Evaluating the 1996–2006 employment projections

*On the whole, the BLS 1996–2006 employment projections
outperformed alternative naïve models, but not projecting
the housing bubble or the rise in oil prices did cause
some inaccuracies in the projections*

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Every 2 years the Bureau of Labor Statistics (BLS, the Bureau) publishes long-term economic projections. In 1997, BLS published the 1996–2006 projections.[1] These projections are used by policymakers, economists, and even students making career decisions, and are one of the most popular products on the BLS Web site. With such a popular product, it is important to ask the question, How accurate are these projections?

BLS has published numerous articles evaluating its earlier projections.[2] Most past articles focused on a specific part of the projections: the labor force, industry employment, or occupational employment. In 2005, two researchers from outside the Bureau (on a contract with BLS), H.O. Stekler and Rupin Thomas, wrote an article evaluating the accuracy of the Bureau's 1988–2000 projections and suggested metrics and methods, including naïve models, for evaluating future projections.[3] Subsequently, BLS decided to revamp how it evaluates its own projections and convened a team that used Stekler and Thomas' ideas as a starting point when it developed recommendations for future projection evaluations. Following the team's recommendations, this article evaluates all four parts of the projections in a holistic manner and attempts to show how problems in earlier parts of the projections process affected the later parts.

The first step in evaluating any projection is to compare actual data with projected data. Although such a comparison may seem simple, revisions to GDP definitions, occupation and industry classification systems, and historical data make such a comparison quite complex. The first section of the article discusses how BLS attempted to match and compare projected data, which were created on the basis of one set of definitions, classifications systems, and historical data (pre-1997 data), with actual data, which were created under a different set of definitions and classification systems, and were based on revised historical data. After discussing data comparability, the article will evaluate the accuracy of the four parts of the projections: the population and labor force projections, the macroeconomic projections, the industry employment projections, and the occupational employment projections. The metrics used in this article are described in the appendix.

Following Stekler and Thomas' recommendations and the BLS projection evaluation team's recommendations, this article will not only quantify the accuracy of the projections; it will attempt to explain, when possible, why differences occurred, and will compare the accuracy of the BLS projections with the accuracy of naïve models. (See the appendix for an explanation of the naïve models used in this article.) The compari-

son with naïve models is necessary because accuracy can only be judged through comparisons. Because of a lack of comparable projections, naïve models provide the basis for comparison. Most of the naïve models employed in this article assume that the rate of change over the next 10 years will equal the rate of change over the previous 10 years. The section of the article on occupational employment projections describes additional types of naïve models employed in that section.

Data comparability

The 1996–2006 projections, created in 1996 and 1997, used 1996 data and the racial, gross domestic product (GDP), occupational, and industrial definitions, and occupational and industrial classification systems, used in 1996. Analyzing the accuracy of economic projections requires comparing projected values with actual data. In the case of the 1996–2006 projections, direct comparisons between the 2006 projections and the 2006 actual data were more difficult because the aforementioned definitions and classification systems changed between 1996 and 2006. In addition to those changes, the results of the 2000 Census brought into question the accuracy of the 1996 estimates of the U.S. population, and the rebasing and revising of GDP data altered the historical data (1986–1996) that were used to create the projections.

Population. The 2000 Census counted 281.4 million residents, 6.8 million more residents than the Census Bureau had projected just a year earlier. Subsequent analysis suggested the Census Bureau underestimated the level of immigration throughout the 1990s.[4] If this analysis is correct, the actual 1996 resident population was larger, more Hispanic, and more male than the estimated resident population used in creating the projections. Because young Hispanic men participate in the labor force at above-average rates, underestimating immigration affected the labor force estimate more than the overall population estimate.

Race categories. To better capture and reflect the multiracial nature of the U.S. population, the 2000 Census incorporated changes to race categories. The 2000 Census, for the first time, allowed respondents to classify themselves in more than one racial category. When the 1996–2006 projections were created, no multiracial race category existed and no projections had been made for the multiracial population. The new race category reduced the accuracy of comparisons of the projected race categories

(which did not include a multiracial category) with the actual race categories (which did include a multiracial category). Although the impact of the new multiracial category reduced the population estimates for all single-race categories,[5] the impact was small because the multiracial category accounted for just 1.4 percent of the total population.

GDP. Definitional changes between 1996 and 2006 went far beyond race groups. Every 5 years, the Bureau of Economic Analysis publishes comprehensive revisions of the National Income and Product Accounts and the associated GDP data; these revisions incorporate major definitional and classification changes, methodological changes, adjustments stemming from the results of the most recent economic census and other surveys, and other statistical improvements. Since GDP data are time-series data, changes not only affect projected levels of GDP, but also lead to revisions of historical levels of GDP.[6] GDP data revisions led to the average annual growth rate in the decade preceding the projections (1986–1996) to be revised from 2.3 percent to 2.9 percent. The 1999 revisions altered the total level of GDP and the distribution of GDP among its various components.[7]

In the 1996–2006 projections, real GDP and its components were stated in 1992 chain-weighted dollars. When the 2006 evaluation was conducted, they were stated in 2000 chain-weighted dollars. Although the levels of GDP cannot be compared without adjustments, the growth rate of GDP is directly comparable.

Industrial classification. In 1996, industry data were constructed under the Standard Industrial Classification (SIC) system. As a general rule, the names and structures used in this article follow the SIC system. In 2001, BLS began collecting and reporting employment data based on the North American Industrial Classification System (NAICS). The transition to the NAICS was not simply a change of definitions and titles of industries; it was a major philosophical change in how businesses were classified into industries. Comparable industry data were created by converting the NAICS-based 2006 Current Employment Statistics data to an SIC basis, by use of the NAICS-to-SIC crosswalk; a mix of three-digit and four-digit NAICS industries were converted to a mix of two-digit and three-digit SIC industries. Data from these industries were aggregated to create data for industry divisions.[8] The crosswalk was developed from the 2001 establishment data that were "dual coded" (recorded under both the old (SIC) and the new (NAICS) industry classification systems).

Although the ratios used for the conversion process are likely to be accurate for the year 2001 and are the most reasonable option for converting data from other years, the further one gets from 2001, the more the accuracy of the crosswalk is expected to decline. Because of differences due to definitional changes and revisions to the data that occurred since the 1996 data were initially published, some of the tables in this article contain two sets of actual 1996 data for industry divisions.[9]

Occupational classification. Before 1999, Occupational Employment Statistics (OES) staffing pattern data were collected under an occupational classification system unique to the OES program. Starting in 1999 the OES staffing pattern data were collected under a classification system based on the 2000 Standard Occupational Classification (SOC) system. Although BLS staff created an occupational crosswalk that matched the old OES occupations to SOC occupations,[10] the lack of dual-coded microdata lessened the comparability of old and new occupations and resulted in only about half of the occupations projected in 1996 being included in this article.[11]

The shift to the SOC system resulted not only in mundane definitional changes, but also in some broader, more philosophical changes. In 1998, under the older classification system, the OES survey estimated that there were 8,321,000 managers. In 2006, under the SOC system, there were 5,893,000 managers. Though it is possible that the much-talked-about flattening of management structures caused this decline, the most likely possibility is that the shift to the SOC system's more restrictive definition of managers and first-line supervisors caused the decline.

Although all of the changes to the definitions and classification systems underlying the relevant economic data made it more difficult to analyze the accuracy of the 1996–2006 projections, careful adjustments to the data made it possible to conduct such an analysis. However, the adjustments to the data were not able to completely eliminate comparability issues.

The labor force

BLS begins its economic projections by projecting the size of the labor force, which requires calculating the working-age resident population and the labor force participation rate. The Census Bureau projects the working-age civilian noninstitutional population (CNIP)[12] of the United States by detailed age, sex, race, and ethnic categories. BLS projects the labor force participation rate for these same categories. Multiplying the CNIP projections by the respec-

tive labor force participation rates provides the labor force projections for 136 age, sex, race, and ethnic categories. The total labor force projection is the sum of the projections of the 136 detailed groups. Some of the projected and actual working-age resident population statistics are presented in table 1. Labor force participation rates (actual and projected) are presented in table 2, labor force levels in table 3.

BLS projected the labor force to be 148.9 million in 2006, and the actual labor force in 2006 was 151.4 million, an underprojection of 2.6 million, or 1.7 percent. The first statistic that goes into calculating the size of the labor force, the CNIP, was underprojected. The Census Bureau projected the 2006 CNIP to be 221.2 million, and the actual CNIP was 228.8 million, an underprojection of 7.6 million, or 3.3 percent. The second statistic that goes into calculating the size of the labor force, the labor force participation rate, was overprojected. The projected participation rate was 67.6 percent, and the actual rate in 2006 was 66.2 percent, an overprojection of 1.4 percentage points. The magnitude of the underprojection of the CNIP was too large to be completely cancelled out, and, consequently, the labor force was underprojected. If the size of the CNIP had been perfectly projected, the overprojected labor force participation rate would have resulted in the labor force being overprojected by 3.3 million people.

The main reason that the Census Bureau underprojected the population was that it underprojected immigration. During the 1990s and 2000s immigrants tended to be young, Hispanic men, so it is unsurprising that the differences for men were larger than the differences for women,[13] the differences for Hispanics were larger than for non-Hispanics, and the differences for 16- to 24-year-olds were larger than those for older age groups. Although both men and women were underprojected, the underprojection for men, 4.3 million (3.9 percent), was larger than that for women, 3.3 million (2.8 percent).[14] (See table 1.)

To a small extent (estimated to be about 0.1 or 0.2 percent) the labor force participation rate was intentionally overprojected to offset what BLS thought to be an underestimation of immigration by the Census Bureau.[15] Overprojecting the labor force participation rate to adjust for an underprojected CNIP should have produced a more accurate total labor force figure. However, the size of the adjustment to the participation rate was quite small, and the adjustment does not fully explain the 1.0 percentage point overprojection of the participation rate.

Sex groups. When the labor force participation rates are broken down by sex, it becomes apparent that the

Table 1.	Civilian noninstitutional population, by age, sex, race, and ethnicity, 1996 and 2006 (projected and actual)								
Labor force group	**Thousands of people**			**Percent change**		**Numerical error**	**Percent error**	**Share of population**	
	1996	**2006**		**1996–06**		**2006**		**2006**	
	Actual	**Projected**	**Actual**	**Projected**	**Actual**	**Projected versus actual**		**Projected**	**Actual**
Total, 16 years and older....	200,591	221,191	228,815	10.3	14.1	−7,624	−3.3	100.0	100.0
16 to 24..	32,343	38,106	36,943	17.8	14.2	1,163	3.1	17.2	16.1
16 to 19..	14,934	17,245	16,678	15.5	11.7	567	3.4	7.8	7.3
20 to 24	17,409	20,862	20,265	19.8	16.4	597	2.9	9.4	8.9
25 to 54	115,506	119,500	124,884	3.5	8.1	−5,384	−4.3	54.0	54.6
25 to 34..	40,252	36,370	39,230	−9.6	−2.5	−2,860	−7.3	16.4	17.1
35 to 44..	43,086	41,550	42,753	−3.6	−.8	−1,203	−2.8	18.8	18.7
45 to 54..	32,167	41,580	42,901	29.3	33.4	−1,321	−3.1	18.8	18.7
55 and older......................................	52,742	63,584	66,988	20.6	27.0	−3,404	−5.1	28.7	29.3
55 to 64	20,990	29,956	31,375	42.7	49.5	−1,419	−4.5	13.5	13.7
65 to 74..	18,244	18,140	18,685	−0.6	2.4	−545	−2.9	8.2	8.2
75 and older......................................	13,507	15,488	16,928	14.7	25.3	−1,440	−8.5	7.0	7.4
Men, 16 and older............................	96,206	106,267	110,605	10.5	15.0	−4,338	−3.9	48.0	48.3
16 to 24..	16,210	19,518	18,650	20.4	15.1	868	4.7	8.8	8.2
16 to 19	7,600	8,675	8,459	14.1	11.3	216	2.6	3.9	3.7
20 to 24..	8,611	10,844	10,191	25.9	18.3	653	6.4	4.9	4.5
25 to 54..	56,671	58,290	61,640	2.9	8.8	−3,350	−5.4	26.4	26.9
25 to 34..	19,775	17,839	19,568	−9.8	−1.0	−1,729	−8.8	8.1	8.6
35 to 44..	21,222	20,392	21,082	−3.9	−.7	−690	−3.3	9.2	9.2
45 to 54..	15,674	20,058	20,991	28.0	33.9	−933	−4.4	9.1	9.2
55 and older......................................	23,324	28,459	30,315	22.0	30.0	−1,856	−6.1	12.9	13.2
55 to 64	9,997	14,131	15,095	41.4	51.0	−964	−6.4	6.4	6.6
65 to 74..	8,194	8,361	8,574	2.0	4.6	−213	−2.5	3.8	3.7
75 and older......................................	5,134	5,967	6,646	16.2	29.5	−679	−10.2	2.7	2.9
Women, 16 and older.......................	104,385	114,924	118,210	10.1	13.2	−3,286	−2.8	52.0	51.7
16 to 24..	16,132	18,588	18,292	15.2	13.4	296	1.6	8.4	8.0
16 to 19	7,335	8,570	8,218	16.8	12.0	352	4.3	3.9	3.6
20 to 24	8,798	10,018	10,074	13.9	14.5	−56	−.6	4.5	4.4
25 to 54..	58,835	61,210	63,243	4.0	7.5	−2,033	−3.2	27.7	27.6
25 to 34..	20,477	18,531	19,662	−9.5	−4.0	−1,131	−5.8	8.4	8.6
35 to 44..	21,865	21,158	21,671	−3.2	−.9	−513	−2.4	9.6	9.5
45 to 54..	16,493	21,521	21,910	30.5	32.8	−389	−1.8	9.7	9.6
55 and older......................................	29,417	35,125	36,675	19.4	24.7	−1,550	−4.2	15.9	16.0
55 to 64	10,993	15,825	16,280	44.0	48.1	−455	−2.8	7.2	7.1
65 to 74..	10,050	9,780	10,111	−2.7	.6	−331	−3.3	4.4	4.4
75 and older......................................	8,374	9,521	10,284	13.7	22.8	−763	−7.4	4.3	4.5
Race:									
White..	168,317	182,147	186,264	8.2	10.7	−4,117	−2.2	82.3	81.4
Men...	81,489	88,893	91,021	9.1	11.7	−2,128	−2.3	40.2	39.8
Women...	86,828	93,255	95,243	7.4	9.7	−1,988	−2.1	42.2	41.6
Black...	23,604	26,548	27,007	12.5	14.4	−459	−1.7	12.0	11.8
Men...	10,575	11,483	12,130	8.6	14.7	−647	−5.3	5.2	5.3
Women...	13,029	15,064	14,877	15.6	14.2	187	1.3	6.8	6.5
Asian and other.................................	8,671	12,496	12,315	44.1	42.0	181	1.5	5.6	5.4
Men...	4,142	5,891	5,880	42.2	42.0	11	.2	2.7	2.6
Women...	4,530	6,605	6,435	45.8	42.1	170	2.6	3.0	2.8
Multiple race group........................	...	...	3,229	...	...	...	...	...	1.4
Men...	...	...	1,574	...	...	...	...	...	.7
Women...	...	...	1,655	...	...	...	...	...	.7

Table 1.	Continued—Civilian noninstitutional population, by age, sex, race, and ethnicity, 1996 and 2006 (projected and actual)									
Labor force group	**Thousands of people**			**Percent change**		**Numerical error**	**Percent error**	**Share of population**		
	1996	**2006**		**1996–06**		**2006**		**2006**		
	Actual	**Projected**	**Actual**	**Projected**	**Actual**	**Projected versus actual**		**Projected**	**Actual**	
Ethnicity:										
Hispanic origin...................................	19,213	26,459	30,103	37.7	56.7	−3,644	−12.1	12.0	13.2	
Men...	9,604	13,270	15,473	38.2	61.1	−2,203	−14.2	6.0	6.8	
Women...	9,610	13,189	14,630	37.2	52.2	−1,441	−9.8	6.0	6.4	
White non-Hispanic origin..............	150,026	158,638	158,308	5.7	5.5	330	.2	71.7	69.2	
Men...	72,318	77,013	76,597	6.5	5.9	416	.5	34.8	33.5	
Women...	77,708	81,625	81,711	5.0	5.2	−86	−.1	36.9	35.7	

overprojection of the overall participation rate resulted mostly from an overprojected female participation rate. The 2006 participation rate for men, 73.5 percent, was only one-tenth of a percentage point below the projected rate of 73.6 percent. The female labor force participation rate rose during the 1960s, 1970s, and 1980s, and was the main factor increasing the overall labor force participation rate. The female labor force participation rate grew from 55.3 percent in 1986 to 59.3 percent in 1996. It peaked in 1999 at 60.0 percent and then started declining gradually. Although BLS had anticipated slowing growth in the female labor force participation rate, it had failed to project that the trend would actually reverse and the rate would decline. On the basis of the upward historical trend in the women's labor force participation rate, BLS had projected the female labor force participation rate to continue increasing and to reach 61.4 percent in 2006. The actual participation rate in 2006 was 59.4 percent, an overprojection of 2.0 percentage points.

With the female CNIP underprojected by 3.3 million and the female labor force participation rate overprojected by 2.0 percentage points, the two differences largely offset each other and resulted in an overprojection of only 400,000 in the female labor force. The 2006 female labor force, projected to be 70.6 million, was actually 70.2 million. With the male CNIP underprojected by 4.3 million (a larger error than that of the female population) and the male participation rate projected to within one-tenth of a percentage point of the true value, there was no large overprojection to offset the underprojected CNIP, which resulted in an underprojected male labor force. The 2006 male labor force, projected to be 78.2 million, was actually 81.3 million.

Race groups. The CNIP for Whites was underprojected by 4.1 million. Whites, projected to make up 82.3 percent

of the 2006 CNIP, made up 81.4 percent in the actual 2006 data. The white labor force participation rate, projected to be 68.1 percent, was actually 66.3 percent. The difference in the participation rate between the projection and reality was concentrated in the white female population. The underprojected white population and overprojected white labor force participation rate largely offset each other and resulted in a projected white labor force of 123.6 million, compared with the actual white labor force of 123.8 million.

The black CNIP was underprojected by less than half a million. Blacks, projected to be 12.0 percent of the CNIP, were actually 11.8 percent. The black labor force participation rate was overprojected, but was more accurately projected than the white participation rate. The projected 2006 black participation rate was 64.9 percent, and the actual participation rate was 63.8 percent. The underprojected population and the overprojected participation rate resulted in the black labor force being underprojected by fewer than 100,000 people. The projected 2006 black labor force was 17.2 million, and the actual 2006 black labor force was 17.3 million.

