

### *Employment outlook: 2010–2020*

## Overview of projections to 2020

*Slow labor force growth and a gross domestic product growth of 3.0 percent annually are projected to result in a gain of 20.5 million jobs between 2010 and 2020; the fastest job growth is projected for industries and occupations related to healthcare and construction, although the construction industry is not expected to regain all the jobs it lost since its annual average peak employment in 2006*

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**T**his issue of the *Monthly Labor Review* features the Bureau of Labor Statistics (BLS) 2010–2020 employment projections, providing a detailed picture of the expected size and structure of the U.S. economy in 2020 and the change over the decade. This overview article presents highlights from these projections and summarizes results set forth in the four articles that follow.

The BLS projections are built on the assumption of a full-employment economy in 2020. Given the sharp downturn experienced in the 2007–2009 recession and the subsequent slow recovery, especially in the labor market, the path from 2010 to 2020 is from a relative low point to a robust target year. As discussed in the next section, this situation results in projected rapid growth rates for some measures that reflect recovery from the recession and, with some important exceptions, growth beyond recovery.

Here are some highlights from the 2010–2020 projections:

- The labor force will grow slowly and become much older as the baby-boom generation moves entirely into the 55-years-and-older age group, whose labor force participation rates are significantly lower.
- The labor force will continue to become more diverse, with Hispanics making up 18.6 percent of the total by 2020.
- Consistent with slow labor force growth and assumptions concerning a full-employment economy in 2020, gross domestic product (GDP) is projected to grow by 3.0 percent annually. Productivity growth is projected at an annual rate of 2.0 percent, similar to its long-term trend.
- Nonfarm payroll employment is projected to increase by 1.4 percent annually, regaining the jobs lost during the 2007–2009 recession and expanding further, to reach 149.5 million by 2020. Total employment, including agriculture and self-employed and unpaid family workers, is projected to increase by 20.5 million over the decade.
- The health care and social assistance industry is expected to be the most rapidly growing sector in terms of employment, followed by the construction sector. Despite rapid growth, the construction sector is not projected to return to its prerecession peak employment level.
- Occupation groups related to health care, personal care services, social ser-

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VICES, and construction are expected to be the most rapidly growing; however, office and administrative support occupations are projected to add the largest number of new jobs.

- Employment in the construction and extraction, production, and transportation and material moving occupation groups fell by 10 percent or more from 2006 to 2010. Although all three groups are expected to grow between 2010 and 2020, none is projected to regain its 2006 employment level.
- Occupations in which a master's degree is typically needed for entry are expected to grow by 21.7 percent, faster than the growth rate for any other education category. Among occupations in which a high school diploma or the equivalent is typically needed for entry, occupations that have apprenticeships as the typical kind of on-the-job training are projected to be the fastest growing and to have higher pay. These two results are based on the new education and training system introduced with the 2010–2020 projections.<sup>1</sup>

Since the 1960s, BLS has produced long-term economic and employment projections every other year. These projections are used in career exploration by high school students and their teachers and parents, college students, career changers, and career development and guidance specialists. The projections are the foundation of the BLS *Occupational Outlook Handbook*, the nation's most widely used career information resource.<sup>2</sup> The projections also are used by state workforce agencies as a starting point for developing state and area projections that, together with the national projections, are widely used by policymakers and education and training officials to make decisions about education and training policy, funding, and program offerings. In addition, other federal agencies, researchers, and academics use the projections to understand trends in the economy and labor market.

Because the 2010–2020 projections were prepared as the U.S. economy was emerging from the deepest recession since the 1930s, this article begins with a discussion of the impact of the recession on the projections and a consideration of the way to understand them in the context of recession and recovery. The next section presents a brief review of the BLS projection methods. Finally, the article provides an overview of the projection results, summarizing the four subsequent articles in this issue of the *Monthly Labor Review*.

## Interpreting the projections after recession

Because of the uncertainty of shocks and of the state of the business cycle at a 10-year time horizon, long-term models are generally predicated on the assumption that the economy will converge back to long-term trends. In this sense, the recession does not have as much of an influence on the BLS projections as some might expect. The United States has a history of recoveries from recessions, and the BLS assumes that the coming decade will exhibit similar behavior. More fundamentally, the projections assume that the U.S. economy will be at or near full employment. Thus, GDP is expected to recover to somewhere near the level of its potential by 2020. But this possibility is not a certainty and therefore presents a risk to the projections. Further, the severity of the 2007–2009 recession can affect the interpretation of the projections, particularly the projected growth rates. Both the interpretation problem and risks to the projections are explored next.

