputs; together with the misprojection of labor productivity, this resulted in the overprojection of total employment.

At the industry level, the average absolute percentage error in employment for 71 industries was 14.8 percent; when weighted by industry employment shares, the average dropped to 8 percent. This again indicates that the larger percentage errors were in the smaller industries. Estimates for more than 40 percent of the industries, accounting for more than two-thirds of employment, were within 10 percent of the actual values. The largest single concentration of error was in the construction industry; personal and business services were a close second. The third largest source of error was the trade sector; although the discrepancy was small, it became important because of the large size of the sector.

The 1975 evaluation differed from the review of the 1970 projections, chiefly because the macro model was not used in the 1970 study. In addition, the 1970 study found productivity factors to be the most important in explaining errors in projected employment, while the 1975 study found macro controls to be the major source.

Occupational estimates. In 1967, the Division of Occupational Outlook completed an industry-occupation matrix which described the relationship of employment in 162 occupations and 124 industries during 1960 and

projected these relationships to 1975.⁹ The primary data sources for the project were the 1950 and 1960 censuses and, for industry employment, annual estimates from the BLS establishment surveys from 1947 onward.

A revision of the 1975 matrix based largely on additional industry data was completed in 1969. Although the revision was not published, it is a resource for the occupational outlook program, and provides more historical data for evaluating projections. Due to a major change in the occupational employment classification system beginning with the 1970 census, only 76 of the 162 detailed occupations were comparable over the 1960–75 period.

The unforeseen economic downturn of the mid-1970's reduced the accuracy of the occupational projections; although the errors were not as great as initially supposed, the target year turned out to be the trough of the recession, and the actual unemployment rate was 8.5 percent. Consequently, employment in cyclically sensitive occupations, such as craft and operative occupations, generally was overprojected. Employment in these two groups had been growing in line with projected trends through 1974, but turned down as economic conditions worsened in 1975. Interestingly, underprojections did occur in 3 of the 9 major occupational groups despite the recession, and these errors might have been somewhat higher if economic conditions in 1975 had been as favorable as originally assumed.

The difference between projected and actual employment for the major occupational groups ranged from a 6.7-percent underestimate for clerical workers to a 9.1-percent overestimate for operatives. The average of the absolute percentage difference was 6.1 percent. The projections for more detailed occupations were subject to much larger error, averaging 20.8-percent off 1975 employment levels. Again, differences between projected and actual employment tended to be smaller for the larger worker groups.

Several projection methods that would have been simpler than the matrix procedure were explored during the 1975 review. Among these, the most successful was linear extrapolation of employment trends for each occupation. These extrapolations averaged an absolute 26.2 percent off actual 1975 employment in the 76 detailed occupations, compared with the 20.8-percent error in the matrix projections.

The direction of employment change between 1960 and 1975 was correctly anticipated for all of the nine major occupational groups, although employment in five was overprojected. However, the evaluation of 1975 employment projections for detailed occupations was hampered by the previously mentioned change in the Census Bureau occupational classification system for the 1970 census. Beginning in late 1971, the revised system

was adopted for the Current Population Survey (CPS), the primary source of occupational employment data between decennial censuses. Largely as a result of this classification change, projections for only 76 of the 162 occupations in the matrix were comparable with 1975 employment data estimated from the CPS. Differences between projected and actual employment in the 76 detailed occupations ranged from a 43-percent understatement for personnel and labor relations workers to a 136-percent overestimate for plasterers. The absolute percentage errors for all 76 occupations averaged 20.8 percent. Two-thirds of the occupations, however, had errors lower than the average.

As indicated earlier, this evaluation found projection accuracy to be related to the size of employment in an occupation. When weighted by employment in each occupation, the average absolute error drops from 20.8 percent to 14 percent, indicating that projections for the largest occupations generally were more accurate. Relatively close estimates for the four occupational categories with more than 1 million workers each in 1975 contributed substantially to the final results. The following tabulation shows how projection accuracy improved with the size of the worker group:

<i>Number of workers in occupations</i>	<i>Number of occupations</i>	<i>Average absolute percent error</i>
Total	76	20.8
Less than 50,000	19	32.4
50,000 to 99,999	14	20.3
100,000 to 299,999	17	15.5
300,000 to 599,999	14	19.8
600,000 and more	12	11.2

A major objective of the evaluation of the 1975 occupational projections was to isolate the effects of errors in the matrix elements that determine occupational employment in the target year (projected employment by industry) on projected occupational staffing patterns for each industry (industry-occupation ratios).

Although the occupational projections were off the mark for many reasons, including the economic downturn, the 1975 review established that the ratio estimates were a far greater source of error in the occupational projections than the estimates of industry employment levels. In fact, a simulated matrix based on actual 1975 industry employment levels and the estimated ratios produced occupational totals that were no more accurate, on average, than the projections, suggesting that the quality of the ratios was so poor as to negate the effect of perfect industry employment projections.