The "Asians and others" CNIP was overprojected by fewer than 200,000 people. The Asians and others group includes Asians, Native Americans and Native Alaskans, and Native Hawaiians and other Pacific Islanders.[16] The 2006 Asian and others CNIP, projected to be 12.5 million, actually was 12.3 million. Asians and others, projected to make up 5.6 percent of the CNIP in 2006, actually made up 5.4 percent. The 2006 Asians and others labor force participation rate was projected to be 65.7 percent, and the actual rate was 66.2. The overprojected population and the underprojected labor force participation rate resulted in the 2006 Asian and others labor force being underprojected by about 100,000 people. The projected 2006 Asian and others labor force was 8.0 million, and the actual la-

Table 2.	Civilian labor force participation rates, by age, sex, race, and ethnicity, 1996 and 2006 (projected and actual)						
	1996	**2006**		**Numerical change**		**Numerical difference**	**Percent difference**
Labor force group				**1996–06**		**2006**	
	Actual	**Projected**	**Actual**	**Projected**	**Actual**	**Projected verses actual**	
Total, 16 years and older.........................	66.8	67.6	66.2	0.8	−0.6	1.4	2.1
16 to 24...	65.5	62.4	60.6	−3.1	−4.9	1.8	3.0
16 to 19	52.3	51.8	43.7	−.5	−8.6	8.1	18.5
20 to 24	76.8	74.3	74.6	−2.5	−2.2	−.3	−.4
25 to 54	83.8	85.5	82.9	1.7	−.9	2.6	3.1
25 to 34...	84.1	84.8	83.0	.7	−1.1	1.8	2.2
35 to 44...	84.8	85.3	83.8	.5	−1.0	1.5	1.8
45 to 54...	82.1	84.6	81.9	2.5	−.2	2.7	3.3
55 and older...	30.3	36.8	38.0	6.5	7.7	−1.2	−3.2
55 to 64	57.9	62.6	63.7	4.7	5.8	−1.1	−1.7
65 to 74...	17.5	18.2	23.6	.7	6.1	−5.4	−22.9
75 and older...	4.7	5.9	6.4	1.2	1.7	−.5	−7.8
Men, 16 and older.......................................	74.9	73.6	73.5	−1.3	−1.4	.1	.1
16 to 24...	68.8	65.8	63.3	−3.0	−5.5	2.5	3.9
16 to 19...	53.2	52.5	43.7	−.7	−9.5	8.8	20.1
20 to 24...	82.5	76.5	79.6	−6.0	−2.9	−3.1	−3.9
25 to 54	91.8	90.8	90.6	−1.0	−1.2	.2	.2
25 to 34...	93.2	92.3	91.7	−.9	−1.5	.6	.7
35 to 44...	92.4	90.6	92.1	−1.8	−.3	−1.5	−1.6
45 to 54...	89.1	89.5	88.1	.4	−1.0	1.4	1.6
55 and older...	38.3	43.8	44.9	5.5	6.6	−1.1	−2.4
55 to 64	67.0	70.2	69.6	3.2	2.6	.6	.9
65 to 74...	22.9	23.9	28.8	1.0	5.9	−4.9	−17.0
75 and older...	7.3	9.2	9.5	1.9	2.2	−.3	−3.2
Women, 16 and older..................................	59.3	61.4	59.4	2.1	.1	2.0	3.4
16 to 24...	62.2	62.2	57.9	.0	−4.3	4.3	7.4
16 to 19...	51.3	51.0	43.7	−.3	−7.6	7.3	16.7
20 to 24	71.3	71.8	69.5	.5	−1.8	2.3	3.3
25 to 54	76.1	79.3	75.5	3.2	−.6	3.8	5.0
25 to 34...	75.2	77.6	74.4	2.4	−.8	3.2	4.3
35 to 44...	77.5	80.2	75.9	2.7	−1.6	4.3	5.7
45 to 54...	75.4	79.9	76.0	4.5	.6	3.9	5.1
55 and older...	23.9	29.9	32.3	6.0	8.4	−2.4	−7.4
55 to 64	49.6	55.8	58.2	6.2	8.6	−2.4	−4.1
65 to 74...	13.1	13.3	19.2	.2	6.1	−5.9	−30.7
75 and older...	3.1	3.9	4.4	.8	1.3	−.5	−11.4
Race:							
White..	67.2	68.1	66.3	.9	−.9	1.8	2.7
Men...	75.8	74.3	74.1	−1.5	−1.7	.2	.3
Women..	59.1	62.0	58.9	2.9	−.2	3.1	5.3
Black	64.1	64.9	63.8	.8	−.3	1.1	1.7
Men...	68.7	69.6	66.7	.9	−2.0	2.9	4.3
Women..	60.4	61.3	61.5	.9	1.1	−.2	−.3
Asian and other..	65.8	65.7	66.2	−.1	.4	−.5	−.7
Men...	73.4	71.6	74.4	−1.8	1.0	−2.8	−3.8
Women..	58.8	60.1	58.7	1.3	−.1	1.4	2.4
Multiple race group....................................	...	...	65.9	...	...	...	...
Men...	...	...	72.3	...	...	...	...
Women..	...	...	59.7	...	...	...	...

Table 2.	Continued—Civilian labor force participation rates, by age, sex, race, and ethnicity, 1996 and 2006 (projected and actual)							
Labor force group	1996	2006		Numerical change		Numerical difference	Percent difference	
				1996–06		2006		
	Actual	Projected	Actual	Projected	Actual	Projected verses actual		
Ethnicity								
Hispanic origin...	66.5	65.7	68.6	–0.8	2.1	–2.9	–4.2	
Men..	79.6	77.1	80.4	–2.5	.8	–3.3	–4.1	
Women..	53.4	57.2	56.1	3.8	2.7	1.1	2.0	
White non-Hispanic origin..............................	67.3	68.7	65.9	1.4	–1.4	2.8	4.2	
Men..	75.3	74.1	73.0	–1.2	–2.3	1.1	1.5	
Women..	59.8	63.7	59.3	3.9	–.5	4.4	7.4	

bor force was 8.2 million. When adjusted for rounding, the difference between the projected and actual levels was much closer to 100,000 than 200,000.

Since the multiple race group did not exist in 1996, no projections were made for the group. In 2006, the multiple race group accounted for 3.2 million people, or 1.4 percent of the CNIP. The general overprojection of shares of the CNIP for other race groups can be attributed to some people reclassifying themselves from being of a single race to being a member of the new multiple race group. Within the labor force, the multiple race group accounted for 2.1 million people, or 1.4 percent of the labor force. If the multiple race category did not exist, the members of this group would have been assigned to one of the other three race categories and would have increased the actual labor force and CNIP numbers for those groups.

Ethnic groups. In BLS statistics, Hispanics are considered to be an ethnic, not racial, group. Hispanics can be of any race, but more than 90 percent classify themselves as white when they are asked to choose among the race groups in the tables. Thus, the differences associated with the projection of Hispanics affect mostly the white race category. Estimates of Hispanics were revised more after the 2000 Census than estimates of any other group. In the 1996–2006 projections, Hispanics were underprojected by 3.6 million, or 12.1 percent. The 2006 Hispanic CNIP was projected to be 26.5 million, and the actual level was 30.1 million. Since Hispanics have high immigration rates and constitute the majority of undocumented immigrants,[17] they are a difficult group to project accurately, and they tend to be underprojected. Hispanic labor force participation also was underprojected: the actual 2006 participation rate, 68.6 percent, was a full 3.0 percentage points above the projected 65.7 percent rate. With both the CNIP and labor force participation rate for Hispanics underprojected, the Hispanic labor force also was underprojected. The projected size of the 2006 Hispanic labor force was 17.4 million, and the actual number was 20.7 million.

The white non-Hispanic CNIP was overprojected by about 300,000, or 0.2 percent. The projected CNIP was 158.6 million, and the actual CNIP was 158.3 million. The problems in projecting the white CNIP can be attributed to underprojecting the white Hispanic population. The 2006 white non-Hispanic labor force participation rate, projected to be 68.7 percent, was actually 65.9 percent. The overprojected participation rate and fairly accurately projected CNIP resulted in the 2006 white non-Hispanic labor force projection of 108.2 million being above the actual level of 104.6 million.

Naïve model. The BLS population and labor force participation rate projections outperformed those of the naïve model (which assumed that the historical rates of growth would continue). The results presented in table 4 show that the BLS labor force participation rate and labor force projection outperformed the naïve model in 7 out of 11 (with one tie) and 8 out of 11 categories, respectively.

Macroeconomic projections

The BLS projections of the aggregate economy are based on a long-term view of the U.S. economy that assumes a long-run full-employment economy. The 1996–2006 projections created a reasonable model of what the economy might look like in 2006. Different assumptions about key variables can lead to different projections for the macroeconomy. The GDP projection is based on projections of the supply of labor and on assumptions affecting energy, taxes, Federal expenditures and grants,

Table 3.	Civilian labor force, by age, sex, race, and ethnicity, 1996 and 2006 (projected and actual)								
Labor force group	**Thousands of people**			**Percent change**		**Numerical difference**	**Percent difference**	**Share of labor force**	
	1996	**2006**		**1996–06**		**2006**		**2006**	
	Actual	**Projected**	**Actual**	**Projected**	**Actual**	**Projected verses actual**		**Projected**	**Actual**
Total, 16 years and older...	133,943	148,847	151,428	11.1	13.1	−2,581	−1.7	100.0	100.0
16 to 24...........	21,183	24,418	22,394	15.3	5.7	2,024	9.0	16.4	14.8
16 to 19...........	7,806	8,924	7,281	14.3	−6.7	1,643	22.6	6.0	4.8
20 to 24...........	13,377	15,494	15,113	15.8	13.0	381	2.5	10.4	10.0
25 to 54...........	96,786	101,454	103,566	4.8	7.0	−2,112	−2.0	68.2	68.4
25 to 34...........	33,833	30,842	32,573	−8.8	−3.7	−1,731	−5.3	20.7	21.5
35 to 44...........	36,556	35,455	35,848	−3.0	−1.7	−393	−1.1	23.8	23.7
45 to 54...........	26,397	35,157	35,146	33.2	33.1	11	.0	23.6	23.2
55 and older...........	15,974	22,974	25,468	43.8	59.4	−2,494	−9.8	15.4	16.8
55 to 64...........	12,146	18,753	19,984	54.4	64.5	−1,231	−6.2	12.6	13.2
65 to 74...........	3,194	3,300	4,404	3.3	37.9	−1,104	−25.1	2.2	2.9
75 and older...........	634	921	1,080	45.3	70.3	−159	−14.7	.6	.7
Men, 16 and older...........	72,087	78,226	81,255	8.5	12.7	−3,029	−3.7	52.6	53.7
16 to 24...........	11,147	12,848	11,810	15.3	5.9	1,038	8.8	8.6	7.8
16 to 19...........	4,043	4,551	3,693	12.6	−8.7	858	23.2	3.1	2.4
20 to 24...........	7,104	8,297	8,116	16.8	14.2	181	2.2	5.6	5.4
25 to 54...........	51,999	52,908	55,840	1.7	7.4	−2,932	−5.3	35.5	36.9
25 to 34...........	18,431	16,469	17,944	−10.6	−2.6	−1,475	−8.2	11.1	11.8
35 to 44...........	19,602	18,478	19,407	−5.7	−1.0	−929	−4.8	12.4	12.8
45 to 54...........	13,967	17,961	18,489	28.6	32.4	−528	−2.9	12.1	12.2
55 and older...........	8,941	12,470	13,605	39.5	52.2	−1,135	−8.3	8.4	9.0
55 to 64...........	6,693	9,919	10,509	48.2	57.0	−590	−5.6	6.7	6.9
65 to 74...........	1,872	1,999	2,466	6.8	31.7	−467	−18.9	1.3	1.6
75 and older...........	375	552	630	47.2	68.0	−78	−12.4	.4	.4
Women, 16 and older...........	61,857	70,620	70,173	14.2	13.4	447	.6	47.4	46.3
16 to 24...........	10,036	11,570	10,584	15.3	5.5	986	9.3	7.8	7.0
16 to 19...........	3,763	4,373	3,588	16.2	−4.7	785	21.9	2.9	2.4
20 to 24...........	6,273	7,197	6,997	14.7	11.5	200	2.9	4.8	4.6
25 to 54...........	44,787	48,546	47,726	8.4	6.6	820	1.7	32.6	31.5
25 to 34...........	15,403	14,373	14,628	−6.7	−5.0	−255	−1.7	9.7	9.7
35 to 44...........	16,954	16,977	16,441	.1	−3.0	536	3.3	11.4	10.9
45 to 54...........	12,430	17,196	16,656	38.3	34.0	540	3.2	11.6	11.0
55 and older...........	7,033	10,504	11,863	25.6	68.7	−1,359	−11.5	7.1	7.8
55 to 64...........	5,452	8,834	9,475	62.0	73.8	−641	−6.8	5.9	6.3
65 to 74...........	1,321	1,301	1,937	−1.5	46.6	−636	−32.8	.9	1.3
75 and older...........	260	369	451	41.9	73.5	−82	−18.2	.2	.3
Race:									
White...........	113,108	123,581	123,834	9.3	9.5	−253	−.2	83.0	81.8
Men...........	61,783	66,008	67,613	6.8	10.3	−1,605	−2.4	44.3	44.7
Women...........	51,325	57,572	56,221	12.2	9.5	1,351	2.4	38.7	37.1
Black...........	15,134	17,225	17,314	13.8	14.4	−89	−.5	11.6	11.4
Men...........	7,264	7,996	8,128	10.1	11.9	−132	−1.6	5.4	5.4
Women...........	7,869	9,229	9,186	17.3	16.7	43	.5	6.2	6.1
Asian and other...........	5,703	8,041	8,152	41.0	18.0	−111	−1.4	5.4	5.4
Men...........	3,039	4,222	4,375	38.9	19.2	−153	−3.5	2.8	2.9
Women...........	2,664	3,818	3,777	43.3	16.6	41	1.1	2.6	2.5
Multiple race group...........	...	...	2,127	...	...	...	...	...	1.4
Men...........	...	...	1,138	...	...	...	...	...	.8
Women...........	...	...	989	...	...	...	...	...	.7
Ethnicity:									
Hispanic origin...........	12,774	17,401	20,694	36.2	62.0	−3,293	−15.9	11.7	13.7
Men...........	7,646	10,235	12,488	33.9	63.3	−2,253	−18.0	6.9	8.2
Women...........	5,128	7,166	8,206	39.7	60.0	−1,040	−12.7	4.8	5.4

Table 3.	Continued—Civilian labor force, by age, sex, race, and ethnicity, 1996 and 2006 (projected and actual)								
Labor force group	**Thousands of people**			**Percent change**		**Numerical difference**	**Percent difference**	**Share of labor force**	
	1996	**2006**		**1996–06**		**2006**		**2006**	
	Actual	**Projected**	**Actual**	**Projected**	**Actual**	**Projected verses actual**		**Projected**	**Actual**
White non-Hispanic origin............	100,915	108,166	104,629	7.2	3.7	3,537	3.4	72.7	69.1
Men..	54,451	56,856	55,953	4.4	2.8	903	1.6	38.2	37.0
Women...	46,464	51,310	48,676	10.4	4.8	2,634	5.4	34.5	32.1

Table 4.	Civilian labor force: projected, actual, and naïve model, 2006					
Group	**Projected**	**Actual**	**Naïve model**	**Actual minus naïve**	**Actual minus projected**	**Which model performed better?**
Civilian labor force participation rates						
Total, 16 years and older...................................	67.6	66.2	68.3	–2.1	–1.4	BLS
16 to 24 years..	62.4	60.6	62.5	–1.9	–1.8	BLS
25 to 54 years..	85.5	82.9	85.6	–2.7	–2.6	BLS
55 years and older...	36.8	38.0	30.5	7.5	1.2	BLS
Men...	73.6	73.5	73.5	0.0	–0.1	Naïve
Women..	61.4	59.4	63.6	–4.2	–2.0	BLS
One race:						
White..	68.1	66.3	68.9	–2.6	–1.8	BLS
Black...	64.9	63.8	64.9	–1.1	–1.1	Tie
Asian and other...	65.7	66.2	66.1	.1	.5	Naïve
Hispanic origin...	65.7	68.6	67.6	1.0	2.9	Naïve
White non-Hispanic..	68.7	65.9	69.1	–3.2	–2.8	BLS
Civilian labor force levels						
Total, 16 years and older...................................	148,847	151,428	152,254	–826	2,581	Naïve
16 to 24 years..	24,418	22,394	19,203	3,191	–2,024	BLS
25 to 54 years..	101,454	103,566	117,737	–14,171	2,112	BLS
55 years and older...	22,974	25,468	17,121	8,347	2,494	BLS
Men...	78,226	81,255	79,431	1,824	3,029	Naïve
Women..	70,620	70,173	73,003	–2,830	–447	BLS
One race:						
White..	123,581	123,834	125,671	–1,837	253	BLS
Black...	17,225	17,314	18,100	–786	89	BLS
Asian and other...	8,041	8,152	9,648	–1,496	111	BLS
Hispanic origin...	17,401	20,694	20,205	489	3,293	Naïve
White non-Hispanic..	108,166	104,629	108,309	–3,680	–3,537	BLS

and other transfer payments.

The key general assumptions in the projections are consistent with a long-term focus: there will be no major wars, natural disasters, or oil embargoes, and the long-term horizon will not change drastically because short-term fluctuations tend to smooth out substantially over the long term. Although these assumptions may seem unrealistic, projecting shocks is impossible, and therefore it is more reasonable to build a projection without them. Part of why it is reasonable to build a model without projecting shocks is that, over the long run, despite large fluctuations, the economy tends to regress to the typical long-run trend. In the end, the 1996–2006 period did see a number of major events that changed the economy: the attacks of September 11th, the wars in Iraq and Afghanistan, the dot-com and housing bubbles, and a sharp runup in oil prices.

Some of the assumptions built into the model are major economic factors such as demographics, fiscal policy, monetary policy, productivity growth, and the fluctuations of the unemployment rate: they affect the long-term projections of the value of GDP, the makeup of final demand, and the level of employment necessary to produce that GDP.[18]

Demographics in general and the size of the labor force in particular are the most important elements in deter-

mining the economy's potential output. A sensitivity analysis of exogenous and endogenous variables in the macro model points to the importance of the demographic factors in determining long-run levels of GDP.[19] As previously discussed, BLS underprojected the growth of the labor force by 1.7 percent, which consequently reduced the BLS projection of GDP. An article that accompanied the original publication of the 1996–2006 projections discussed the impact of underprojecting labor force growth: "A 0.8-percent increase in GDP results from a 1.0-percent increase in the labor force."[20] According to that relationship, if BLS had not underprojected labor force growth, the projected average annual growth rate of GDP would have been 2.3 percent, higher than the originally projected 2.1 percent growth rate. The major demographic projections and other key macroeconomic projections are compared with actual results in table 5.

Productivity projections are partly based on assumptions and partly based on the results of the model. From 1996 through 2004, productivity grew faster than it did during the 1980s and early 1990s. From 2001 to 2004, productivity growth averaged 3.5 percent annually. Although the contribution of productivity to the growth of the overall economy decreased in 2005 and 2006, the actual average annual 2.6 percent rate of productivity growth over the 1996–2006 period was more than double the projected rate of 1.2 percent.[21]

A full-employment economy is a key assumption in the model. With persistently low unemployment and inflation through much of the 1996–2006 period, the actual level of unemployment associated with full employment became widely debated. The unemployment rate in the 1996–2006 period twice dipped to levels unseen since the late 1960s. (See chart 1 for a graphical representation of the unemployment rate from 1960 to 2006.) When the annual unemployment rate data for the 1960–2006 period are examined, it can be seen that 4 of the 10 years with the lowest annual unemployment rate fall within the period in question. In 2006, the unemployment rate was 4.6 percent, well below BLS' assumption of full employment being 5.4 percent. (See table 5.)
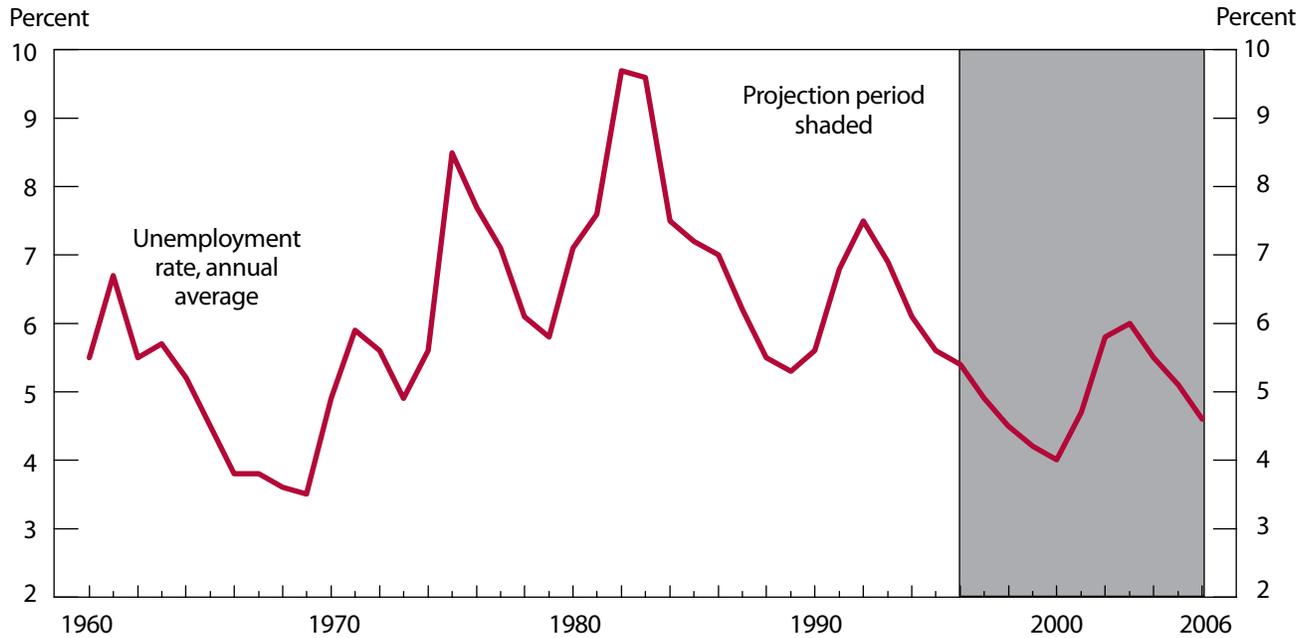
Another assumption in the economic projections is that there would not be an oil embargo. Although there were no oil embargoes during the 1996–2006 period, the in-