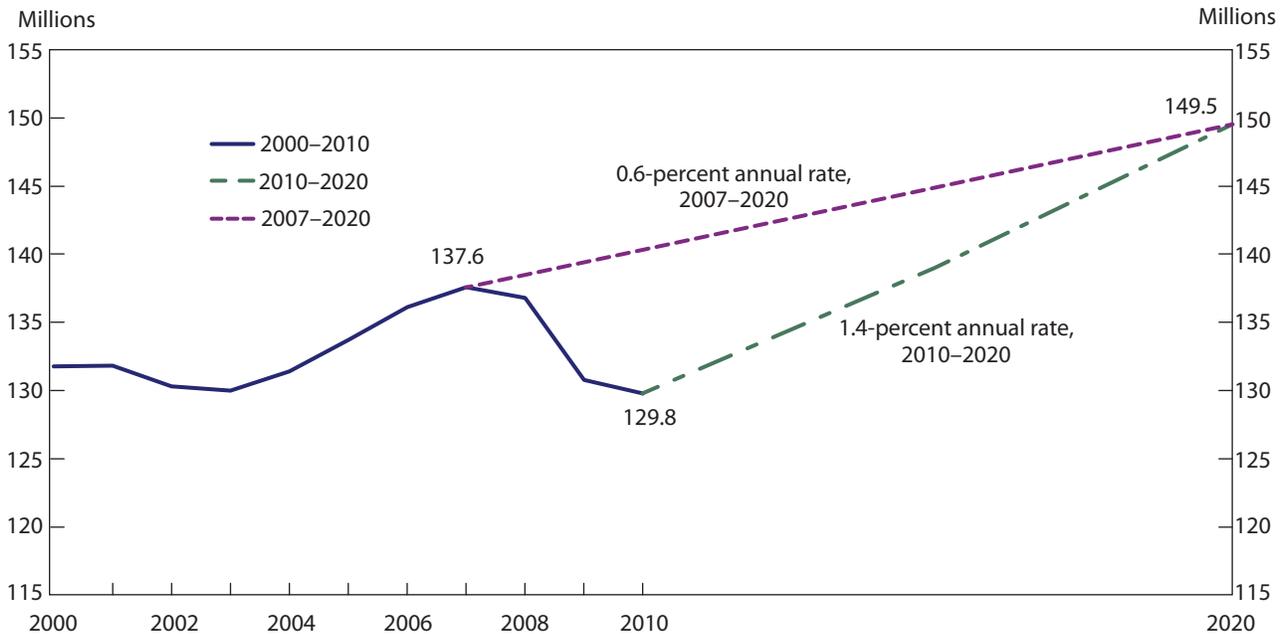
## Interpreting projected growth rates

Depending upon which industry or occupation is being considered, one should keep in mind that “growth” may mean either recovery growth or growth beyond recovery, or both. The recession affected industry and occupation groups differently: some were severely affected, some mildly so, and others seem not to have been affected at all. Not all industries or occupations are expected to recover completely; others are expected to recover and have continued growth. Industries and occupations that maintained growth through the recession are generally expected to continue to grow. In contrast, industries and occupations with a long-term trend of declining employment that accelerated during the recession may exhibit projected rates of decline that are slower than otherwise expected.

Because levels of many variables are low in 2010 relative to their historical behavior, projected growth rates may appear more robust than they would otherwise be. Users of the 2010–2020 projections should keep this possibility in mind when they take projected employment trends into account in making decisions. For example, consider the projected value of 149.5 million<sup>3</sup> for total nonfarm payroll employment, shown in chart 1. From the 2007 peak of 137.6 million, the projected annual growth rate to 2020 is 0.6 percent, while from the 2010 level of 129.8 million, the growth rate to 2020 is 1.4 percent, or more than twice as fast.

For one key sector, construction, growth is expected

**Chart 1. Total nonfarm payroll employment, 2000–2010 and projected to 2020**



NOTE: BLS does not project specific data for each of the years between 2010 and 2020. Interim years to the 2020 projection point are expressed by a dashed straight line only.

SOURCE: U.S. Bureau of Labor Statistics, Current Employment Statistics (historical data), and Employment Projections Program (2020 data).

to be rapid over the next decade, but projected levels for 2020 are generally lower than peaks experienced during 2005 and 2006. Housing starts are expected to increase by 10 percent annually, to 1.5 million units.<sup>4</sup> Although this annual growth rate is high, the projection for 2020 housing starts is still more than a half million lower than the peak of 2.1 million units built in 2005. Similarly, construction wage and salary employment is projected to grow at a 2.9-percent annual rate from the 2010 level of 5.5 million to 7.4 million in 2020. (See chart 2.) However, even this employment growth is not sufficient for construction to return to its peak, the 2006 figure of 7.7 million. In contrast, the health care and social assistance major industry sector had wage and salary employment of 14.9 million in 2006 and grew through the recession, to 16.4 million in 2010, a 2.4-percent annual growth rate. This sector is projected to grow by 3.0 percent annually, to a level of 22 million in 2020.