The ratio estimates were based on scanty data for

trends in the occupational structure of industries. Although the projections were made in the late 1960's, the only comprehensive sources of historical data on ratios were the 1950 and 1960 decennial censuses. A long-recognized need for current, detailed data on industry staffing patterns prompted the initiation of the cooperative Federal-State program, Occupational Employment Statistics, in 1970.

Continuing analysis of the accuracy of projections is an important activity in improving their reliability. Thus, evaluation of previous projections has become a regular part of the BLS program. Complete employment data soon will be available for comparison with the 1980 industry and occupational projections, and an evaluation of the complete set of 1980 projections is currently planned.

The Bureau's policy of updating the medium-term scenarios every 2 years also contributes to accuracy. The three articles which follow reflect such an update of the 1990 GNP, industry output and employment, and occupational projections developed in 1978-79.

THE PREPARATION OF ECONOMIC PROJECTIONS is, to a degree, both a science and an art. Thus, misunderstandings may arise between the users, who feel the need for exact numbers, and producers, who recognize their inability to predict with such precision. Such conflicts are all the more likely because projections analysts generally employ a framework which develops numerical answers to specific questions, and users are inevitably tempted to attribute to those numbers an exactness they should not be accorded. The Bureau attempts to address this dilemma, in at least a small way, by making clear all of the important assumptions underlying its projections, by developing alternative versions which reflect at least some of the uncertainties about the future, by evaluating past projections to assist users in appreciating the unpredictable nature of certain future events, and by updating the projections on a regular 2-year cycle.

Even so, the Bureau is aware that many uses of the projections (see box) require quantitative estimates. It is incumbent on users to realize that differing assumptions can change the results, that underlying data and methods can cause errors, and that estimates should be carefully reviewed to take into account subsequent developments which could not be anticipated at the time the projections were prepared.

A final comment, from Edgar R. Fiedler, on projections, their uncertainties, and their uses: "give them a number or give them a date, but never both."¹⁰ □

¹ The labor force projections were published earlier. See Howard N Fullerton, Jr., "The 1995 labor force: a first look," *Monthly Labor Review*, December 1980, pp. 11–21.

² See Fullerton, "The 1995 labor force."

³ The employment total used in this and the subsequent articles consists of wage and salary workers, self-employed, and unpaid family workers.

⁴ See Paul M. Ryscavage, "BLS labor force projections: a review of methods and results," *Monthly Labor Review*, April 1979, pp. 15–22.

⁵ Tapering refers to the assumptions and formulations used to move from the most recent rate of change in labor force participation for a given age-sex group to a zero rate of change several decades in the future.

⁶ Valerie A. Personick and Robert A. Sylvester, "Evaluation of BLS 1970 economic and employment projections," *Monthly Labor Review*, August 1976, pp. 13–16.

⁷ *Projections of the Post-Vietnam Economy, 1975*, Bulletin 1733 (Bureau of Labor Statistics, 1972).

⁸ Paul T. Christy and Karen J. Horowitz, "An evaluation of BLS projections of 1975 output and employment," *Monthly Labor Review*, August 1979, pp. 8–19.

⁹ Evaluations of earlier occupational projections are described in Sol Swerdloff, "How good were manpower projections for the 1960's," *Monthly Labor Review*, November 1969, pp. 17–22. The article referenced here is Max L. Carey, "Evaluating the 1975 projections of occupational employment," *Monthly Labor Review*, June 1980, pp. 10–21.

The Bureau's occupational projections for 1975 were first published in *Occupational Employment Patterns for 1960 and 1975*, Bulletin 1599 (Bureau of Labor Statistics, 1968). The projections also were presented in a corollary report, *Tomorrow's Manpower Needs, Volume IV*, Bulletin 1606 (Bureau of Labor Statistics, 1969). The projections evaluated in this article were obtained from the latter publication. There are minor differences in estimates presented in the two publications.

¹⁰ Edgar R. Fiedler, "The Three R's of Economic Forecasting—Ir-rational, Irrelevant, and Irreverent," *Across the Board*, June 1977, pp. 62–63.

Translating projections into action

In some respects the appraisal of forecasts puts a greater burden on the policymaker than the original task of forecasting itself. The accuracy of current forecasts is, of course, yet to be determined. Evaluation of the methodology of various forecasts may require technical sophistication at least as great as, and perhaps greater than, that of the specialist in forecasting. Yet the policymaker is rarely a specialist in forecasting techniques, nor is he often an authority on the phenomena being projected. Moreover, for the frequent case in which numerous forecasts of the same trend are available, the selection of a "most likely" forecast is in itself an act of forecasting, since the policymaker chooses the forecast which reflects assumptions and methods that appear most reasonable to him. The policymaker thus tacitly chooses a set of assumptions about the future and methodology for projecting the essence of those assumptions.

— WILLIAM ASCHER
*Forecasting: An appraisal for
Policy-Makers and Planners*
(Baltimore, Md., The Johns Hopkins
University Press, 1978), pp. 1–2.