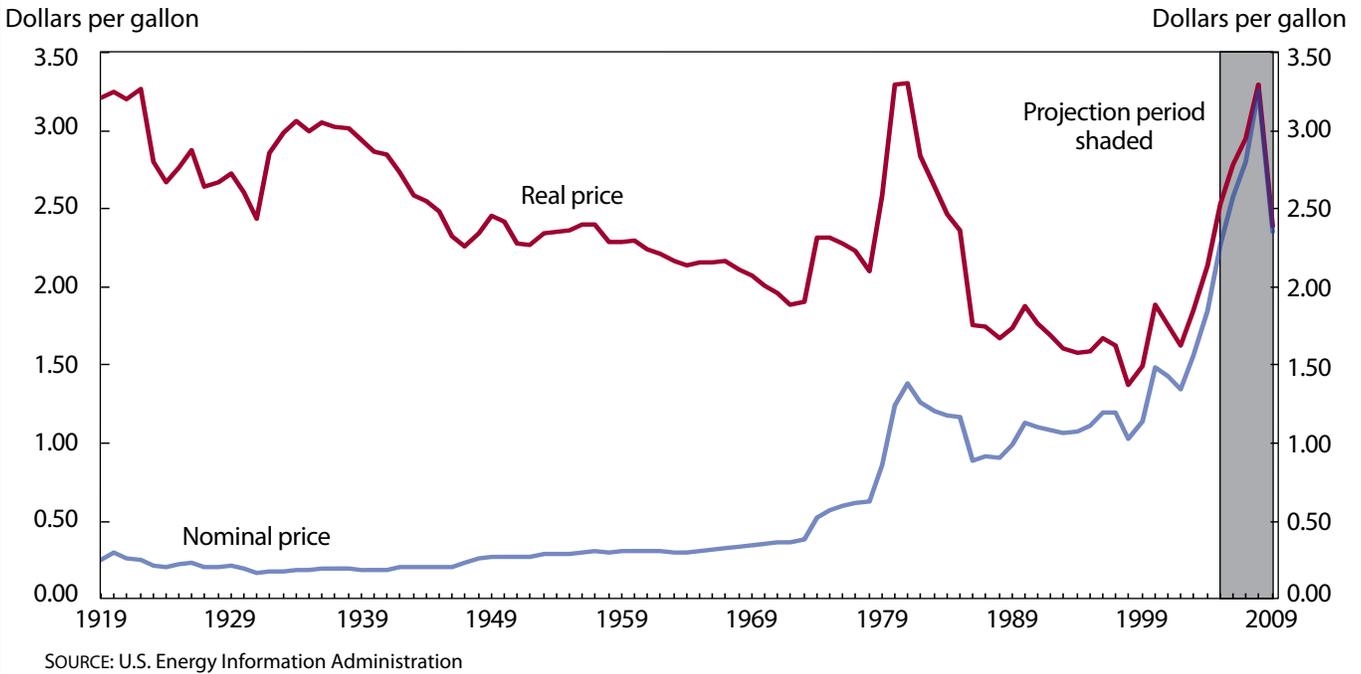| Table 5.	Major economic variables, actual and projected, 2006						
	2006		2006		Average annual rate of change, 1996–2006		
Economic variable			Difference				
	Actual	Projected	Percent	Level	Actual	Projected	Difference
[In millions]							
Population, including overseas armed forces......................	299.1	288.7	−3.5	−10.4	1.1	0.8	−0.3
Population, aged 16 and older..	228.8	225.5	−1.4	−3.3	1.3	1.0	−.3
Population, aged 65 and older..	37.3	36.6	−1.9	−0.7	.9	.8	−.1
Civilian labor force...	151.4	148.8	−1.7	−2.6	1.2	1.1	−.1
Unemployment rate (in percent)..	4.6	5.4	17.4	.8	−1.5	−.1	1.4
Household employment..	144.4	140.9	−2.4	−3.5	1.3	1.1	−.2
Nonfarm payroll employment...	136.2	137.3	0.8	1.1	1.3	1.4	.1
[In billions]							
Nominal disposable personal income (DPI).............................	9,640.7	8,997.1	−6.7	−643.6	5.4	4.9	−.5
Real DPI (in chained 2000 dollars for the actual statistics and chained 1992 dollars for the projected statistics)...	8,407.0	6,154.3	...	...	3.3	1.9	−1.4
Real DPI per capita (chained 2000 dollars for actual and chained 1992 dollars for projected)...................................	28,134.0	21,317.9	...	...	1.1	1.1	.0
Federal deficit (nominal)..	−201.1	−.8	−99.6	200.3	...	...	...
Federal deficit as a percent of nominal GDP..........................	−1.5	−.0	−100.0	1.5	...	...	...
Net exports (chained 2000 dollars for actual and chained 1992 dollars for projected)....................................	−615.7	−63.8	...	...	...	...	...
Merchandise trade balance...	−720.3	−237.1	...	...	...	...	...
Services trade balance..	102.6	178.2	...	...	...	...	...
Federal funds rate (in percent)...	5.0	4.3	...	−.7	...	...	...
Price of imported crude oil (dollars per barrel).....................	58.9	27.0	−54.2	−31.9	11.1	2.8	−8.3
Savings rate (in percent)...	.7	3.1	...	2.4	...	...	...
Nonfarm labor productivity (index)...	1.4	1.1	−18.6	−.3	2.6	1.2	−1.4
SOURCE: 1996–2006 projections data are from BLS; actual 2006 data are from the Bureau of Economic Analysis.							

Chart 1. Average annual unemployment rate, 1960–2006

Percent   Percent

Projection period shaded

Unemployment rate, annual average

Chart 2. Real and nominal gasoline pump price, annual average, 1919–2009

Dollars per gallon   Dollars per gallon

Real price

Projection period shaded

Nominal price

SOURCE: U.S. Energy Information Administration

crease in prices that did occur could be compared to what might have occurred if there had been an oil embargo. Starting in the late 1990s (see chart 2), there was a shift in the long-run trend in oil prices. With the exception of

the politically driven oil shocks of the 1970s, real oil prices trended downwards from the invention of the automobile to the late 1990s, and nominal oil prices were fairly flat from the late 1970s until the late 1990s. Strong growth in

Table 6.	Real gross domestic product, by demand category, 2006					
		Billions of chained		Average annual rate of change		
Demand category		2000 dollars	1992 dollars	1996–2006		
		Actual	**Projected**	**Actual**	**Projected**	**Difference**
Gross domestic product...................................		$11,294.9	$8,539.1	3.1	2.1	−1.0
Personal consumption expenditures........................		8,029.0	5,772.9	3.6	2.1	−1.5
Durable goods...		1,185.1	867.3	7.1	3.6	−3.5
Nondurable goods..		2,335.3	1,683.8	3.3	1.6	−1.7
Services...		4,529.9	3,239.8	3.0	2.1	−0.9
Gross private domestic investment..........................		1,912.5	1,469.7	4.5	3.3	−1.2
Nonresidential...		1,318.2	1,132.0	4.7	4.0	−.7
Residential...		552.9	302.7	3.8	0.9	−2.9
Inventory changes...		42.3	41.5	3.9	9.0	5.1
Exports...		1,314.9	1,686.0	4.5	7.4	2.9
Goods..		928.7	1,313.2	4.8	8.0	3.2
Services...		386.2	389.7	3.9	6.0	2.1
Imports...		1,930.6	1,749.8	7.7	6.4	−1.3
Goods..		1,649.0	1,550.3	8.0	6.9	−1.1
Services...		283.8	211.5	5.9	3.9	−2.0
Government...		1,971.2	1,400.6	2.3	1.0	−1.3
Federal defense consumption expenditures and gross investment...................................		490.0	257.3	2.5	−2.0	−4.5
Federal nondefense consumption expenditures and gross investment.............................		250.8	141.5	2.8	−.8	−3.6
State and local consumption expenditures and gross investment.............................		1,230.2	1,005.9	2.2	2.3	.1
Residual		−1.9	−44.4	...	...	...

the global demand for oil helped to change this long-run trend and shifted both nominal and real oil prices sharply upwards. BLS does not project oil prices; it uses projections produced by the Energy Information Agency. Although the Energy Information Agency had projected oil would be $27 a barrel in 2006, it was actually $59. Because the United States imported about 60 percent of its oil in 2006,[22] the increase in the price of oil raised the U.S. trade deficit that year.[23]

GDP. As shown in table 6, BLS underprojected average annual GDP growth for the 1996–2006 period by 1.0 percentage point. BLS projected 2.1 percent average annual growth, and actual growth was 3.1 percent. However, the numbers in table 6 fail to account for the substantial revisions to GDP data (previously mentioned) that occurred beginning in 1996 and led to revisions of historical data going back well before 1996. Table 7 shows that, in revising the projections to account for both the rebasing of GDP data and revisions to pre-1997 data, the projected average annual GDP growth rate should be adjusted from 2.1 percent to either 2.5 percent or 2.7 percent (depending on the method used for adjusting the projections to account for revisions to the historical data.)[24] Thus, once data revisions are accounted for, the underprojection of

average annual GDP growth shrinks from 1.0 percentage point to about half a percentage point.

A combination of underprojecting the labor force and productivity growth and overprojecting the unemployment rate contributed to GDP growth being underprojected. The actual 3.1 percent average annual GDP growth rate was above both the projected 2.1 percent rate and the revised projected rate of 2.5 to 2.7 percent.

Components of GDP. Projecting GDP necessitates projecting its underlying parts, which make up final demand. GDP consists of four categories of final demand: personal consumption expenditures (PCE), gross private domestic investment, foreign trade, and government consumption and investment. PCE accounts for more than two-thirds of GDP and is the largest and one of the most stable components of final demand. Private domestic investment is one of the most volatile factors in final demand and one of the hardest to project because it is strongly affected by business cycles, interest rates, and inflation. Foreign trade has grown as a share of the total economy and become more complex and harder to project. The government component of GDP is another relatively stable component, but it did change because of the wars fought over the latter half of the 1996–2006 period.

	Level			Annual average rate of change	
GDP	**1986**	**1996**	**2006**	**1986–96**	**1996–2006**
Original data, published in 1997 (billions of chained 1992 dollars)[1]	$5,489.9	$6,911.0	$8,539.1	2.3	2.1
Original data (billions of chained 2000 dollars)[2]	6,208.7	8,092.1	10,394.8	2.7	2.5
Revised data, published in 2007 (billions of chained 2000 dollars)[3]	6,263.6	8,328.9	11,294.9	2.9	3.1
Adjusted growth rate[4]				2.9	2.7

Table 7. GDP with National Income and Product Account adjustments, 1986–2006

[1] Original data: Historical data for 1986 and 1996 and a projected value for 2006 (in 1992 dollars) were published in the MLR in November 1997.

[2] Original data rebased to chained 2000 dollars with recalculated growth rates, 1986–96 = 2.7 percent and 1996–2006 = 2.5 percent

[3] Revised historical data: historical data for 1986, 1996, and 2006 (in 2000

dollars) were revised and then published by the Bureau of Economic Analysis in December 2007.

[4] The 1996–2006 projected growth rate was revised upwards by the same amount as the 1986–96 actual growth rate, resulting in a figure of 2.7 percent.

The components of GDP with the largest differences between projected and actual growth rates were expenditures for durable consumer goods, residential construction, and exports of goods and services. (See table 6 for the projections and actual GDP data on a real basis and table 8 for the results on a nominal basis. Real GDP data will be discussed on an average annual growth rate basis, and nominal GDP data will be discussed as a share of total GDP.)

During the 1996–2006 period, PCE grew faster than the overall economy. BLS had projected PCE to grow as a share of nominal GDP from 68.0 percent in 1996 to 70.1 percent in 2006, and PCE did grow, from 67.3 percent (revised share) in 1996 to 69.9 percent in 2006. On a real basis, BLS had projected PCE to grow at the same average annual rate as GDP—2.1 percent. Of course, revisions to historical GDP data that occurred after the projections were produced suggest that the projected average annual rate should be revised up to 2.5 percent to 2.7 percent. Real PCE, projected to grow at a 2.1 percent rate, grew at an average annual rate of 3.6 percent over the 1996–2006 period.

All three categories of PCE (durable goods, nondurable goods, and services) grew faster, on a real basis, than BLS had projected, but durable goods consumption grew at the fastest rate. Durable goods—which include big-ticket items such as automobiles, home furnishings, major household appliances, and televisions—grew at a 7.1 percent average annual rate over the 1996–2006 period, whereas BLS had projected 3.6 percent growth. The growth in spending on durable goods was linked to the housing bubble in a few ways. First, evidence shows that the wealth effect generated by rising home prices increased consumer spending, particularly on durable goods.[25] Second, the high levels of investment in residential structures, which includes

both building new homes and renovating existing homes, are intuitively linked to consumption of new appliances, which are durable goods. Third, survey evidence shows that consumers cite moving to a new home or renovating an existing home as a major reason for buying new furniture, which also is a durable good.[26] Automobile sales did decline in 2006, but strong demand for other durable goods offset the decline. Although BLS underprojected the real growth rate in the two other categories of PCE as well—services (3.0 percent actual growth, compared with 2.1 percent projected) and nondurable goods (3.3 percent actual growth, compared with a projected rate of 1.6 percent)—these categories were underprojected by amounts more consistent with the underprojection in the overall rate of growth of GDP, which can be attributed to the revisions in historical data, the underprojected labor force growth, and the general underprojection in growth.

BLS underprojected the growth of gross private domestic investment. The real average annual growth rate, projected to be 3.3 percent, was 4.5 percent. When gross private domestic investment is broken down into its two largest components, nonresidential and residential investment, it becomes apparent that residential investment was the underprojected component. The final component of gross private domestic investment, inventories, is quite small relative to the other two categories and has very little impact on total investment growth. Although BLS underprojected the average annual real growth rate of nonresidential investment (4.0 percent projected, compared with 4.7 percent actual—see table 6), the underprojection could be attributed to the revisions in data that resulted in the 1986–1996 growth rate for nonresidential investment being revised upwards, from 3.4 percent to 4.6 percent.

Residential investment grew at an average annual rate of 8.3 percent between 2003 and 2005. Starting in 2006,

Table 8. **Nominal GDP by major category, 1996 and 2006**

[In billions of dollars]

Category	Level				Percent distribution			
	1996		2006		1996		2006	
	Original[1]	Revised[2]	Projected	Actual	Original[1]	Revised[2]	Projected	Actual
Gross domestic product..	$7,580.0	$7,816.8	$12,288.8	$13,178.4	100.0	100.0	100.0	100.0
Personal consumption expenditures..................................	5,152.0	5,256.8	8,619.1	9,207.2	68.0	67.3	70.1	69.9
Gross private domestic investment....................................	1,119.8	1,240.3	1,772.1	2,220.4	14.8	15.9	14.4	16.8
Exports..	855.4	868.5	1,880.0	1,480.8	11.3	11.1	15.3	11.2
Imports..	954.9	964.8	2,015.1	2,238.1	12.6	12.3	16.4	17.0
Federal defense consumption expenditures and gross investment...	348.1	354.6	400.6	624.1	4.6	4.5	3.3	4.7
Federal nondefense consumption expenditures and gross investment..	176.0	172.8	221.8	308.0	2.3	2.2	1.8	2.3
State and local consumption expenditures and gross investment...	883.6	888.6	1,410.2	1,575.9	11.7	11.4	11.5	12.0

[1] Original 1996 data, published in 1997
[2] Revised 1996 data, published in 2006

it began to retreat from its 2005 peak, but residential investment and home sales and prices remained well above historical levels. As previously discussed, BLS does not attempt to project large economic fluctuations. Because BLS did not project the bubble, it is unsurprising that it underprojected growth in residential investment. The annual population growth rate was faster than projected for the 1996–2006 period, but the housing bubble was the primary reason that the annual residential construction growth rate during the period, 3.8 percent, was four times higher than the projected growth rate, 0.9 percent.

The trend towards increased globalization can be seen in the growth of the foreign trade sector outpacing the growth of the aggregate economy. The projected real average annual growth rate of exports for the 1996–2006 period, 7.4 percent, exceeded the actual 4.5 percent rate for the same period. Whereas the growth of exports was overprojected, the growth of imports was underprojected. On a real basis, imports were projected to grow at a 6.4 percent average annual rate but actually grew at a 7.7 percent rate. With imports underprojected and exports overprojected, it is unsurprising that the BLS projection of net exports (the trade deficit) as a share of nominal GDP in 2006 was not accurate: BLS projected that net exports would be –1.1 percent of GDP, but in reality they were –5.8 percent. The difference between the projected and actual level of net exports could be partly attributed to the underprojected oil price. The San Francisco Federal Reserve Bank stated that "these numbers [the trade deficit and oil imports] imply that higher oil prices and the resulting higher cost of petroleum imports have accounted for over 50 percent of the deterioration in the overall U.S. trade deficit during

this period [from January 2002 to July 2006]."[27] Another reason for the underprojection of imports is that durable goods make up a large share of imports,[28] and the housing bubble increased consumption of durable goods.

BLS breaks up Federal Government consumption expenditures and investment into the categories of defense and nondefense. Since BLS did not project the two wars, it projected Federal defense consumption expenditures and gross investment to decline at a 2.0 percent real average annual rate, whereas in actuality they grew by 2.5 percent per year on average. Over the projection period, defense, which had been projected to fall from 4.6 percent (4.5 percent revised) of nominal GDP in 1996 to 3.3 percent in 2006, actually held fairly steady at 4.7 percent in 2006. Nondefense consumption expenditures and gross investment followed a pattern similar to that of defense consumption and investment. Real nondefense spending, projected to decline at a 0.8 percent rate, grew at a 2.8 percent rate. On a nominal basis, nondefense consumption and investment, projected to decline from 2.3 percent (2.2 percent revised) of GDP in 1996 to 1.8 percent in 2006, actually held steady at 2.3 percent of GDP in 2006.

Federal budget. The Federal deficit, which amounted to 1.5 percent of nominal GDP in 1996, was projected to decline. However, after 2000, various factors combined to shift the Federal budget towards higher deficits: following September 11, 2001, defense spending surged to pay for military operations in Iraq and Afghanistan and for conducting other antiterrorism activities[29]; government revenues were negatively affected by the tax cuts enacted from 2001[30] through 2006; and the Medicare prescrip-

tion drug benefit increased government expenses.[31] As a result of these factors, the 2006 budget deficit, as a share of nominal GDP, was at the same level as in 1996, 1.5 percent.

Conclusion.   Several factors combined to cause BLS to underproject GDP growth for the 1996–2006 period. About half of the difference between the projected 2.1 percent growth rate and the actual 3.1 percent growth rate can be explained by revisions to how GDP growth was calculated. Another 0.2 percent of the 1.0 percent difference can be explained by the underprojected growth of the labor force. Thus, 0.3 percent of the 1.0 percent underprojection can be attributed to the macroeconomic projections.

Industry employment

This section evaluates the data for employment by industry in the 1996–2006 projections. As explained earlier, employment growth and levels were projected for both industry divisions and for two-digit and three-digit SIC industries. The industry projections are influenced by both the labor force projections and the macroeconomic projections. Errors in projecting employment in specific industry divisions were far larger, relatively, than the error in the labor force projection, and the industry division projection errors should not be attributed to the labor force projection error. For example, the labor force was underprojected by 2.6 million people, and the manufacturing sector alone was overprojected by 2.7 million jobs. The macroeconomic projections not only determine the total number of workers projected, but they also influence the expected distribution of employment among industries by determining both the expected levels of consumption of broad categories of goods and services and the expected levels of consumption of a few key products, such as automobiles and new homes. This section begins by examining the accuracy of the projections of employment in industry divisions and then moves into the accuracy of the projections for individual industries. When possible, it will discuss how the macroeconomic projections affected the industry employment projections. Finally, the projections are compared with the results of a naïve model.

As discussed previously, data revisions and changes to industry classification systems substantially altered the structure of the data. The conversion of data back to the 1996 SIC-based industry classification system and the revisions that occurred after the employment projections were produced caused some discrepancies that resulted in the two distinct columns of 1996 data in table 9. Subtract-

ing the actual statistic from the adjusted projected statistic should provide a better measure of the accuracy of the projected employment change in each sector than subtracting the actual statistic from the unadjusted projected statistic, because using the adjusted statistic takes account of revisions to the 1996 data. The results found with the adjusted statistic were quite similar to those found with the unadjusted statistic, with the exception of the results for the Federal Government, in which the sign changes. This change is due to revisions of the 1996 employment data for the Federal Government that were made after the employment projections were produced.

Only wage and salary employment in nonagricultural industries is included in this analysis.[32] The 2006 dataset used in this analysis accounts for approximately 135 million jobs and represents about 98 percent of 2006 wage and salary employment. (The other 2 percent, of course, is in agriculture.)

Results for industry divisions.   BLS overprojected employment for the following divisions, in order of largest overprojection to smallest in percent terms: manufacturing, utilities, transportation, services, and communications. BLS underprojected employment for the following divisions, in order of largest underprojection to smallest: mining; construction; finance, insurance, and real estate; State and local government; and trade. Federal Government employment was either underprojected or overprojected by about 2 percent, depending upon whether the adjusted 1996 data or the original 1996 data are used.