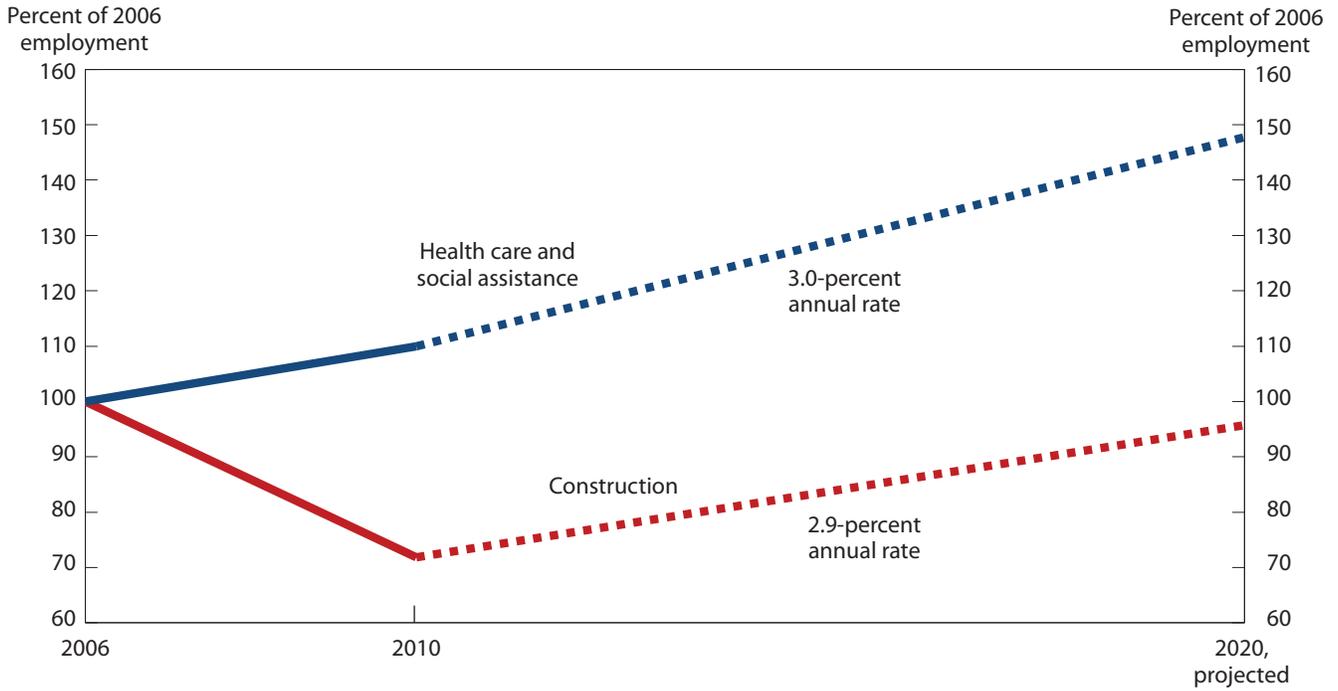
The situation with the construction sector carries over to the occupational projections, as discussed by C. Brett Lockard and Michael Wolf in their article.<sup>5</sup> Comparing the construction and extraction occupation group with the computer and mathematical occupation group, Lockard and Wolf find that both groups have projected growth of about 22 percent over the decade. The two

groups had dramatically different experiences during the recession, however. Employment in computer and mathematical occupations grew by 7.0 percent between 2006 and 2010, while the construction and extraction occupations declined nearly 24 percent. (See chart 3.) As a result, the 2010 unemployment rates for these groups were 5.2 percent and 20.1 percent, respectively.<sup>6</sup> The strong projected employment growth has a different meaning for each group. In the computer and mathematics group, robust growth is expected to provide opportunities for new workers; in the construction and extraction group, all of the projected rapid growth represents the partial recovery of jobs lost during the recession and the potential reabsorption of many workers who were displaced.