The largest numerical differences were in manufacturing, with employment overprojected by approximately 3.3 million jobs, and services, with employment overprojected by 2.4 million jobs. Part of the differences in both sectors could be attributed to adjustments made to the data: the adjusted differences are 2.7 million jobs in manufacturing and 1.6 million jobs in services. Because services is the largest division in the economy, the adjusted percent difference was not very large, only 4 percent. Manufacturing is much smaller, so the overprojection of 2.7 million jobs meant that the percent difference in manufacturing, 18 percent, was the third largest of any division. The largest percent differences were in mining and construction, in which employment levels were underprojected by 32 percent and 21 percent, respectively.

The direction of change (that is, whether the change in employment was positive or negative) was correctly projected for all the industry divisions except mining and utilities; employment in mining was projected to fall by an average annual rate of 2.5 percent, but in fact it grew

Table 9.	Projected and actual employment in selected industry divisions, 2006										
	Thousands of jobs						Percent difference, 2006		Average annual rate of change, 1996–2006		Percent change, 1996
Division	Original 1996 data, published in 1997	Revised and re-mapped 1996 data, published in 2006	Pro-jected	Actual	Pro-jected minus actual	Adjusted projected minus actual	Pro-jected minus actual	Ad-justed pro-jected minus actual	Pro-jected	Ad-justed pro-jected	Origi-nal 1996 to revised 1996
	1996		2006		2006						
Construction...............	5,400.0	5,376.9	5,899.9	7,478.1	−1,578.2	−1,601.4	−21.1	−21.4	0.9	3.4	−0.4
State and local government.............	16,690.0	16,662.1	18,480.2	19,261.7	−781.5	−809.4	−4.1	−4.2	1.0	1.5	−.2
Finance, insurance, and real estate..........	6,899.2	6,893.6	7,651.0	8,284.4	−633.4	−639.1	−7.6	−7.7	1.0	1.9	−.1
Trade..............................	28,108.0	27,968.7	31,103.1	31,430.4	−327.3	−466.6	−1.0	−1.5	1.0	1.2	−.5
Mining...........................	573.9	557.0	443.4	626.1	−182.7	−199.6	−29.2	−31.9	−2.5	1.2	−2.9
Federal Government	2,757.0	2,877.0	2,670.0	2,728.3	−58.3	61.7	−2.1	2.3	−.3	−.5	4.4
Communications.......	1,337.4	1,340.2	1,360.4	1,340.4	20.0	22.8	1.5	1.7	.2	.0	.2
Utilities.........................	884.9	859.3	976.1	824.9	151.2	125.6	18.3	15.2	1.0	−.4	−2.9
Transportation............	4,038.1	4,001.0	4,774.2	4,420.2	354.0	316.9	8.0	7.2	1.7	1.0	−.9
Services........................	34,513.6	33,675.2	45,626.9	43,185.9	2,441.0	1,602.6	5.7	3.7	2.8	2.5	−2.4
Manufacturing............	18,457.4	17,806.7	18,107.8	14,759.6	3,348.2	2,697.5	22.7	18.3	−.2	−1.9	−3.5
Total..............................	119,659.5	118,017.5	137,093.0	134,340.0	2,753.0	1,111.0	2.0	.8	1.4	1.3	−1.4

by 1.2 percent per year. Utilities were projected to grow by 1.0 percent annually, but this sector fell by 0.4 percent per year on average. (See table 9.)

Results at the industry level. Table 10 displays accuracy metrics for the industry divisions and for all industries taken together. The unweighted mean absolute percent error (MAPE) for all industries was 24.7 percent. When weighted by industry employment, the MAPE dropped to 11.7 percent. The fact that the weighted MAPE was much lower than the unweighted MAPE indicates that BLS was more accurate when projecting large industries than small industries. BLS correctly projected whether an industry would grow or decline 72 percent of the time. The dissimilarity index—which focuses more on structural change by measuring how much each industry's projected share of total employment would have to change to match the actual share and, therefore, is not affected by differences in the total level of employment—was 5.9 percent. A detailed description of the dissimilarity index is available in the appendix.

When the results for all the industries within each division are compared with the results at the division level,

two divisions, construction and communications, stand out because each contained only one industry in the 1996 industry employment projections. Consequently, the performance metrics for these divisions are identical to those of their respective industries.

Tables 11 and 12 present the employment data for the individual industries, by their original rankings for fastest projected growth and largest projected numerical growth. Computer and data processing services, management and public relations, residential care, personnel supply services, and individual and miscellaneous social services all were expected to be among the 10 fastest growing industries, and they were. Industries that were projected to grow rapidly, but did not, include miscellaneous transportation services, which was projected to be the third fastest at 4.8 percent average annual growth; water and sanitation, projected to grow the seventh fastest at 4.2 percent annually; and automobile parking, repair, and services, which rounded out the original top 10 and was projected to grow at 3.3 percent annually. All of these industries did grow in employment, but not at the rapid rates projected.

The industries among that original top 10 that did grow rapidly but had not been projected to do so were

Table 10.	Accuracy metrics by industry division and for all industries, 1996–2006 employment				
Division	Projection technique	Direction of change (in percent)	MAPE[1] (unweighted, in percent)	MAPE[1] (weighted, in percent)	Dissimilarity index
Mining...	BLS	80.0	27.6	32.3	11.4
	Naïve	60.0	50.9	48.9	21.8
Construction..	BLS	100.0	21.1	21.1	.0
	Naïve	.0	30.5	30.5	.0
Manufacturing...	BLS	65.3	29.8	24.9	.4
	Naïve	57.1	33.5	27.7	.6
Transportation...	BLS	62.5	20.5	13.9	7.3
	Naïve	75.0	25.1	22.6	10.6
Communications..	BLS	100.0	1.5	1.5	.0
	Naïve	100.0	1.0	1.0	.0
Utilities..	BLS	66.7	34.6	33.6	10.5
	Naïve	66.7	26.2	23.1	9.4
Trade..	BLS	100.0	3.8	3.2	2.7
	Naïve	100.0	2.4	2.4	1.3
Finance, insurance, and real estate..............	BLS	83.3	9.2	10.0	3.3
	Naïve	83.3	12.7	13.9	5.1
Services..	BLS	89.7	12.4	11.0	4.6
	Naïve	89.7	11.5	10.7	4.7
Federal Government......................................	BLS	25.0	76.7	27.7	9.4
	Naïve	50.0	44.0	17.8	6.0
State and local government...........................	BLS	83.3	22.7	11.5	6.4
	Naïve	83.3	23.2	14.2	6.7
All industries...	BLS	72.4	24.7	11.7	5.9
	Naïve	67.8	26.7	13.0	6.4

[1] Mean absolute percent error.

State and local government enterprises; oil and gas field services; personal services; and nondepository credit institutions, and holding and other investment offices. The industries that were projected to decline the fastest and did were watches, clocks, and parts; footwear, except rubber and plastic; luggage, handbags, and leather products; apparel; and tires and inner tubes. All of the 10 industries that were projected to decline the most rapidly in terms of employment did in fact decline, and for the most part they are near the bottom of the list.

Of the 10 industries projected to grow by the largest numbers of jobs, 6 were among the actual largest growing. Personnel supply services, eating and drinking places, State and local government education, computer and data processing services, offices of health practitioners, and retail trade (excluding eating and drinking places) contributed the most to job growth in numerical terms, as expected. (See table 12.) The other four rounding out the original top 10 were among the top 20 job gainers over the 1996–2006 period.

Because BLS did not anticipate the housing bubble, it underprojected the magnitude of job growth in the construction industry. Construction grew by about 2 million jobs—more than quadruple the anticipated growth of 500,000. Investment in residential construction, which drives much of the employment in the construction industry, was projected to grow 0.9 percent per year, much less than the actual 3.8 percent growth that occurred over the 1996–2006 period.

The housing bubble was not the only shift from historical trends that affected the accuracy of the projections. The large increase in the price of oil that occurred after 1999 is the main factor that caused BLS not to correctly project the direction of change in the mining division. When the mining division is broken down into its five component industries, it becomes apparent that the growth in the price of oil caused employment in the oil and gas field services industry to increase enough not only to offset employment declines in the other industries in the mining division, but also to increase total employment in the division.

Most of the industries projected to have the largest losses in employment did decline. Apparel, private households, and computer and office equipment were among the industries with the largest losses, as expected. Federal general government, State and local government enterprises, and depository institutions also were expected to decline; however, these industries were among the 25 with the greatest absolute job growth. Upward revisions in 1996

Table 11. **Actual and projected wage and salary employment levels and growth rates (in percent), by industry, in order of fastest to slowest projected growth, 1996–2006**

Industry	Thousands of jobs			Change, projected	Change, actual	Average annual rate of change, projected	Average annual rate of change, actual	Rank by actual average annual growth
	1996	2006, projected	2006, actual	1996–2006	1996–2006	1996–2006	1996–2006	1996–2006
Computer and data processing services....................................	1,207.9	2,509.1	1,978.4	1,301.2	770.5	7.6	5.1	3
Health services, not elsewhere classified..................................	1,171.9	1,968.3	1,553.2	796.4	381.3	5.3	2.9	17
Management and public relations.....	873.2	1,400.0	1,435.6	526.8	562.4	4.8	5.1	2
Miscellaneous transportation services....................................	204.4	327.4	250.8	123.0	46.4	4.8	2.1	27
Residential care...........................	672.1	1,069.8	976.5	397.7	304.4	4.8	3.8	8
Personnel supply services....................	2,646.0	4,039.3	3,741.1	1,393.3	1,095.1	4.3	3.5	10
Water and sanitation..............................	230.9	349.1	236.8	118.2	5.9	4.2	.3	63
Individual and miscellaneous social services....................................	846.3	1,265.9	1,347.0	419.6	500.7	4.1	4.8	5
Offices of health practitioners..............	2,751.4	4,045.9	3,680.3	1,294.5	928.9	3.9	3.0	16
Amusement and recreation services, not elsewhere classified....................................	1,108.6	1,565.3	1,412.2	456.7	303.6	3.5	2.4	21
Automobile parking, repair, and services....................................	890.3	1,236.2	1,014.4	345.9	124.1	3.3	1.3	42
Nursing and personal care facilities...	1,732.2	2,377.0	1,944.3	644.8	212.1	3.2	1.2	45
Producers, orchestras, and entertainers.................................	151.7	204.6	176.3	52.9	24.6	3.0	1.5	38
Miscellaneous equipment rental and leasing.................................	237.8	320.2	287.8	82.4	50.0	3.0	1.9	28
Security and commodity brokers........	551.4	740.4	765.0	189.0	213.6	3.0	3.3	12
Passenger transportation arrangement..............................	212.9	277.2	167.3	64.3	−45.6	2.7	−2.4	123
Child day care services...........................	569.3	733.5	806.7	164.2	237.4	2.6	3.5	9
Miscellaneous business services..........	2,022.8	2,599.3	2,318.6	576.5	295.8	2.5	1.4	40
Museums, botanical, zoological gardens.................................	84.7	108.8	118.8	24.1	34.1	2.5	3.4	11
Nondepository credit institutions, and holding and other investment offices.................................	725.6	928.2	1093.5	202.6	367.9	2.5	4.2	6
Research and testing services..............	568.5	726.2	742.3	157.7	173.8	2.5	2.7	20
Legal services.................................	929.9	1,186.7	1,061.5	256.8	131.6	2.5	1.3	41
Automotive rentals, without drivers..	193.3	246.0	199.5	52.7	6.2	2.4	.3	62
Engineering and architectural services....................................	839.1	1,051.7	1,140.3	212.6	301.2	2.3	3.1	15
Commercial sports................................	123.6	154.5	154.1	30.9	30.5	2.3	2.2	23
Air transportation..........................	1,122.1	1,401.0	1,118.4	278.9	−3.7	2.2	.0	66
Job training and related services........	315.4	391.7	399.4	76.3	84.0	2.2	2.4	22
Motion pictures...........................	367.6	454.9	417.2	87.3	49.6	2.2	1.3	43
Carpets and rugs......................................	61.1	75.5	40.3	14.4	−20.8	2.1	−4.1	156
Drugs...	258.6	319.3	310.6	60.7	52.0	2.1	1.8	32
Accounting, auditing, and other services....................................	612.5	751.6	666.2	139.1	53.7	2.1	.8	47
Educational services..............................	2,020.1	2,478.1	2,801.4	458.0	781.3	2.1	3.3	13
Federal Government enterprises, not elsewhere classified............................	134.6	165.0	45.1	30.4	−89.5	2.1	−10.4	172
Services to buildings..............................	897.1	1,097.2	1,177.1	200.1	280.0	2.0	2.8	18
Local and interurban passenger transit....................................	439.1	527.2	513.2	88.1	74.1	1.8	1.6	37
Miscellaneous plastics products, not elsewhere classified............................	714.0	855.3	635.2	141.3	−78.8	1.8	−1.2	92
Eating and drinking places....................	7,499.4	8,883.5	9,347.1	1,384.1	1,847.7	1.7	2.2	24

Table 11.	Continued—Actual and projected wage and salary employment levels and growth rates (in percent), by industry, in order of fastest to slowest projected growth, 1996–2006							
	Thousands of jobs			Change, projected	Change, actual	Average annual rate of change, projected	Average annual rate of change, actual	Rank by actual average annual growth
Industry	1996	2006, projected	2006, actual	1996–2006	1996–2006	1996–2006	1996–2006	1996–2006
Toys and sporting goods........................	113.5	134.0	76.4	20.5	−37.1	1.7	−3.9	152
State and local electric utilities............	85.4	100.0	77.8	14.6	−7.6	1.6	−.9	83
Miscellaneous repair services...............	233.3	271.2	248.4	37.9	15.1	1.5	.6	54
Medical equipment, instruments, and supplies........................	267.7	310.3	265.6	42.6	−2.1	1.5	−.1	67
Railroad equipment................................	36.3	42.0	26.5	5.7	−9.8	1.5	−3.1	136
State and local government education........................	8,671.3	10,002.3	10,233.4	1,331.0	1,562.1	1.4	1.7	34
Hotels and other lodging places..........	1,716.0	1,977.9	1,833.4	261.9	117.4	1.4	.7	53
Electronic components and accessories........................	610.0	700.0	474.8	90.0	−135.2	1.4	−2.5	128
Personal services, not elsewhere classified........................	238.3	272.8	351.1	34.5	112.8	1.4	4.0	7
Meat products...........................	481.3	550.8	497.7	69.5	16.4	1.4	.3	60
Trucking and warehousing...................	1,640.9	1,860.0	1,934.2	219.1	293.3	1.3	1.7	35
Real estate...........................	1,381.3	1,561.0	1,699.7	179.7	318.4	1.2	2.1	26
Beauty and barber shops....................	411.8	462.3	511.7	50.5	99.9	1.2	2.2	25
Insurance carriers...........................	1,510.0	1,694.0	1,595.2	184.0	85.2	1.2	.6	57
Electrical repair shops........................	114.3	128.2	102.1	13.9	−12.2	1.2	−1.1	91
Video tape rental...........................	154.8	173.1	146.7	18.3	−8.1	1.1	−.5	74
Wholesale trade...........................	6,483.1	7,228.3	6,881.7	745.2	398.6	1.1	.6	55
Advertising...........................	242.4	270.0	278.5	27.6	36.1	1.1	1.4	39
Paperboard containers and boxes....	217.4	241.9	172.6	24.5	−44.8	1.1	−2.3	119
Membership organizations..................	2,185.0	2,427.6	2,258.6	242.6	73.6	1.1	.3	61
Office and miscellaneous furniture and fixtures........................	143.5	159.2	131.0	15.7	−12.5	1.0	−.9	82
Hospitals...........................	3,813.5	4,229.0	4,466.9	415.5	653.4	1.0	1.6	36
Partitions and fixtures........................	85.0	94.1	69.0	9.1	−16.0	1.0	−2.1	113
Greeting cards...........................	26.8	29.5	13.9	2.7	−12.9	1.0	−6.4	168
Insurance agents, brokers, and service........................	707.4	777.4	843.0	70.0	135.6	.9	1.8	33
Miscellaneous transportation equipment........................	75.3	82.5	78.7	7.2	3.4	.9	.4	58
State and local general government, not elsewhere classified..................	6,085.9	6,658.4	5,947.3	572.5	−138.6	.9	−.2	70
Construction...........................	5,400.0	5,899.9	7,478.1	499.9	2,078.1	.9	3.3	14
Industrial machinery, not elsewhere classified........................	348.6	379.3	341.9	30.7	−6.7	.8	−.2	69
Aerospace...........................	549.9	595.9	480.5	46.0	−69.4	.8	−1.3	94
Metal coating, engraving, and allied services........................	133.4	144.4	123.7	11.0	−9.7	.8	−.8	78
Miscellaneous fabricated textile products........................	221.0	239.2	155.1	18.2	−65.9	.8	−3.5	145
Refrigeration and service industry machinery........................	204.9	220.0	170.1	15.1	−34.8	.7	−1.8	105
Miscellaneous food and kindred products........................	185.4	198.6	173.9	13.2	−11.5	.7	−.6	77
Wood buildings and mobile homes..	88.7	95.0	72.3	6.3	−16.4	.7	−2.0	108
Periodicals...........................	131.5	140.0	124.4	8.5	−7.1	.6	−.6	75
Construction and related machinery........................	232.3	247.0	213.2	14.7	−19.1	.6	−.9	80
Retail trade, except eating and drinking places........................	14,125.5	14,991.3	15,201.6	865.8	1,076.1	.6	.7	52
Millwork, plywood, and structural members........................	287.6	304.0	303.9	16.4	16.3	.6	.6	56

Table 11.	Continued—Actual and projected wage and salary employment levels and growth rates (in percent), by industry, in order of fastest to slowest projected growth, 1996–2006							
Industry	**Thousands of jobs**			**Change, projected**	**Change, actual**	**Average annual rate of change, projected**	**Average annual rate of change, actual**	**Rank by actual aver-age annual growth**
	1996	**2006, projected**	**2006, actual**	**1996–2006**	**1996–2006**	**1996–2006**	**1996–2006**	**1996–2006**
Laundry, cleaning, and shoe repair...	439.1	460.0	404.4	20.9	−34.7	0.5	−0.8	79
Books...	124.4	129.5	101.1	5.1	−23.3	.4	−2.1	112
Converted paper products except containers...............................	240.4	249.9	184.3	9.5	−56.1	.4	−2.6	129
Funeral service and crematories........	95.0	98.7	102.7	3.7	7.7	.4	.8	50
Blankbooks and bookbinding.............	66.3	68.7	44.5	2.4	−21.8	.4	−3.9	153
U.S. Postal Service...................................	856.2	880.0	770.1	23.8	−86.1	.3	−1.1	88
Wood containers and miscellaneous wood products.......................	141.2	145.0	133.0	3.8	−8.2	.3	−.6	76
Soap, cleaners, and toilet goods.........	154.0	157.0	137.9	3.0	−16.1	.2	−1.1	89
Manufactured products, not elsewhere classified..............................	224.0	228.1	190.0	4.1	−34.0	.2	−1.6	103
Communications..	1,337.4	1,360.4	1,340.4	23.0	3.0	.2	.0	64
Concrete, gypsum, and plaster products..	211.5	213.8	254.6	2.3	43.1	.1	1.9	31
Logging...	80.1	80.7	65.3	.6	−14.8	.1	−2.0	109
Fabricated structural metal products..	438.5	440.0	474.7	1.5	36.2	.0	.8	49
Local government passenger transit...	211.4	212.0	255.6	.6	44.2	.0	1.9	29
Commercial printing and business forms...	608.6	610.0	475.0	1.4	−133.6	.0	−2.4	126
Nonferrous foundries.............................	89.2	89.3	70.5	.1	−18.7	.0	−2.3	120
Preserved fruits and vegetables..........	237.2	237.2	189.6	.0	−47.6	.0	−2.2	117
Electric utilities...	473.7	472.0	370.3	−1.7	−103.4	.0	−2.4	125
Agricultural chemicals............................	52.4	52.2	38.7	−.2	−13.7	.0	−3.0	135
Metalworking machinery and equipment.......................................	345.4	344.0	244.7	−1.4	−100.7	.0	−3.4	142
Industrial chemicals................................	262.7	261.0	152.5	−1.7	−110.2	−.1	−5.3	165
Grain mill products and fats and oils..	158.0	156.8	130.9	−1.2	−27.1	−.1	−1.9	106
Miscellaneous electrical equipment.......................................	152.9	151.1	99.6	−1.8	−53.3	−.1	−4.2	158
Special industry machinery....................	177.4	175.0	126.3	−2.4	−51.1	−.1	−3.3	140
Paints and allied products.....................	52.5	51.6	41.9	−.9	−10.6	−.2	−2.2	118
State and local government hospitals...	1,037.8	1,017.3	1,010.5	−20.5	−27.3	−.2	−.3	71
Miscellaneous fabricated metal products..	253.5	248.0	219.6	−5.5	−33.9	−.2	−1.4	96
General industrial machinery and equipment.......................................	257.2	250.0	207.1	−7.2	−50.1	−.3	−2.1	115
Miscellaneous publishing......................	86.2	83.4	78.5	−2.8	−7.7	−.3	−.9	84
Motor vehicles and equipment...........	962.5	929.3	841.0	−33.2	−121.5	−.4	−1.3	95
Water transportation..............................	173.1	167.1	193.4	−6.0	20.3	−.4	1.1	46
Depository institutions..........................	2,023.5	1,950.0	2,288.0	−73.5	264.5	−.4	1.2	44
Watch, jewelry, and furniture repair...	27.0	26.0	21.7	−1.0	−5.3	−.4	−2.2	116
Sugar and confectionery products...	98.5	94.8	71.8	−3.7	−26.7	−.4	−3.1	137
Federal electric utilities..........................	26.2	25.0	22.5	−1.2	−3.7	−.5	−1.5	99
Communications equipment...............	269.2	255.0	173.1	−14.2	−96.1	−.5	−4.3	159
Sawmills and planing mills....................	182.1	172.3	156.3	−9.8	−25.8	−.6	−1.5	100
Pulp, paper, and paperboard mills.....	223.2	210.0	136.0	−13.2	−87.2	−.6	−4.8	162
Rubber products and plastic hose and footwear.......................................	187.5	176.2	132.4	−11.3	−55.1	−.6	−3.4	143
All other primary metals........................	45.0	42.2	33.9	−2.8	−11.1	−.6	−2.8	131

Table 11.	Continued—Actual and projected wage and salary employment levels and growth rates (in percent), by industry, in order of fastest to slowest projected growth, 1996–2006							
Industry	Thousands of jobs			Change, projected	Change, actual	Average annual rate of change, projected	Average annual rate of change, actual	Rank by actual average annual growth
	1996	2006, projected	2006, actual	1996–2006	1996–2006	1996–2006	1996–2006	1996–2006
Jewelry, silverware, and plated ware..	49.1	46.0	36.7	–3.1	–12.4	–.7	–2.9	133
Miscellaneous petroleum and coal products...................................	41.5	38.8	37.4	–2.7	–4.1	–.7	–1.0	87
Dairy products...............................	143.7	134.0	131.7	–9.7	–12.0	–.7	–.9	81
Nonmetallic minerals, except fuels....	106.2	98.9	105.0	–7.3	–1.2	–.7	–.1	68
Household furniture............................	275.3	255.8	235.6	–19.5	–39.7	–.7	–1.5	101
Screw machine products, bolts, rivets, not elsewhere classified........	100.8	93.0	97.9	–7.8	–2.9	–.8	–.3	72
Federal general government...............	1,740.0	1,600.0	1,890.6	–140.0	150.6	–.8	.8	48
Knitting mills..	179.5	165.0	57.7	–14.5	–121.8	–.8	–10.7	173
Nonferrous rolling and drawing..........	167.7	153.8	130.6	–13.9	–37.1	–.9	–2.5	127
Bakery products....................................	210.1	191.9	181.5	–18.2	–28.6	–.9	–1.5	98
Plastics materials and synthetics........	158.8	145.0	105.1	–13.8	–53.7	–0.9	–4.0	154
Plumbing and nonelectric heating equipment......................................	57.6	52.4	49.1	–5.2	–8.5	–.9	–1.6	102
Ship and boat building and repairing......................................	156.6	142.3	168.9	–14.3	12.3	–1.0	.8	51
Electric lighting and wiring equipment......................................	177.8	161.4	128.8	–16.4	–49.0	–1.0	–3.2	138
Weaving, finishing, yarn, and thread mills..	332.0	301.2	144.5	–30.8	–187.5	–1.0	–8.0	169
Miscellaneous textile goods.................	51.3	46.5	33.9	–4.8	–17.4	–1.0	–4.1	155
Miscellaneous chemical products......	92.8	84.0	72.9	–8.8	–19.9	–1.0	–2.4	122
Iron and steel foundries........................	128.9	116.0	91.6	–12.9	–37.3	–1.0	–3.4	141
Ophthalmic goods.................................	35.6	32.0	31.5	–3.6	–4.1	–1.1	–1.2	93
Bowling centers..	81.8	73.1	107.0	–8.7	25.2	–1.1	2.7	19
Newspapers...	442.3	394.9	360.3	–47.4	–82.0	–1.1	–2.0	110
Measuring and controlling devices....	297.0	265.0	268.4	–32.0	–28.6	–1.1	–1.0	86
Ordnance and ammunition....................	47.5	42.0	33.3	–5.5	–14.2	–1.2	–3.5	146
Household audio and video equipment......................................	82.7	72.9	46.3	–9.8	–36.4	–1.3	–5.6	167
Primary nonferrous smelting and refining..	39.4	34.6	25.3	–4.8	–14.1	–1.3	–4.3	160
Cutlery, hand tools, and hardware.....	124.9	109.3	76.3	–15.6	–48.6	–1.3	–4.8	161
Engines and turbines..............................	84.0	73.4	67.9	–10.6	–16.1	–1.3	–2.1	114
Railroad transportation.........................	231.1	201.8	231.6	–29.3	.5	–1.3	.0	65
Service industries for the printing trade..	51.6	45.0	36.2	–6.6	–15.4	–1.4	–3.5	144
Stone, clay, and miscellaneous mineral products...................................	164.1	143.1	135.1	–21.0	–29.0	–1.4	–1.9	107
Metal forgings and stampings.............	252.5	220.0	198.8	–32.5	–53.7	–1.4	–2.4	121
Computer and office equipment........	363.0	313.7	217.8	–49.3	–145.2	–1.4	–5.0	163
Oil and gas field services........................	169.3	146.0	272.3	–23.3	103.0	–1.5	4.9	4
Pipelines, except natural gas...............	14.5	12.5	11.4	–2.0	–3.1	–1.5	–2.4	124
Gas utilities..	180.3	155.0	217.8	–25.3	37.5	–1.5	1.9	30
Glass and glass products........................	147.6	125.7	103.1	–21.9	–44.5	–1.6	–3.5	147
Farm and garden machinery and equipment......................................	99.2	84.4	88.7	–14.8	–10.5	–1.6	–1.1	90
Hydraulic cement.......................................	17.4	14.8	18.1	–2.6	.7	–1.6	.4	59
Metal mining..	53.8	45.0	35.4	–8.8	–18.4	–1.8	–4.1	157
Beverages..	178.5	149.3	171.4	–29.2	–7.1	–1.8	–.4	73
Private households..................................	928.0	775.2	802.5	–152.8	–125.5	–1.8	–1.4	97
Electric distribution equipment..........	81.7	67.5	62.2	–14.2	–19.5	–1.9	–2.7	130

Table 11.	Continued—Actual and projected wage and salary employment levels and growth rates (in percent), by industry, in order of fastest to slowest projected growth, 1996–2006							
Industry	**Thousands of jobs**			**Change, projected**	**Change, actual**	**Average annual rate of change, projected**	**Average annual rate of change, actual**	**Rank by actual aver-age annual growth**
	1996	**2006, projected**	**2006, actual**	**1996–2006**	**1996–2006**	**1996–2006**	**1996–2006**	**1996–2006**
State and local government enterprises, not elsewhere classified..........................	598.2	490.2	1,575.9	−108.0	977.7	−2.0	10.2	1
Blast furnaces and basic steel products................................	240.3	196.7	161.8	−43.6	−78.5	−2.0	−3.9	151
Household appliances............................	121.0	96.4	83.5	−24.6	−37.5	−2.2	−3.6	149
Petroleum refining..................................	100.2	79.5	72.2	−20.7	−28.0	−2.3	−3.2	139
Electrical industrial apparatus..............	156.0	122.4	108.7	−33.6	−47.3	−2.4	−3.5	148
Photographic equipment and supplies..	84.9	65.1	50.6	−19.8	−34.3	−2.6	−5.0	164
Tires and inner tubes..............................	79.5	59.3	58.9	−20.2	−20.6	−2.9	−2.9	134
Apparel..	642.9	475.1	189.5	−167.8	−453.4	−3.0	−11.5	174
Metal cans and shipping containers................................	39.0	28.6	29.3	−10.4	−9.7	−3.1	−2.8	132
Tobacco products.....................................	41.4	30.3	28.4	−11.1	−13.0	−3.1	−3.7	150
Luggage, handbags, and leather products, not elsewhere classified..	49.4	34.4	20.2	−15.0	−29.2	−3.6	−8.5	170
Crude petroleum, natural gas, and gas liquids................................	148.2	101.5	134.9	−46.7	−13.3	−3.7	−.9	85
Search and navigation equipment....	160.7	109.5	135.2	−51.2	−25.5	−3.8	−1.7	104
Footwear, except rubber and plastic...	46.5	30.8	16.0	−15.7	−30.5	−4.0	−10.1	171
Watches, clocks, and parts.....................	7.7	5.1	4.4	−2.6	−3.3	−4.0	−5.5	166
Coal mining...	96.4	52.0	78.5	−44.4	−17.9	−6.0	−2.0	111

government employment may be a substantial factor in this result.

The large errors in the projections of industries that are part of State or Federal Government could be attributed to NAICS-to-SIC crosswalk problems. The data were recalculated for the aggregate industry of Federal Government (except the Postal Service) and that of State and local government, and the issues with the government industries were somewhat resolved. State and local government, as an industry, was projected to show the largest employment growth—1.8 million jobs. The actual job growth was approximately 2.6 million, making it the number one contributor to job growth. The 1.4 percent growth rate was higher than the projected 1.0 percent rate. Federal Government (except Postal Service) was projected to be among the industries with the largest employment declines (111,000); it actually increased in employment by 57,000 jobs. This corresponds to an average annual growth rate of 0.3 percent, compared with the projected decline of 0.6 percent, and was near the middle of the rankings for fastest growth.

Naïve model. Tables 10 and 13 provide a comparison of the BLS industry employment projections with those of a naïve model across a range of accuracy metrics. Since higher values indicate greater accuracy for some metrics and less accuracy for others, the final row of table 13 provides a summary of which model performed better by each metric, and, as that row clearly shows, the BLS model outperformed the naïve model in every metric.

Occupational employment

The results of the industry and macroeconomic projections are used to project employment in specific occupations. The occupational employment projections are used by policymakers to determine which educational programs to support and by jobseekers making career choices. The first part of this section discusses the accuracy of the BLS occupational employment projections. The second part of this section discusses how the accuracy of the 1996–2006 projections compares with that of alternative naïve models.

Table 12.	Actual and projected numerical wage and salary employment levels and growth, by industry, in order of fastest to slowest projected numerical growth, 1996–2006							
Industry	Thousands of jobs			Change, projected	Change, actual	Average annual rate of change, projected	Average annual rate of change, actual	Rank by actual numerical change
	1996	2006, projected	2006, actual	1996–2006	1996–2006	1996–2006	1996–2006	1996–2006
Personnel supply services...................	2,646.0	4,039.3	3,741.1	1,393.3	1,095.1	4.3	3.5	4
Eating and drinking places.................	7,499.4	8,883.5	9,347.1	1,384.1	1,847.7	1.7	2.2	2
State and local government education..	8,671.3	10,002.3	10,233.4	1,331.0	1,562.1	1.4	1.7	3
Computer and data processing services.......................................	1,207.9	2,509.1	1,978.4	1,301.2	770.5	7.6	5.1	9
Offices of health practitioners...........	2,751.4	4,045.9	3,680.3	1,294.5	928.9	3.9	3.0	7
Retail trade exclude eating and drinking places................................	14,125.5	14,991.3	15,201.6	865.8	1076.1	.6	.7	5
Health services, not elsewhere classified...................................	1,171.9	1,968.3	1,553.2	796.4	381.3	5.3	2.9	14
Wholesale trade......................................	6,483.1	7,228.3	6,881.7	745.2	398.6	1.1	.6	13
Nursing and personal care facilities...................................	1,732.2	2,377.0	1,944.3	644.8	212.1	3.2	1.2	26
Miscellaneous business services.......	2,022.8	2,599.3	2,318.6	576.5	295.8	2.5	1.4	20
State and local general government, not elsewhere classified....................................	6,085.9	6,658.4	5,947.3	572.5	−138.6	.9	−.2	171
Management and public relations......................................	873.2	1,400.0	1,435.6	526.8	562.4	4.8	5.1	11
Construction..	5,400.0	5,899.9	7,478.1	499.9	2,078.1	.9	3.3	1
Educational services.............................	2,020.1	2,478.1	2,801.4	458.0	781.3	2.1	3.3	8
Amusement and recreation services, not elsewhere classified..	1,108.6	1,565.3	1,412.2	456.7	303.6	3.5	2.4	18
Individual and miscellaneous social services..	846.3	1,265.9	1,347.0	419.6	500.7	4.1	4.8	12
Hospitals...	3,813.5	4,229.0	4,466.9	415.5	653.4	1.0	1.6	10
Residential care..	672.1	1,069.8	976.5	397.7	304.4	4.8	3.8	17
Automobile parking, repair, and services...................................	890.3	1,236.2	1,014.4	345.9	124.1	3.3	1.3	31
Air transportation..................................	1,122.1	1,401.0	1,118.4	278.9	−3.7	2.2	.0	72
Hotels and other lodging places.......	1,716.0	1,977.9	1,833.4	261.9	117.4	1.4	.7	32
Legal services...	929.9	1,186.7	1,061.5	256.8	131.6	2.5	1.3	30
Membership organizations................	2,185.0	2,427.6	2,258.6	242.6	73.6	1.1	.3	39
Trucking and warehousing................	1,640.9	1,860.0	1,934.2	219.1	293.3	1.3	1.7	21
Engineering and architectural services....................................	839.1	1,051.7	1,140.3	212.6	301.2	2.3	3.1	19
Nondepository credit institutions, and holding and other investment offices	725.6	928.2	1093.5	202.6	367.9	2.5	4.2	15
Services to buildings.............................	897.1	1,097.2	1,177.1	200.1	280.0	2.0	2.8	22
Security and commodity brokers......	551.4	740.4	765.0	189.0	213.6	3.0	3.3	25
Insurance carriers...................................	1,510.0	1,694.0	1,595.2	184.0	85.2	1.2	.6	36
Real estate..	1,381.3	1,561.0	1,699.7	179.7	318.4	1.2	2.1	16
Child day care services.........................	569.3	733.5	806.7	164.2	237.4	2.6	3.5	24
Research and testing services............	568.5	726.2	742.3	157.7	173.8	2.5	2.7	27
Miscellaneous plastics products, not elsewhere classified....................	714.0	855.3	635.2	141.3	−78.8	1.8	−1.2	157
Accounting, auditing, and other services.....................................	612.5	751.6	666.2	139.1	53.7	2.1	.8	40
Miscellaneous transportation services.....................................	204.4	327.4	250.8	123.0	46.4	4.8	2.1	44
Water and sanitation............................	230.9	349.1	236.8	118.2	5.9	4.2	.3	61

Table 12.	Continued—Actual and projected numerical wage and salary employment levels and growth, by industry, in order of fastest to slowest projected numerical growth, 1996–2006							
Industry	**Thousands of jobs**			**Change, projected**	**Change, actual**	**Average annual rate of change, projected**	**Average annual rate of change, actual**	**Rank by actual numerical change**
	1996	**2006, projected**	**2006, actual**	**1996–2006**	**1996–2006**	**1996–2006**	**1996–2006**	**1996–2006**
Electronic components and accessories...........................	610.0	700.0	474.8	90.0	−135.2	1.4	−2.5	170
Local and interurban passenger transit.................................	439.1	527.2	513.2	88.1	74.1	1.8	1.6	38
Motion pictures.......................................	367.6	454.9	417.2	87.3	49.6	2.2	1.3	43
Miscellaneous equipment rental and leasing..............................	237.8	320.2	287.8	82.4	50.0	3.0	1.9	42
Job training and related services......	315.4	391.7	399.4	76.3	84.0	2.2	2.4	37
Insurance agents, brokers, and service...................................	707.4	777.4	843.0	70.0	135.6	.9	1.8	29
Meat products..	481.3	550.8	497.7	69.5	16.4	1.4	.3	55
Passenger transportation arrangement.........................	212.9	277.2	167.3	64.3	−45.6	2.7	−2.4	142
Drugs...	258.6	319.3	310.6	60.7	52.0	2.1	1.8	41
Producers, orchestras, and entertainers...........................	151.7	204.6	176.3	52.9	24.6	3.0	1.5	53
Automotive rentals, without drivers................................	193.3	246.0	199.5	52.7	6.2	2.4	.3	60
Beauty and barber shops....................	411.8	462.3	511.7	50.5	99.9	1.2	2.2	35
Aerospace..	549.9	595.9	480.5	46.0	−69.4	.8	−1.3	155
Medical equipment, instruments, and supplies............................	267.7	310.3	265.6	42.6	−2.1	1.5	−0.1	67
Miscellaneous repair services............	233.3	271.2	248.4	37.9	15.1	1.5	0.6	57
Personal services, not elsewhere classified..............................	238.3	272.8	351.1	34.5	112.8	1.4	4.0	33
Commercial sports................................	123.6	154.5	154.1	30.9	30.5	2.3	2.2	51
Industrial machinery, not elsewhere classified.............	348.6	379.3	341.9	30.7	−6.7	.8	−.2	76
Federal government enterprises, not elsewhere classified...................	134.6	165.0	45.1	30.4	−89.5	2.1	−10.4	161
Advertising...	242.4	270.0	278.5	27.6	36.1	1.1	1.4	49
Paperboard containers and boxes.....	217.4	241.9	172.6	24.5	−44.8	1.1	−2.3	141
Museums, botanical, zoological gardens..............................	84.7	108.8	118.8	24.1	34.1	2.5	3.4	50
U.S. Postal Service.................................	856.2	880.0	770.1	23.8	−86.1	.3	−1.1	159
Communications....................................	1337.4	1,360.4	1,340.4	23.0	3.0	.2	.0	63
Laundry, cleaning, and shoe repair..	439.1	460.0	404.4	20.9	−34.7	.5	−.8	132
Toys and sporting goods.....................	113.5	134.0	76.4	20.5	−37.1	1.7	−3.9	135
Video tape rental..................................	154.8	173.1	146.7	18.3	−8.1	1.1	−.5	81
Miscellaneous fabricated textile products.................................	221.0	239.2	155.1	18.2	−65.9	.8	−3.5	154
Millwork, plywood, and structural members...........................	287.6	304.0	303.9	16.4	16.3	.6	.6	56
Office and miscellaneous furniture and fixtures..........................	143.5	159.2	131.0	15.7	−12.5	1.0	−.9	94
Refrigeration and service industry machinery.............................	204.9	220.0	170.1	15.1	−34.8	.7	−1.8	133
Construction and related machinery..............................	232.3	247.0	213.2	14.7	−19.1	.6	−.9	111
State and local electric utilities..........	85.4	100.0	77.8	14.6	−7.6	1.6	−.9	79
Carpets and rugs...................................	61.1	75.5	40.3	14.4	−20.8	2.1	−4.1	115
Electrical repair shops.........................	114.3	128.2	102.1	13.9	−12.2	1.2	−1.1	92
Miscellaneous food and kindred products.................................	185.4	198.6	173.9	13.2	−11.5	.7	−.6	90
Metal coating, engraving, and allied services......................	133.4	144.4	123.7	11.0	−9.7	.8	−.8	85

Table 12.	Continued—Actual and projected numerical wage and salary employment levels and growth, by industry, in order of fastest to slowest projected numerical growth, 1996–2006							
Industry	**Thousands of jobs**			**Change, projected**	**Change, actual**	**Average annual rate of change, projected**	**Average annual rate of change, actual**	**Rank by actual numerical change**
	1996	**2006, projected**	**2006, actual**	**1996–2006**	**1996–2006**	**1996–2006**	**1996–2006**	**1996–2006**
Converted paper products, except containers..........	240.4	249.9	184.3	9.5	−56.1	.4	−2.6	153
Partitions and fixtures...........................	85.0	94.1	69.0	9.1	−16.0	1.0	−2.1	103
Periodicals..	131.5	140.0	124.4	8.5	−7.1	.6	−.6	78
Miscellaneous transportation equipment..	75.3	82.5	78.7	7.2	3.4	.9	.4	62
Wood buildings and mobile homes..	88.7	95.0	72.3	6.3	−16.4	.7	−2.0	106
Railroad equipment..............................	36.3	42.0	26.5	5.7	−9.8	1.5	−3.1	86
Books...	124.4	129.5	101.1	5.1	−23.3	.4	−2.1	117
Manufactured products, not elsewhere classified...........................	224.0	228.1	190.0	4.1	−34.0	.2	−1.6	130
Wood containers and miscellaneous wood products.......	141.2	145.0	133.0	3.8	−8.2	.3	−.6	82
Funeral service and crematories......	95.0	98.7	102.7	3.7	7.7	.4	.8	59
Soap, cleaners, and toilet goods.......	154.0	157.0	137.9	3.0	−16.1	.2	−1.1	104
Greeting cards......................................	26.8	29.5	13.9	2.7	−12.9	1.0	−6.4	95
Blankbooks and bookbinding...........	66.3	68.7	44.5	2.4	−21.8	.4	−3.9	116
Concrete, gypsum, and plaster products..	211.5	213.8	254.6	2.3	43.1	.1	1.9	46
Fabricated structural metal products..	438.5	440.0	474.7	1.5	36.2	.0	.8	48
Commercial printing and business forms...	608.6	610.0	475.0	1.4	−133.6	.0	−2.4	169
Logging..	80.1	80.7	65.3	.6	−14.8	.1	−2.0	101
Local government passenger transit...	211.4	212.0	255.6	.6	44.2	.0	1.9	45
Nonferrous foundries...........................	89.2	89.3	70.5	.1	−18.7	.0	−2.3	110
Preserved fruits and vegetables........	237.2	237.2	189.6	.0	−47.6	.0	−2.2	144
Agricultural chemicals.........................	52.4	52.2	38.7	−.2	−13.7	.0	−3.0	98
Paints and allied products..................	52.5	51.6	41.9	−.9	−10.6	−.2	−2.2	88
Watch, jewelry, and furniture repair..	27.0	26.0	21.7	−1.0	−5.3	−.4	−2.2	75
Grain mill products and fats and oils...	158.0	156.8	130.9	−1.2	−27.1	−.1	−1.9	121
Federal electric utilities.........................	26.2	25.0	22.5	−1.2	−3.7	−.5	−1.5	71
Metalworking machinery and equipment..	345.4	344.0	244.7	−1.4	−100.7	.0	−3.4	163
Industrial chemicals.............................	262.7	261.0	152.5	−1.7	−110.2	−.1	−5.3	165
Electric utilities.......................................	473.7	472.0	370.3	−1.7	−103.4	.0	−2.4	164
Miscellaneous electrical equipment..	152.9	151.1	99.6	−1.8	−53.3	−.1	−4.2	149
Pipelines, except natural gas.............	14.5	12.5	11.4	−2.0	−3.1	−1.5	−2.4	69
Special industry machinery................	177.4	175.0	126.3	−2.4	−51.1	−.1	−3.3	148
Hydraulic cement..................................	17.4	14.8	18.1	−2.6	.7	−1.6	.4	64
Watches, clocks, and parts..................	7.7	5.1	4.4	−2.6	−3.3	−4.0	−5.5	70
Miscellaneous petroleum and coal products..	41.5	38.8	37.4	−2.7	−4.1	−.7	−1.0	74
All other primary metals......................	45.0	42.2	33.9	−2.8	−11.1	−.6	−2.8	89
Miscellaneous publishing...................	86.2	83.4	78.5	−2.8	−7.7	−.3	−.9	80
Jewelry, silverware, and plated ware..	49.1	46.0	36.7	−3.1	−12.4	−.7	−2.9	93
Ophthalmic goods................................	35.6	32.0	31.5	−3.6	−4.1	−1.1	−1.2	73
Sugar and confectionery products..	98.5	94.8	71.8	−3.7	−26.7	−.4	−3.1	120

| Table 12. | Continued—Actual and projected numerical wage and salary employment levels and growth, by industry, in order of fastest to slowest projected numerical growth, 1996–2006 |

Industry	Thousands of jobs			Change, projected	Change, actual	Average annual rate of change, projected	Average annual rate of change, actual	Rank by actual numerical of change
	1996	2006, projected	2006, actual	1996–2006	1996–2006	1996–2006	1996–2006	1996–2006
Primary nonferrous smelting and refining.......................................	39.4	34.6	25.3	−4.8	−14.1	−1.3	−4.3	99
Miscellaneous textile goods..............	51.3	46.5	33.9	−4.8	−17.4	−1.0	−4.1	107
Plumbing and nonelectric heating equipment.................................	57.6	52.4	49.1	−5.2	−8.5	−.9	−1.6	83
Ordnance and ammunition................	47.5	42.0	33.3	−5.5	−14.2	−1.2	−3.5	100
Miscellaneous fabricated metal products...	253.5	248.0	219.6	−5.5	−33.9	−.2	−1.4	129
Water transportation............................	173.1	167.1	193.4	−6.0	20.3	−.4	1.1	54
Service industries for the printing trade...................................	51.6	45.0	36.2	−6.6	−15.4	−1.4	−3.5	102
General industrial machinery and equipment.................................	257.2	250.0	207.1	−7.2	−50.1	−.3	−2.1	147
Nonmetallic minerals, except fuels..	106.2	98.9	105.0	−7.3	−1.2	−.7	−.1	66
Screw machine products, bolts, rivets, not elsewhere classified.......	100.8	93.0	97.9	−7.8	−2.9	−.8	−.3	68
Bowling centers......................................	81.8	73.1	107.0	−8.7	25.2	−1.1	2.7	52
Metal mining...	53.8	45.0	35.4	−8.8	−18.4	−1.8	−4.1	109
Miscellaneous chemical products...	92.8	84.0	72.9	−8.8	−19.9	−1.0	−2.4	113
Dairy products..	143.7	134.0	131.7	−9.7	−12.0	−.7	−.9	91
Sawmills and planing mills.................	182.1	172.3	156.3	−9.8	−25.8	−.6	−1.5	119
Household audio and video equipment.................................	82.7	72.9	46.3	−9.8	−36.4	−1.3	−5.6	134
Metal cans and shipping containers...................................	39.0	28.6	29.3	−10.4	−9.7	−3.1	−2.8	84
Engines and turbines...........................	84.0	73.4	67.9	−10.6	−16.1	−1.3	−2.1	105
Tobacco products..................................	41.4	30.3	28.4	−11.1	−13.0	−3.1	−3.7	96
Rubber products and plastic hose and footwear...	187.5	176.2	132.4	−11.3	−55.1	−.6	−3.4	152
Iron and steel foundries......................	128.9	116.0	91.6	−12.9	−37.3	−1.0	−3.4	137
Pulp, paper, and paperboard mills...	223.2	210.0	136.0	−13.2	−87.2	−.6	−4.8	160
Plastics materials and synthetics......	158.8	145.0	105.1	−13.8	−53.7	−.9	−4.0	151
Nonferrous rolling and drawing.......	167.7	153.8	130.6	−13.9	−37.1	−.9	−2.5	136
Communications equipment.............	269.2	255.0	173.1	−14.2	−96.1	−.5	−4.3	162
Electric distribution equipment........	81.7	67.5	62.2	−14.2	−19.5	−1.9	−2.7	112
Ship and boat building and repairing.......................................	156.6	142.3	168.9	−14.3	12.3	−1.0	.8	58
Knitting mills...	179.5	165.0	57.7	−14.5	−121.8	−.8	−10.7	167
Farm and garden machinery and equipment.................................	99.2	84.4	88.7	−14.8	−10.5	−1.6	−1.1	87
Luggage, handbags, and leather products, not elsewhere classified.	49.4	34.4	20.2	−15.0	−29.2	−3.6	−8.5	127
Cutlery, handtools, and hardware...	124.9	109.3	76.3	−15.6	−48.6	−1.3	−4.8	145
Footwear, except rubber and plastic..	46.5	30.8	16.0	−15.7	−30.5	−4.0	−10.1	128
Electric lighting and wiring equipment.................................	177.8	161.4	128.8	−16.4	−49.0	−1.0	−3.2	146
Bakery products.....................................	210.1	191.9	181.5	−18.2	−28.6	−.9	−1.5	125
Household furniture.............................	275.3	255.8	235.6	−19.5	−39.7	−.7	−1.5	139
Photographic equipment and supplies..	84.9	65.1	50.6	−19.8	−34.3	−2.6	−5.0	131
Tires and inner tubes...........................	79.5	59.3	58.9	−20.2	−20.6	−2.9	−2.9	114
State and local government hospitals....................................	1,037.8	1,017.3	1,010.5	−20.5	−27.3	−.2	−.3	122
Petroleum refining................................	100.2	79.5	72.2	−20.7	−28.0	−2.3	−3.2	123

Table 12.	Continued—Actual and projected numerical wage and salary employment levels and growth, by industry, in order of fastest to slowest projected numerical growth, 1996–2006							
Industry	**Thousands of jobs**			**Change, projected**	**Change, actual**	**Average annual rate of change, projected**	**Average annual rate of change, actual**	**Rank by actual numerical change**
	1996	**2006, projected**	**2006, actual**	**1996–2006**	**1996–2006**	**1996–2006**	**1996–2006**	**1996–2006**
Stone, clay, and miscellaneous mineral products	164.1	143.1	135.1	−21.0	−29.0	−1.4	−1.9	126
Glass and glass products	147.6	125.7	103.1	−21.9	−44.5	−1.6	−3.5	140
Oil and gas field services	169.3	146.0	272.3	−23.3	103.0	−1.5	4.9	34
Household appliances	121.0	96.4	83.5	−24.6	−37.5	−2.2	−3.6	138
Gas utilities	180.3	155.0	217.8	−25.3	37.5	−1.5	1.9	47
Beverages	178.5	149.3	171.4	−29.2	−7.1	−1.8	−.4	77
Railroad transportation	231.1	201.8	231.6	−29.3	.5	−1.3	.0	65
Weaving, finishing, yarn, and thread mills	332.0	301.2	144.5	−30.8	−187.5	−1.0	−8.0	173
Measuring and controlling devices.	297.0	265.0	268.4	−32.0	−28.6	−1.1	−1.0	124
Metal forgings and stampings	252.5	220.0	198.8	−32.5	−53.7	−1.4	−2.4	150
Motor vehicles and equipment	962.5	929.3	841.0	−33.2	−121.5	−.4	−1.3	166
Electrical industrial apparatus	156.0	122.4	108.7	−33.6	−47.3	−2.4	−3.5	143
Blast furnaces and basic steel products	240.3	196.7	161.8	−43.6	−78.5	−2.0	−3.9	156
Coal mining	96.4	52.0	78.5	−44.4	−17.9	−6.0	−2.0	108
Crude petroleum, natural gas, and gas liquids	148.2	101.5	134.9	−46.7	−13.3	−3.7	−0.9	97
Newspapers	442.3	394.9	360.3	−47.4	−82.0	−1.1	−2.0	158
Computer and office equipment	363.0	313.7	217.8	−49.3	−145.2	−1.4	−5.0	172
Search and navigation equipment	160.7	109.5	135.2	−51.2	−25.5	−3.8	−1.7	118
Depository institutions	2,023.5	1,950.0	2,288.0	−73.5	264.5	−0.4	1.2	23
State and local government enterprises, not elsewhere classified	598.2	490.2	1,575.9	−108.0	977.7	−2.0	10.2	6
Federal general government	1,740.0	1,600.0	1,890.6	−140.0	150.6	−.8	.8	28
Private households	928.0	775.2	802.5	−152.8	−125.5	−1.8	−1.4	168
Apparel	642.9	475.1	189.5	−167.8	−453.4	−3.0	−11.5	174

Table 13.	Accuracy metrics for all industries, 1996–2006 employment projections					
					Spearman's rank correlation	
Projection technique	**Direction of change**	**MAPE (unweighted)**	**MAPE (weighted)**	**Dissimilarity index**	**For employment levels**	**For average annual percent change**
BLS	72.4	24.7	11.7	5.9	0.60	0.59
Naïve	67.4	26.8	13.0	6.4	.56	.55
Which model performed better?	BLS	BLS	BLS	BLS	BLS	BLS

Accuracy. Table 14 presents the results of both the overall accuracy of the BLS occupational projections and the accuracy by detailed occupation. The occupations evaluated accounted for about half of all employment in both the base (1996) and projection (2006) years. BLS correctly projected the direction of change for about two-thirds of the occupations. The fact that the weighted MAPE is lower than the unweighted MAPE means that the Bureau more accurately projected the employment of large occupations than that of small occupations, because

weighting adjusts for the size of occupations. (See the note at the end of table 14.)

The dissimilarity index result shows that BLS was off by only 4.2 percent in projecting the distribution of employment among occupations. The dissimilarity index focuses on occupational employment shares and not levels of employment, and therefore it is not affected by errors in projecting the total level of employment. Since the dissimilarity index is not as skewed by large differences in a few occupations as MAPEs are, the result of the index is more

Table 14.	Actual and projected levels, and numeric and percent growth for wage and salary employment, by occupation, 1996–2006								

SOC code	Occupation	1996	Project-ed, 2006	Actual, 2006	Pro-jected numeric change	Actual numeric change	Numeric differ-ence b/t actual and pro-jected	Pro-jected percent change	Actual percent change
	Sum of the occupations in the table	65,018,667	73,997,326	72,151,313	8,978,659	7,132,646	1,846,013	13.8	11.3
	Percent of all occupations..	49.1	49.0	47.9	48.3	39.0	...	...	...
11–2000	Advertising, marketing, promotions, public relations, and sales managers.....................................	482,044	619,597	582,664	137,553	100,620	36,933	28.5	20.9
11–3031	Financial managers..	800,060	946,468	506,347	146,408	−293,713	440,121	18.3	−36.7
11–3040	Human resources managers..	215,606	253,999	136,197	38,393	−79,409	117,802	17.8	−36.8
11–3051	Industrial production managers...	207,400	202,180	157,341	−5,219	−50,058	44,839	−2.5	−24.1
11–3061	Purchasing managers	232,463	250,644	69,526	18,181	−162,937	181,118	7.8	−70.1
11–9021	Construction managers	249,201	294,132	487,077	44,931	237,875	−192,944	18.0	95.5
11–9030	Education administrators	385,683	430,389	442,976	44,707	57,294	−12,587	11.6	14.9
11–9061	Funeral directors...	32,752	33,417	28,770	664	−3,982	4,647	2.0	−12.2
11–9051/ 11–9081	Food service managers/ lodging managers....................	589,254	756,909	421,247	167,655	−168,006	335,662	28.5	−28.5
13–1022	Wholesale and retail buyers, except farm products	182,625	182,507	156,568	−118	−26,056	25,938	−.1	−14.3
13–1023	Purchasing agents, except wholesale, retail, and farm products...	224,043	238,446	287,429	14,403	63,386	−48,982	6.4	28.3
13–1051	Cost estimators..	187,944	217,154	221,100	29,210	33,156	−3,946	15.5	17.6
13–2011	Accountants and auditors..	1,002,289	1,126,840	1,274,357	124,551	272,068	−147,517	12.4	27.1
13–2031	Budget analysts..	65,631	73,310	61,858	7,679	−3,773	11,452	11.7	−5.7
13–2041	Credit analysts..	39,611	45,877	67,132	6,266	27,521	−21,255	15.8	69.5
13–2053	Insurance underwriters..	94,625	100,359	104,477	5,734	9,852	−4,118	6.1	10.4
13–2070	Loan counselors and officers	209,035	267,709	405,939	58,674	196,905	−138,230	28.1	94.2
13–2081	Tax examiners, collectors, and revenue agents..............	64,052	65,508	80,726	1,456	16,674	−15,217	2.3	26.0
15–2011	Actuaries..	15,944	16,243	18,137	299	2,193	−1,894	1.9	13.8
15–2041	Statisticians...	13,818	13,912	22,416	94	8,598	−8,503	.7	62.2
17–1011	Architects, except landscape and naval...........................	94,121	112,598	131,873	18,476	37,752	−19,275	19.6	40.1
17–1012	Landscape architects	16,672	20,124	27,839	3,452	11,167	−7,716	20.7	67.0
17–2011	Aerospace engineers...	52,514	56,587	89,831	4,072	37,317	−33,244	7.8	71.1
17–2041	Chemical engineers..	49,220	56,586	30,444	7,366	−18,776	26,142	15.0	−38.1
17–2051	Civil engineers...	196,135	231,301	256,330	35,167	60,195	−25,028	17.9	30.7
17–2131	Materials engineers	18,269	19,509	21,616	1,240	3,347	−2,107	6.8	18.3
17–2141	Mechanical engineers...	227,861	263,826	225,797	35,965	−2,064	38,029	15.8	−.9
17–2161	Nuclear engineers...	13,642	14,346	15,273	704	1,631	−927	5.2	12.0
17–2171	Petroleum engineers...	13,388	11,480	17,355	−1,908	3,967	−5,875	−14.3	29.6
19–1010	Agricultural and food scientists	24,337	29,101	32,943	4,764	8,606	−3,842	19.6	35.4
19–1020	Biological scientists	82,580	103,270	86,646	20,690	4,066	16,624	25.1	4.9
19–1040	Medical scientists	35,097	43,890	91,909	8,793	56,812	−48,019	25.1	161.9
19–2010	Astronomers and physicists..	17,769	17,478	18,172	−290	403	−694	−1.6	2.3
19–2021	Atmospheric and space scientists......................................	7,330	7,931	8,759	601	1,429	−828	8.2	19.5
19–2031	Chemists...	91,088	107,738	83,697	16,650	−7,391	24,041	18.3	−8.1
19–2042/ 19–2043	Geoscientists, except hydrologists and geographers/hydrologists..	47,409	54,347	39,375	6,937	−8,034	14,972	14.6	−16.9
19–3030	Psychologists	142,833	154,215	165,915	11,381	23,082	−11,700	8.0	16.2
19–3051	Urban and regional planners	29,379	30,774	33,809	1,395	4,430	−3,035	4.7	15.1
21–1012	Educational, vocational, and school counselors	175,180	208,556	259,543	33,376	84,363	−50,987	19.1	48.2
21–2021	Directors, religious activities and education	85,131	115,331	99,230	30,200	14,099	16,101	35.5	16.6
23–1011	Lawyers	621,846	740,215	760,672	118,369	138,826	−20,457	19.0	22.3
25–2021	Elementary school teachers, except special education..	1,490,734	1,644,104	1,540,159	153,370	49,426	103,945	10.3	3.3
25–2022/ 25–2031	Middle school teachers, except special and vocational education/ secondary school teachers, except special and vocational education........................	1,406,048	1,718,181	1,695,608	312,133	289,559	22,574	22.2	20.6
25–2040	Special education teachers..	407,018	647,674	458,916	240,655	51,898	188,758	59.1	12.8
25–4010	Archivists, curators, and museum technicians................	19,919	22,854	27,487	2,934	7,568	−4,633	14.7	38.0
25–4021	Librarians...	154,482	161,820	158,373	7,338	3,891	3,447	4.8	2.5

See note at end of table.

SOC code	Occupation	1996	Project-ed, 2006	Actual, 2006	Pro-jected numeric change	Actual numeric change	Numeric differ-ence b/t actual and pro-jected	Pro-jected percent change	Actual percent change
25–9021	Farm and home management advisors.............................	16,072	9,916	14,969	–6,155	–1,103	–5,053	–38.3	–6.9
27–1010 27–1021/ 27–1022/ 27–1023/ 27–1024/ 27–1027/ 27–1029	Artists and related workers.. Commercial and industrial designers/ fashion designers/ floral designers/ graphic designers/ set and exhibit designers/ designers, all other	276,229 279,142	354,416 350,987	218,131 444,375	78,187 71,846	–58,099 165,233	136,285 –93,387	28.3 25.7	–21.0 59.2
27–1025	Interior designers...	62,861	80,136	71,856	17,275	8,995	8,280	27.5	14.3
27–2010/ 27–2099	Actors, producers, and directors/ entertainers and performers, sports and related workers, all other........	105,149	129,978	240,179	24,828	135,029	–110,201	23.6	128.4
27–2030	Dancers and choreographers..	23,362	29,910	40,196	6,548	16,834	–10,286	28.0	72.1
27–3022	Reporters and correspondents..	59,847	57,995	59,212	–1,852	–635	–1,217	–3.1	–1.1
27–3031	Public relations specialists	110,375	140,381	243,275	30,006	132,899	–102,893	27.2	120.4
27–4021	Photographers...	134,219	157,406	122,480	23,187	–11,739	34,926	17.3	–8.7
27–4031	Camera operators, television, video, and motion picture...	20,042	22,953	26,897	2,911	6,854	–3,943	14.5	34.2
29–1011	Chiropractors..	43,663	55,478	52,725	11,815	9,062	2,754	27.1	20.8
29–1020	Dentists..	162,206	175,363	161,127	13,157	–1,079	14,236	8.1	–.7
29–1031	Dietitians and nutritionists...	58,027	68,597	57,126	10,570	–901	11,471	18.2	–1.6
29–1041	Optometrists...	41,253	46,090	32,740	4,837	–8,513	13,350	11.7	–20.6
29–1051	Pharmacists...	171,864	193,507	243,482	21,642	71,617	–49,975	12.6	41.7
29–1060	Physicians and surgeons...	560,378	677,917	633,292	117,539	72,914	44,625	21.0	13.0
29–1071	Physician assistants	63,762	93,485	65,628	29,723	1,866	27,857	46.6	2.9
29–1081	Podiatrists..	11,344	12,493	11,944	1,150	600	549	10.1	5.3
29–1111	Registered nurses..	1,971,433	2,382,280	2,504,664	410,848	533,231	–122,383	20.8	27.0
29–1121/ 29–1127	Audiologists/ speech-language pathologists..................	87,280	131,451	121,929	44,172	34,650	9,522	50.6	39.7
29–1122	Occupational therapists..	57,361	95,259	98,858	37,899	41,497	–3,598	66.1	72.3
29–1123	Physical therapists...	114,514	195,618	172,948	81,104	58,433	22,670	70.8	51.0
29–1125	Recreational therapists...	37,650	45,679	25,115	8,029	–12,536	20,564	21.3	–33.3
29–1126	Respiratory therapists...	81,822	119,286	102,406	37,464	20,584	16,880	45.8	25.2
29–1131	Veterinarians	58,143	71,313	62,196	13,171	4,053	9,117	22.7	7.0
29–2021	Dental hygienists...	132,834	196,849	167,017	64,015	34,183	29,832	48.2	25.7
29–2031	Cardiovascular technologists and technicians................	32,061	34,471	45,378	2,410	13,317	–10,907	7.5	41.5
29–2033	Nuclear medicine technologists	12,881	14,600	19,850	1,719	6,969	–5,250	13.3	54.1
29–2041	Emergency medical technicians and paramedics..........	149,662	217,092	201,099	67,431	51,437	15,994	45.1	34.4
29–2052	Pharmacy technicians...	82,635	91,848	285,035	9,213	202,401	–193,187	11.1	244.9
29–2053	Psychiatric technicians	66,347	72,380	62,098	6,033	–4,250	10,283	9.1	–6.4
29–2055	Surgical technologists	48,594	64,081	86,197	15,487	37,603	–22,116	31.9	77.4
29–2061	Licensed practical and licensed vocational nurses.......	699,119	847,513	748,605	148,394	49,486	98,908	21.2	7.1
29–2071	Medical records and health Information technicians ...	87,347	131,827	169,742	44,480	82,395	–37,915	50.9	94.3
29–2081	Opticians, dispensing...	66,642	76,064	65,904	9,422	–738	10,160	14.1	–1.1
31–1011	Home health aides...	494,685	872,893	787,315	378,208	292,629	85,578	76.5	59.2
31–1012	Nursing aides, orderlies, and attendants.........................	1,312,136	1,645,133	1,447,233	332,997	135,097	197,900	25.4	10.3
31–1013	Psychiatric aides..	103,072	111,969	61,735	8,898	–41,337	50,235	8.6	–40.1
31–2010	Occupational therapist assistants and aides...................	15,662	26,420	33,216	10,758	17,554	–6,796	68.7	112.1
31–2020	Physical therapist assistants and aides............................	84,482	150,854	106,538	66,372	22,057	44,316	78.6	26.1
31–9091	Dental assistants..	201,622	278,425	279,828	76,803	78,206	–1,403	38.1	38.8
31–9095	Pharmacy aides...	47,207	52,249	50,394	5,042	3,188	1,854	10.7	6.8
33–1021	First-line supervisors/managers of firefighting and prevention workers..	53,532	54,128	52,468	596	–1,064	1,660	1.1	–2.0
33–2011	Firefighters..	224,761	238,500	292,876	13,738	68,115	–54,377	6.1	30.3
33–3012	Correctional officers and jailers...	320,122	423,444	441,761	103,322	121,639	–18,317	32.3	38.0
33–3051	Police and sheriff's patrol officers....................................	500,866	582,432	648,418	81,566	147,552	–65,986	16.3	29.5
33–9021 33–9031	Private detectives and investigators/ gaming surveillance officers and gaming investigators	58,051	68,780	60,352	10,729	2,300	8,428	18.5	4.0
33–9032	Security guards	954,644	1,175,257	1,040,287	220,613	85,643	134,969	23.1	9.0

See note at end of table.

Table 14.	Continued—Actual and projected levels, and numeric and percent growth for wage and salary employment, by occupation,1996–2006								
SOC code	Occupation	1996	Project-ed, 2006	Actual, 2006	Pro-jected numeric change	Actual numeric change	Numeric differ-ence b/t actual and pro-jected	Pro-jected percent change	Actual percent change
33–9091	Crossing guards	60,543	54,962	69,320	–5,580	8,777	–14,357	–9.2	14.5
35–2012	Cooks, institution and cafeteria	434,708	455,279	401,027	20,571	–33,681	54,252	4.7	–7.7
35–2014/ 35–2019	Cooks, restaurant/cooks, all other	727,104	833,234	865,931	106,129	138,827	–32,697	14.6	19.1
35–2021/ 35–9021	Food preparation workers/ dishwashers	1,253,240	1,487,158	1,419,018	233,917	165,778	68,140	18.7	13.2
35–3011	Bartenders	390,433	392,096	495,307	1,663	104,875	–103,211	.4	26.9
35–3031	Waiters and waitresses	1,956,833	2,162,914	2,360,630	206,081	403,797	–197,716	10.5	20.6
35–9011	Dining room and cafeteria attendants and bartender helpers	438,539	500,536	416,276	61,997	–22,263	84,260	14.1	–5.1
35–9031	Hosts and hostesses, restaurant, lounge, and coffee shop	260,316	277,826	351,188	17,510	90,872	–73,362	6.7	34.9
37–1011	First-line supervisors/managers of housekeeping and janitorial workers	108,452	114,671	282,237	6,219	173,785	–167,565	5.7	160.2
37–2021	Pest control workers	59,710	72,974	69,722	13,264	10,012	3,252	22.2	16.8
37–3012	Pesticide handlers, sprayers, and applicators, vegetation	17,617	21,357	30,605	3,740	12,988	–9,249	21.2	73.7
37–3013	Tree trimmers and pruners	25,598	29,753	40,560	4,155	14,962	–10,807	16.2	58.5
39–3021	Motion picture projectionists	8,382	4,604	11,493	–3,778	3,111	–6,889	–45.1	37.1
39–3031	Ushers, lobby attendants, and ticket takers	64,181	82,389	103,166	18,208	38,986	–20,777	28.4	60.7
39–5011	Barbers	59,453	53,737	60,034	–5,716	581	–6,297	–9.6	1.0
39–5012/ 39–5091/ 39–5094	Hairdressers, hairstylists, and cosmetologists/ makeup artists, theatrical and performance/ skin care specialists	585,729	643,665	657,807	57,937	72,078	–14,142	9.9	12.3
39–5092	Manicurists and pedicurists	43,123	62,402	78,121	19,279	34,997	–15,718	44.7	81.2
39–5093	Shampooers	12,600	13,490	29,428	890	16,828	–15,938	7.1	133.5
39–6011	Baggage porters and bellhops	37,815	39,874	49,319	2,059	11,504	–9,445	5.4	30.4
39–6031	Flight attendants	131,808	178,107	96,730	46,299	–35,078	81,378	35.1	–26.6
39–9011	Child care workers	829,697	1,128,885	1,388,168	299,188	558,471	–259,283	36.1	67.3
39–9021	Personal and home care aides	202,459	373,856	767,257	171,396	564,798	–393,401	84.7	279.0
41–1010	First-line supervisors/managers, sales workers	2,315,560	2,561,901	2,205,894	246,341	–109,666	356,006	10.6	–4.7
41–2021	Counter and rental clerks	373,817	457,958	476,623	84,141	102,806	–18,666	22.5	27.5
41–2031	Retail salespersons	4,072,266	4,480,520	4,476,942	408,253	404,676	3,577	10.0	9.9
41–3031	Securities, commodities, and financial services sales agents	263,265	362,899	319,943	99,633	56,677	42,956	37.8	21.5
41–3041	Travel agents	142,296	176,440	101,167	34,143	–41,129	75,272	24.0	–28.9
41–9021	Real estate brokers	77,683	88,668	131,239	10,986	53,556	–42,571	14.1	68.9
43–1011	First-line supervisors/managers of office and administrative support workers	1,368,631	1,630,133	1,418,494	261,502	49,863	211,639	19.1	3.6
43–2011	Switchboard operators, including answering service	237,468	246,171	177,485	8,703	–59,982	68,686	3.7	–25.3
43–2021	Telephone operators	81,437	43,152	26,681	–38,285	–54,757	16,472	–47.0	–67.2
43–3011	Bill and account collectors	268,645	381,058	434,200	112,413	165,556	–53,142	41.8	61.6
43–3021	Billing and posting clerks and machine operators	462,764	515,857	541,869	53,093	79,105	–26,012	11.5	17.1
43–3031	Bookkeeping, accounting, and auditing clerks	2,249,521	2,147,315	2,113,780	–102,206	–135,742	33,536	–4.5	–6.0
43–3051	Payroll and timekeeping clerks	160,985	151,429	213,612	–9,555	52,628	–62,183	–5.9	32.7
43–3061	Procurement clerks	56,382	55,289	77,798	–1,094	21,416	–22,509	–1.9	38.0
43–3071	Tellers	545,419	550,040	607,609	4,620	62,189	–57,569	.8	11.4
43–4011	Brokerage clerks	76,380	90,965	73,309	14,585	–3,071	17,656	19.1	–4.0
43–4071	File clerks	293,030	314,743	233,808	21,713	–59,222	80,936	7.4	–20.2
43–4081	Hotel, motel, and resort desk clerks	143,553	173,729	218,776	30,176	75,223	–45,047	21.0	52.4
43–4141	New accounts clerks	110,015	115,009	81,422	4,993	–28,594	33,587	4.5	–26.0
43–4161	Human resources assistants, except payroll and timekeeping	123,830	125,602	168,201	1,771	44,371	–42,599	1.4	35.8
43–4171	Receptionists and information clerks	1,073,745	1,392,219	1,172,666	318,474	98,921	219,553	29.7	9.2
43–5021	Couriers and messengers	138,471	154,122	133,770	15,651	–4,701	20,352	11.3	–3.4
43–5031	Police, fire, and ambulance dispatchers	85,976	92,597	99,053	6,621	13,077	–6,456	7.7	15.2

See note at end of table.

SOC code	Occupation	1996	Projected, 2006	Actual 2006	Projected numeric change	Actual numeric change	Numeric difference b/t actual and projected	Projected percent change	Actual percent change
43–5032	Dispatchers, except police, fire, and ambulance............	148,456	165,441	190,231	16,985	41,775	−24,790	11.4	28.1
43–5041	Meter readers, utilities..	55,037	56,263	46,574	1,226	−8,463	9,689	2.2	−15.4
43–5051	Postal service clerks..	71,435	74,169	79,505	2,734	8,071	−5,336	3.8	11.3
43–5052	Postal service mail carriers..	331,553	368,560	337,768	37,007	6,215	30,791	11.2	1.9
43–5061	Production, planning, and expediting clerks...................	238,846	253,826	292,794	14,979	53,948	−38,968	6.3	22.6
43–5071	Shipping, receiving, and traffic clerks................................	984,773	1,069,634	768,974	84,861	−215,799	300,660	8.6	−21.9
43–5111	Weighers, measurers, checkers, and samplers, recordkeeping..	47,488	50,362	79,021	2,874	31,533	−28,659	6.1	66.4
43–6011/ 43–6014	Executive secretaries and administrative assistants/ secretaries, except legal, medical, and executive.........	2,880,586	2,793,854	3,557,855	−86,732	677,269	−764,001	−3.0	23.5
43–6012	Legal secretaries...	283,673	319,162	275,269	35,489	−8,404	43,893	12.5	−3.0
43–6013	Medical secretaries...	238,690	314,454	408,369	75,764	169,679	−93,914	31.7	71.1
43–9011	Computer operators...	291,123	197,606	129,997	−93,518	−161,127	67,609	−32.1	−55.3
43–9021	Data entry keyers..	435,608	462,453	313,355	26,845	−122,253	149,098	6.2	−28.1
43–9022	Word processors and typists.......................................	652,543	552,075	178,998	−100,468	−473,545	373,077	−15.4	−72.6
43–9031	Desktop publishers..	30,446	52,837	31,833	22,391	1,387	21,004	73.5	4.6
43–9061	Office clerks, general...	3,134,416	3,351,296	3,200,245	216,880	65,830	151,051	6.9	2.1
43–9081	Proofreaders and copy markers.................................	26,094	16,052	17,856	−10,042	−8,238	−1,805	−38.5	−31.6
43–9111	Statistical assistants...	78,111	64,625	22,507	−13,486	−55,604	42,118	−17.3	−71.2
45–4022	Logging equipment operators.....................................	54,373	56,338	40,496	1,965	−13,877	15,842	3.6	−25.5
47–2011	Boilermakers...	18,293	17,699	17,571	−594	−722	128	−3.2	−3.9
47–2041	Carpet installers...	64,400	72,235	73,205	7,836	8,805	−969	12.2	13.7
47–2071	Paving, surfacing, and tamping equipment operators	79,300	103,027	64,255	23,727	−15,045	38,772	29.9	−19.0
47–2073	Operating engineers and other construction equipment operators..	263,871	291,099	424,152	27,228	160,281	−133,053	10.3	60.7
47–2130	Insulation workers...	65,007	77,572	60,859	12,565	−4,148	16,713	19.3	−6.4
47–2140	Painters and paperhangers..	443,720	509,293	472,732	65,573	29,013	36,561	14.8	6.5
47–2161	Plasterers and stucco masons...................................	31,871	36,104	61,148	4,233	29,277	−25,044	13.3	91.9
47–2181	Roofers...	138,141	144,101	156,284	5,960	18,143	−12,183	4.3	13.1
47–4011	Construction and building inspectors...........................	66,265	75,863	109,730	9,598	43,465	−33,867	14.5	65.6
47–4021	Elevator installers and repairers................................	25,187	27,209	21,830	2,022	−3,357	5,379	8.0	−13.3
47–4051	Highway maintenance workers...................................	171,386	157,786	145,216	−13,600	−26,170	12,570	−7.9	−15.3
47–5071	Roustabouts, oil and gas..	27,806	18,437	44,085	−9,370	16,278	−25,648	−33.7	58.5
49–2021	Radio mechanics...	7,973	7,396	6,533	−577	−1,440	863	−7.2	−18.1
49–2097	Electronic home entertainment equipment installers and repairers..	32,832	26,590	39,700	−6,242	6,869	−13,111	−19.0	20.9
49–3011	Aircraft mechanics and service technicians...................	136,643	154,683	122,472	18,040	−14,171	32,211	13.2	−10.4
49–3021/ 49–3022	Automotive body and related repairers/ automotive glass installers and repairers...................................	224,690	253,557	206,286	28,867	−18,404	47,271	12.8	−8.2
49–3023	Automotive service technicians and mechanics	775,440	871,266	772,675	95,826	−2,765	98,591	12.4	−.4
49–3031	Bus and truck mechanics and diesel engine specialists...	266,179	288,072	274,876	21,893	8,697	13,196	8.2	3.3
49–3041	Farm equipment mechanics..	44,098	37,084	30,672	−7,014	−13,426	6,412	−15.9	−30.4
49–3042	Mobile heavy equipment mechanics, except engines.	104,349	111,114	130,570	6,765	26,220	−19,455	6.5	25.1
49–3052	Motorcycle mechanics..	11,947	12,627	21,211	680	9,264	−8,584	5.7	77.5
49–3091	Bicycle repairers...	12,759	17,028	8,644	4,269	−4,115	8,384	33.5	−32.3
49–3093	Tire repairers and changers	94,283	100,853	105,842	6,570	11,559	−4,989	7.0	12.3
49–9021	Heating, air conditioning, and refrigeration mechanics and Installers..	256,396	299,926	291,861	43,530	35,465	8,065	17.0	13.8
49–9042	Maintenance and repair workers, general......................	1,362,102	1,607,860	1,390,952	245,758	28,850	216,907	18.0	2.1
49–9044	Millwrights...	77,999	76,319	54,884	−1,681	−23,115	21,434	−2.2	−29.6
49–9051	Electrical power-line installers and repairers	108,081	111,330	112,183	3,249	4,102	−853	3.0	3.8
49–9052	Telecommunications line Installers and repairers..........	200,621	241,652	162,317	41,032	−38,303	79,335	20.5	−19.1
49–9061	Camera and photographic equipment repairers............	14,293	17,718	4,403	3,425	−9,890	13,315	24.0	−69.2
49–9062	Medical equipment repairers......................................	9,736	10,877	37,645	1,140	27,909	−26,769	11.7	286.6
49–9063	Musical instrument repairers and tuners......................	8,987	9,652	5,998	665	−2,989	3,654	7.4	−33.3
49–9064	Watch repairers..	7,353	6,977	3,814	−376	−3,538	3,162	−5.1	−48.1

See note at end of table.

Table 14.	**Continued—Actual and projected levels, and numeric and percent growth for wage and salary employment, by occupation, 1996–2006**							
SOC code	**Occupation**	**1996**	**Project- ed, 2006**	**Actual, 2006**	**Pro- jected numeric change**	**Actual numeric change**	**Numeric differ- ence b/t actual and pro- jected**	**Pro- jected percent change**	**Actual percent change**
49–9069	Precision instrument and equipment repairers, all other	38,449	37,600	16,327	−850	−22,122	21,273	−2.2	−57.5
49–9094	Locksmiths and safe repairers	25,000	28,746	26,018	3,746	1,018	2,727	15.0	4.1
49–9096	Riggers	9,274	7,582	12,315	−1,693	3,040	−4,733	−18.3	32.8
51–2011	Aircraft structure, surfaces, rigging, and systems assemblers	24,649	27,091	28,083	2,443	3,434	−991	9.9	13.9
51–2021	Coil winders, tapers, and finishers	21,697	20,996	22,835	−701	1,139	−1,839	−3.2	5.2
51–3011	Bakers	226,486	277,761	149,266	51,275	−77,220	128,495	22.6	−34.1
51–3022	Meat, poultry, and fish cutters and trimmers	151,452	186,225	144,228	34,773	−7,224	41,997	23.0	−4.8
51–4051	Metal-refining furnace operators and tenders	20,889	19,939	18,386	−951	−2,503	1,552	−4.6	−12.0
51–4111	Tool and die makers	133,908	124,475	100,788	−9,433	−33,120	23,687	−7.0	−24.7
51–4121	Welders, cutters, solderers, and brazers	378,391	415,515	409,024	37,124	30,633	6,491	9.8	8.1
51–5012	Bookbinders	4,386	3,729	7,211	−657	2,826	−3,482	−15.0	64.4
51–5021	Job printers	14,693	15,410	48,240	717	33,548	−32,830	4.9	228.3
51–6031	Sewing machine operators	582,975	462,222	232,810	−120,752	−350,165	229,412	−20.7	−60.1
51–6052	Tailors, dressmakers, and custom sewers	87,346	72,735	53,910	−14,612	−33,436	18,825	−16.7	−38.3
51–6092	Fabric and apparel patternmakers	14,382	13,911	9,209	−471	−5,174	4,703	−3.3	−36.0
51–6093	Upholsterers	56,585	56,838	54,809	253	−1,776	2,029	0.4	−3.1
51–7021	Furniture finishers	29,753	33,178	31,326	3,425	1,573	1,851	11.5	5.3
51–8012	Power distributors and dispatchers	15,421	14,845	8,571	−576	−6,850	6,274	−3.7	−44.4
51–8031	Water and liquid waste treatment plant and system operators	98,290	121,070	110,840	22,779	12,549	10,230	23.2	12.8
51–8091	Chemical plant and system operators	36,485	36,206	53,243	−279	16,758	−17,037	−.8	45.9
51–9012	Separating, filtering, clarifying, precipitating, and still machine setters, operators, and tenders	31,879	29,030	44,289	−2,849	12,410	−15,259	−8.9	38.9
51–9021/ 51–9023	Crushing, grinding, and polishing machine setters, operators, and tenders/ mixing and blending machine setters, operators, and tenders	144,610	144,202	185,326	−409	40,716	−41,125	−.3	28.2
51–9022	Grinding and polishing workers, hand	73,752	72,297	44,776	−1,455	−28,976	27,521	−2.0	−39.3
51–9051	Furnace, kiln, oven, drier, and kettle operators and tenders	27,970	25,368	31,596	−2,603	3,625	−6,228	−9.3	13.0
51–9081	Dental laboratory technicians	47,337	47,671	53,439	335	6,102	−5,767	.7	12.9
51–9083	Ophthalmic laboratory technicians	19,022	19,094	29,064	72	10,042	−9,970	.4	52.8
51–9122	Painters, transportation equipment	49,187	58,465	54,322	9,278	5,135	4,143	18.9	10.4
51–9131	Photographic process workers	14,108	13,725	23,684	−383	9,576	−9,958	−2.7	67.9
51–9132	Photographic processing machine operators	49,385	53,349	49,304	3,964	−81	4,045	8.0	−.2
51–9141	Semiconductor processors	58,276	65,427	42,397	7,150	−15,880	23,030	12.3	−27.2
51–9191	Cementing and gluing machine operators and tenders	35,182	29,713	23,362	−5,469	−11,820	6,351	−15.5	−33.6
51–9196	Paper goods machine setters, operators, and tenders	51,255	43,799	113,107	−7,456	61,852	−69,308	−14.5	120.7
51–9197	Tire builders	14,433	12,274	22,664	−2,159	8,231	−10,389	−15.0	57.0
53–2010	Airline pilots and flight engineers	110,007	125,166	107,040	15,159	−2,967	18,126	13.8	−2.7
53–2020	Air traffic controllers and airfield operations specialists	28,894	28,808	30,115	−86	1,221	−1,307	−.3	4.2
53–3011	Ambulance drivers and attendants, except emergency medical technicians	18,394	25,102	21,538	6,709	3,145	3,564	36.5	17.1
53–3021	Bus drivers, transit and intercity	167,108	191,568	198,488	24,460	31,380	−6,920	14.6	18.8
53–3022	Bus drivers, school	425,238	518,042	454,800	92,804	29,562	63,242	21.8	7.0
53–3031	Driver/sales workers	331,173	369,721	445,092	38,548	113,919	−75,371	11.6	34.4
53–3041	Taxi drivers and chauffeurs	106,338	114,402	228,531	8,064	122,193	−114,129	7.6	114.9
53–3099	Motor vehicle operators, all other	26,705	27,594	75,942	889	49,237	−48,348	3.3	184.4
53–4021	Railroad brake, signal, and switch operators	17,792	12,771	24,609	−5,021	6,817	−11,838	−28.2	38.3
53–4031	Railroad conductors and yardmasters	25,330	24,872	40,152	−458	14,823	−15,280	−1.8	58.5
53–4041	Subway and streetcar operators	12,864	14,043	6,936	1,179	−5,927	7,107	9.2	−46.1
53–5031	Ship engineers	8,727	8,154	14,797	−573	6,070	−6,643	−6.6	69.6
53–6021	Parking lot attendants	68,299	86,161	135,204	17,862	66,904	−49,042	26.2	98.0
53–6031	Service station attendants	173,794	174,043	96,199	249	−77,595	77,844	.1	−44.6
53–7021	Crane and tower operators	45,477	44,977	46,393	−500	916	−1,416	−1.1	2.0
	See note at end of table.								

Table 14.	Continued—Actual and projected levels, and numeric and percent growth for wage and salary employment, by occupation, 1996–2006								
SOC code	Occupation	1996	Project-ed, 2006	Actual 2006	Pro-jected numeric change	Actual numeric change	Numeric differ-ence b/t actual and pro-jected	Pro-jected percent change	Actual percent change
53–7041	Hoist and winch operators	9,484	9,938	3,017	455	–6,467	6,922	4.8	–68.2
53–7051	Industrial truck and tractor operators	479,088	536,244	637,034	57,156	157,945	–100,790	11.9	33.0
53–7061	Cleaners of vehicles and equipment	274,177	343,338	368,216	69,160	94,038	–24,878	25.2	34.3
53–7063	Machine feeders and offbearers	265,273	263,119	147,763	–2,154	–117,510	115,356	–.8	–44.3
53–7064	Packers and packagers, hand	986,099	1,207,983	833,812	221,883	–152,287	374,171	22.5	–15.4
53–7081	Refuse and recyclable material collectors	115,705	122,654	135,970	6,949	20,265	–13,317	6.0	17.5

NOTE: For the sum of the occupations in the table, the unweighted mean absolute percent error, weighted mean absolute percent error, direction of change, and dissimilarity index are the following, respectively: 31.4 percent, 17.6 percent, 67.1 percent, and 4.2 percent.

Table 15.	BLS occupational employment projections compared with those of naïve models, 1996–2006			
Model	Dissimilarity index (percent)	Unweighted MAPE[1] (percent)	Weighted MAPE[1] (percent)	Direction of change (percent)
BLS projection	7.6	26.9	15.3	66.2
Naïve 2-point, 10-year linear model	9.6	32.3	21.2	66.9
Naïve 2-point, 5-year linear model	9.5	32.4	20.2	64.0
Naïve linear regression model	7.9	28.9	16.1	64.7
Naïve static model	8.1	29.0	16.4	67.7
Which forecast performed best?	BLS	BLS	BLS	Static model
Second best?	Linear regression	Linear regression	Linear regression	2-point, 10-year forecast

[1] Mean absolute percent error.

indicative of the difference between actual and projected employment for a typical occupation. (For more information on the metrics used in this article, see the metrics section in the appendix.)

As previously mentioned, some errors in projecting occupational employment can be attributed to an imperfect OES–SOC crosswalk. The decline in the overall number of managers resulted in BLS overprojecting employment in seven of the nine managerial occupations included in this analysis, and also resulted in the unweighted MAPE for managerial occupations, 67 percent, being more than double the unweighted MAPE for all occupations, 31 percent. Only two managerial occupations were underprojected: education administrators, by 3 percent, and construction managers, by 40 percent.

Macroeconomic fluctuations that affected the accuracy of the industry projections also affected the occupational projections. Because of the housing bubble, BLS underprojected the employment of most construction-related occupations, not just that of construction managers. The Bureau underprojected the employment of architects, landscape architects, civil engineers, operating engineers and other construction equipment operators, plasterers and stucco masons, roofers, and construction and building inspectors. Underprojecting the price of oil led BLS to underproject the employment of petroleum engineers and that of oil and gas roustabouts.

Naïve models. The level of accuracy of the BLS projections needs to be evaluated in comparison with the accuracy of alternative projections. Creating naïve models of the projections provides bases for comparison. The naïve models require additional historical data going back to 1986, which further restricts the number of comparable occupations. This restriction led to the results in table 15 not exactly matching the results in table 14. The Bureau created four different naïve models to create data to be compared with the original BLS occupational employment projections: (1) a two-point linear projection based on 1986 and 1996 data, (2) a two-point linear projection based on 1991 and 1996 data, (3) a linear regression projection based on 1986–1996 data, and (4) a static model which assumed that occupations would remain the same percentage of total employment in 2006 as they were in

1996. As can be seen in table 15, the BLS projections were more accurate than all of the naïve models in three of four metrics. According to the direction-of-change metric, both the static model and the 10-year, two-point linear forecast outperformed the BLS projection. When evaluated across all the metrics used in this article, the BLS projection outperformed all of the naïve models.

CHANGES IN DATA SERIES, definitions, and classification systems hampered this article's analysis by decreasing the number of occupations available for analysis and creating substantial data comparison problems with regard to macroeconomic and industry employment data. Future evaluations, such as the analysis of the 2000–2010 projections, should be affected less by these types of changes because the NAICS and the SOC system have not undergone too many changes since 2000. Despite the data comparability problems, crosswalks and other adjustments to the data allowed this article to reasonably evaluate the accuracy of the projections and explain some of the causes of differences.

The differences between the projected size of the labor force and its actual size affected the macroeconomic projections more than they affected the industry and occupational employment projections because the latter projections focus more on the distributional nature of employment (what percent of total jobs are in a given industry or occupation) than on the total number of jobs. Compared with the differences in the projection of the

labor force, large macroeconomic fluctuations—caused by the rise in the price of oil, two wars, and the housing bubble—caused larger problems in the industry and occupational employment projections.

The housing bubble caused BLS to underproject the housing-related components of GDP, occupational employment, and industry employment projections, but data from 2007 onward suggest that part of the reason that they were off was that 2006 was near the peak of residential investment. The increase in the real oil price led to differences in several parts of the projections. In the future, BLS could carefully examine oil price projections and perhaps present the results of alternative oil price scenarios as it did in the discussion of uncertainty about labor force growth and its impact on GDP in the original 1996–2006 projections article.

Although the industry and occupational employment projections had weighted MAPEs of 11.7 percent and 17.6 percent, respectively, they still outperformed comparable naïve models. In both the industry and occupational employment projections, the weighted MAPE was lower than the unweighted MAPE; that is, BLS was more accurate in projecting changes in the employment of large industries and occupations than changes in the employment of small industries and occupations. On the whole, the BLS 1996–2006 labor force, occupational employment, and industry employment projections outperformed those of naïve models. □

Notes

[1] *Monthly Labor Review*, November 1997, pp. 3–83.

[2] For a complete list of the Bureau's evaluations of its projections, see **www.bls.gov/emp/ep_pub_projections_eval.htm** (visited Sept. 1, 2010).

[3] See H.O. Stekler and Rupin Thomas, "Evaluating BLS labor force, employment, and occupation projections for 2000," *Monthly Labor Review,* July 2005, pp. 46–56, on the Internet at **www.bls.gov/opub/mlr/2005/07/art5full.pdf** (visited Sept. 1, 2010).

[4] See Michael E. Fix and Jeffrey S. Passel, "U.S. Immigration at the Beginning of the 21st Century," (Washington, DC, Urban Institute, Aug. 2, 2001) on the Internet at **www.urban.org/publications/900417.html** (visited May 25, 2010).

[5] *Annual Estimates of the Population by Sex, Race, and Hispanic or Latino Origin for the United States: April 1, 2000 to July 1, 2006* (Census Bureau), on the Internet at **www.census.gov/popest/national/asrh/NC-EST2006-srh.html** (visited May 19, 2010).

[6] One example of the changes to GDP involved computer software. In 1999 historical GDP was revised upwards when certain business expenditures for computer software were reclassified as investments. Previously, only software embedded in equipment by the producer of

that equipment was counted as investment. Business purchases for own-account production (that is, software produced by a business for its own use) had been classified as inputs to production.

[7] Government purchases of own-account production of software (software produced by a government agency for its own use) shifted from one category of GDP, government consumption expenditures, to another category, gross government investment.

[8] Divisions in the SIC system are comparable to sectors in the NAICS. Because of data comparability issues, some of the industry divisions used in this article are not perfectly comparable to the divisions used in the November 1997 issue of the *Monthly Labor Review* or to the divisions in the official SIC manual. The transportation, communications, electric, gas, and sanitary services division was broken into three parts: transportation, communications, and utilities. The wholesale trade and retail trade divisions were combined into the trade sector. Federal Government is treated as a division, as is State and local government. The individual industries referred to in this article are a mix of two-digit and three-digit SIC industries.

[9] The tables used to convert the NAICS-based CES data to an SIC basis can be found on the Internet at **www.bls.gov/ces/cesratiosemp.htm** (visited Sept. 1, 2010).

[10] The OES–SOC crosswalk identified four kinds of occupational matches:

1) one OES occupation to one SOC occupation
2) one OES occupation and more than one SOC occupation
3) more than one OES occupation to one SOC occupation
4) more than one OES occupation to more than one SOC occupation

The fourth type of occupational match was eliminated because the lack of dual-coded data meant that ratios for converting the occupations did not exist. The results of the other three types of crosswalk matches were evaluated, and a list was compiled to look for trends in detailed occupations that were projected poorly. By looking at the year-over-year growth of several of these occupations, it became clear that the crosswalk was imperfect and missed a few occupations that changed significantly—increasing or decreasing by large amounts in the single year that the new classification system was implemented. The analysis was limited to occupations that fell into the first three types of occupational matches and did not show broader changes that could be attributed to the change in classification systems.

[11] The original occupational employment projections article is the following: George T. Silvestri, "Occupational employment projections to 2006," *Monthly Labor Review*, November 1997, on the Internet at **www.bls.gov/opub/mlr/1997/11/art5full.pdf** (visited Sept. 1, 2010).

[12] BLS uses Census Bureau data to calculate the size of the civilian noninstitutional population by subtracting those who are under the age of 16, in the active-duty armed forces, or institutionalized.

[13] Unless specified otherwise, in this article the term "men" refers to males 16 and older, and the term "women" refers to females 16 and older.

[14] More information on the Census Bureau's population projections is available on the Internet at **www.census.gov/population/www/projections/index.html** (visited Sept. 1, 2010).

[15] Interview with Mitra Toossi on May 21, 2010. In addition, see Howard N. Fullerton Jr., "Evaluating the BLS labor force projections to 2000," *Monthly Labor Review*, October 2003, pp. 3–12; see especially p. 11.

[16] In the broad race category system currently employed by BLS, Native Americans, Pacific Islanders, Native Hawaiians, and Native Alaskans are grouped with the multiple race category in a category called multiple race and other. For the analysis in this article, the group was moved back to the Asian group to reflect the categories used in creating the 2006 projections. Because the multiple race group cannot, by definition, be assigned to a single race category, it was impossible to adjust this group to reflect the race categories used to create the 2006 projections in 1996.

[17] See figure 2 on p. 4 of Michael Hoefer, Nancy Rytina, and Bryan C. Baker, "Estimates of the Unauthorized Immigrant Population Residing in the United States: January 2008" (Department of Homeland Security, February 2009), on the Internet at **www.dhs.gov/xlibrary/assets/statistics/publications/ois_ill_pe_2008.pdf** (visited July 19, 2010).

[18] For a list of the key assumptions, see table 2 on p. 8 of Thomas Boustead, "The U.S. economy to 2006," *Monthly Labor Review*, November 1997, p. 6–22.

[19] *Ibid*, pp. 18-21.

[20] *Ibid*, pp. 21.

[21] Unless otherwise noted, growth rates in this article are average annual growth rates.

[22] *Analysis of Petroleum Imports/Exports & Movements* (U.S. Energy Information Administration), on the Internet at **http://tonto.eia.doe.gov/dnav/pet/pet_pub_analysis_move.asp** (visited May 19, 2010).

[23] "Oil Prices and the U.S. Trade Deficit" *Economic Letter*, Federal Reserve Bank of San Francisco, Sept. 22, 2006, on the Internet at **www.frbsf.org/publications/economics/letter/2006/el2006-24.html** (visited May 19, 2010).

[24] Chain-weighting changes altered the growth rate enough that when the original data (the row titled "original data, published in 1997 (billions of chained 1992 dollars)" in table 7) were simply moved from a 1992 real dollar basis to a 2000 real dollar basis (the row titled "original data (billions of chained 2000 dollars)" in table 7) the projected growth rate went from 2.1 percent to 2.5 percent. Since the historical growth rate for the 1986-1996 period was revised upwards from 2.3 percent to 2.9 percent because of the switch from chained 1992 dollars to chained 2000 dollars and definitional changes to GDP, it would be reasonable to estimate that the projected growth rate for the 1996–2006 period should be revised upwards by the same amount—from 2.1 percent to 2.7 percent. (See the last row of table 7.)

[25] See Eric Belsky and Joel Prakken, *Housing Wealth Effects: Housing's Impact on Wealth Accumulation, Wealth Distribution and Consumer Spending* (Joint Center for Housing Studies, Harvard University, 2004), on the Internet at **www.jchs.harvard.edu/publications/finance/w04-13.pdf** (visited May 28, 2010).

[26] Unpublished online survey, January 2010, conducted by Furniture Today and HGTV.

[27] "Oil Prices and the U.S. Trade Deficit" *Economic Letter*, Federal Reserve Bank of San Francisco.

[28] See Jian Wang, "Durable Goods and the Collapse of Global Trade," *Economic Letter—Insights from the Federal Reserve Bank of Dallas,* February 2010, on the Internet at **www.dallasfed.org/research/eclett/2010/el1002.html** (visited May 28, 2010).

[29] Peter Orszag, *Estimated Costs of U.S. Operations in Iraq and Afghanistan and of Other Activities Related to the War on Terrorism* (Congressional Budget Office, Oct. 24, 2007), on the Internet at **www.cbo.gov/ftpdocs/86xx/doc8690/10-24-CostOfWar_Testimony.pdf** (visited May 19, 2010).

[30] *The Budget and Economic Outlook: Fiscal Years 2004-2013* (Congressional Budget Office, January 2003), p. 2, on the Internet at **www.cbo.gov/ftpdocs/40xx/doc4032/EntireReport_WithErrata.pdf** (visited May 19, 2010).

[31] *The Budget and Economic Outlook: Fiscal Years 2006 to 2015* (Congressional Budget Office, January 2005), p. 55, on the Internet at **www.cbo.gov/ftpdocs/60xx/doc6060/01-25-BudgetOutlook.pdf** (visited May 19, 2010).

[32] Industry employment data in this analysis come from the Current Employment Statistics survey, which is limited to nonagricultural wage and salary employment.

Appendix: Metrics employed in the article

The naïve model.   The objective of a naive model is to provide a benchmark to be used as a basis for comparison. For example, an evaluation of employment projections might reveal that BLS was off by 10 percent in a particular projection. A naïve model is necessary to determine whether that 10 percent error is a reasonable level of error. The following four naïve projection models were employed in this article:

- *Ten-year, two-point linear model.*   One basic way of projecting the labor force by demographic group and projecting employment by occupation or industry assumes that the growth rate of an occupation over the next 10 years will be equal to its growth rate over the previous 10 years. In such a model, year 2006 employment is projected by assuming that the growth rate between 1996 and 2006 will equal the growth rate over the 1986–1996 period. This is the only naïve model used in the labor force, macroeconomic, and industry employment sections of the article.

- *Five-year, two-point linear model.*   It is possible that the recent growth rate of an occupation's employment is a better predictor of future growth. This model assumes that the growth rate between 1991 and 1996 continues over the 1996–2006 period.

- *Ten-year linear regression.*   A linear regression differs from a two-point forecast because it includes data from intervening years in addition to the data from the end years of the forecast (in this case 1986 and 1996.) A line of best fit is determined by minimizing the sum of the squared residuals.

- *Static model.*   The static model assumes that the distribution of employment among occupations will not change over the forecast period. In this case, the static model assumed that, although total employment would grow, each occupation, industry, or demographic group would remain the same percentage of overall employment in 2006 as it was in 1996. The static naïve model projects employment in every occupation increasing by 14 percent—which was the overall rate of employment growth projected by BLS in 1996.

Numeric difference between projection and actual.
Numeric difference $= P_i - A_i$

Percent change or growth rate difference between projection and actual. Percent difference $= \dfrac{P_i - A_i}{A_i}$

A_i = Actual employment in industry/occupation i
P_i = Projected employment in industry/occupation i

Rankings for largest numeric change.   This metric shows where the 20 industries or occupations with the highest projected numeric employment change fell in the actual rankings of industries.

Rankings for greatest percentage change.   This metric shows where the 20 industries or occupations with the highest projected percentage change fell in the actual rankings.

Direction of change.   This metric measures accuracy in a binary way by calculating the percentage of occupations or industries that BLS correctly projected to grow or decline. The metric focuses only on whether the direction of the change was correctly projected and does not measure the size of the actual growth or decline compared with the size of the projected growth or decline.

Mean absolute percent error (MAPE), weighted and unweighted. The MAPE is a measure of accuracy between points in a time series. It is similar to the standard deviation. Ultimately, it is one of the simplest metrics used to determine the accuracy of the labor force, industry employment, and occupational employment projections. It is typically expressed as a percentage. By measuring the percentage difference between projection data and actual data, it adjusts for varying sizes of the different occupations and industries. It can be weighted or unweighted. In a weighted MAPE, each occupation or industry is weighted on the basis of its relative size, rather than weighted the same as all other occupations or industries.

$$\text{Weighted equation: MAPE} = \sum_i w_i * \left| \frac{A_i - P_i}{A_i} \right|$$

$$\text{Unweighted equation: MAPE} = {}^1\!/_n \sum \left| \frac{A_i - P_i}{A_i} \right|$$

A = actual value of occupation/industry/labor force component i
P = projected value of occupation/industry/labor force component i
W = weight of the occupation/industry or percent of total actual employment
N = number of occupations/industries

Dissimilarity index.   A dissimilarity index measures the amount by which a projected distribution would have to change to be identical to the actual distribution. It is typically expressed as a percentage, as in the following example: "The BLS 1986 projection of the distribution of the labor force between men and women in the year 2000 would need to change by 0.7 of a percentage point to reflect the actual distribution." A lower dissimilarity index means that the projection was more accurate.

$$\text{Dissimilarity index} = \frac{1}{2} \sum_{i=1}^{n} \left| \frac{a_i}{A} - \frac{p_i}{P} \right|$$

n = number of industries/occupations/labor force components
a_i = actual employment in industry/occupation/labor force component i
p_i = Projected employment in industry/occupation/labor force component i
A = Actual total employment/labor force
P = Projected total employment/labor force

Spearman's rank correlation. Spearman's rank correlation is used to test the direction and strength of the relationship between two sets of values. Occupations or industries are ranked by projected growth rate and actual growth rate. The rank-order correlation coefficient can be compared across projections.

$$\text{Spearman's rank correlation } \rho = 1 - \frac{6 \sum d_i^2}{n(n^2 - 1)}$$

n = number of industries/occupations
d_i = Difference between actual and projected employment in industry/occupation i