### Risks to the projections

Compiling 10-year projections always involves considerable uncertainty. All econometric models and analytical frameworks abstract from reality and make simplifying assumptions that may not hold in the future. But, given the severity of the most recent recession and the slowness of recovery to date, BLS recognizes that the current set of projections faces more uncertainty than usual. Among the most uncertain factors are fiscal policy, recovery of the

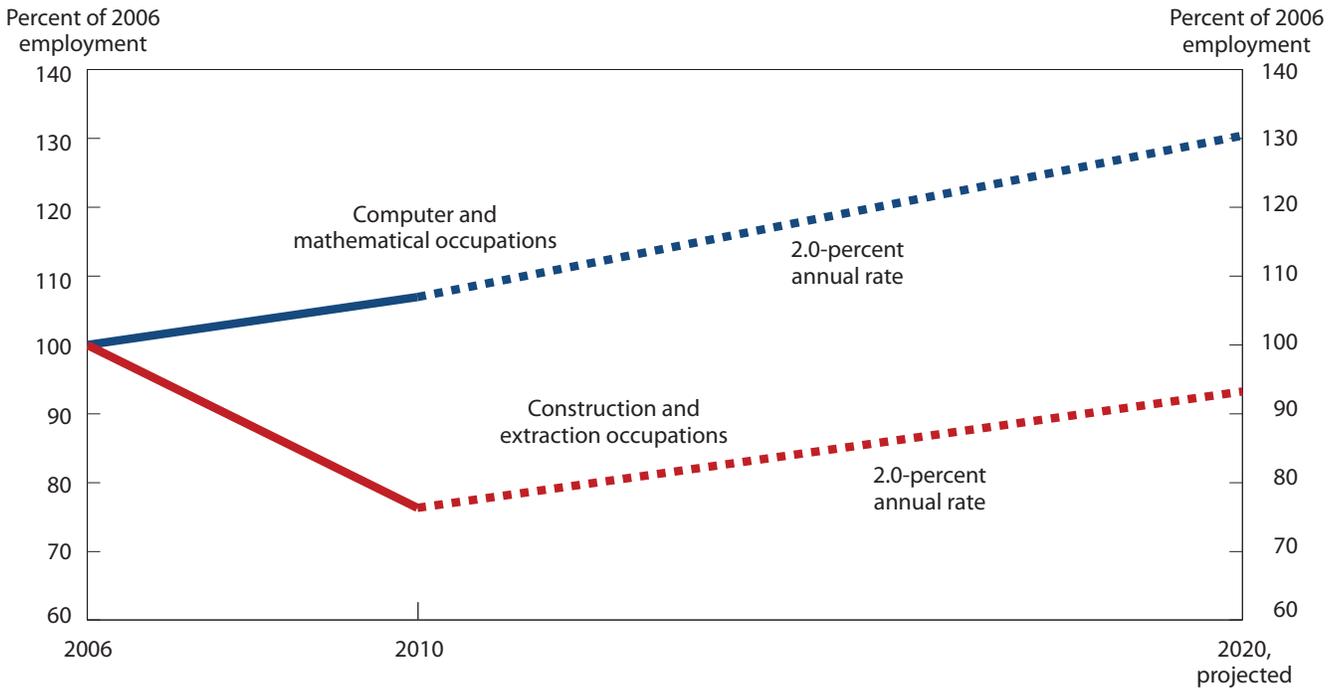
**Chart 2. Employment trends for selected major industry sectors, 2006, 2010, and projected 2020**



NOTE: BLS does not project specific data for each of the years between 2010 and 2020. Interim years to the 2020 projection point are expressed by a dashed straight line only.

SOURCE: U.S. Bureau of Labor Statistics, Current Employment Statistics (historical data), and Employment Projections Program (2020 data).

**Chart 3. Employment trends in two selected occupation groups, 2006, 2010, and projected 2020**



NOTE: BLS does not project specific data for each of the years between 2010 and 2020. Interim years to the 2020 projection point are expressed by a dashed straight line only.

SOURCE: U.S. Bureau of Labor Statistics, Employment Projections Program.

housing market, residual effects of the 2007–2009 recession, and the resolution of the sovereign debt crisis in Europe.

*Fiscal policy.* U.S. fiscal policy covers both tax and spending policies at the federal level. Generally, BLS assumes that the policy enacted at the time of the development of the projections will be in effect during the projection period. However, the Budget Control Act of 2011 made significant reductions in federal government discretionary spending over the coming decade without stipulating the details of how the spending cuts will be implemented. These cuts had not yet been decided upon when the BLS 2020 macroeconomic projections were finalized. The course of fiscal policy from 2010 to 2020 presents an increased underlying risk to the projections.

*Housing market.* The timing and magnitude of the housing recovery are uncertain. The recession was precipitated by the financial crisis, which was in turn driven by defaults in the subprime mortgage market. The housing market and the construction industry suffered severely. As the recession unfolded, many additional homeowners were forced into default through the loss of their jobs. Substantial home equity declines caused many homeowners to curtail spending as their wealth declined. The low number of private housing starts in both 2009 and 2010—less than 600,000—was unprecedented: from 1959 to 2006, the figure never fell below 1 million. Given the nature of the recession, recovery in the markets for both existing and new homes is critical to overall economic recovery. Although BLS expects eventual recovery in the housing market, the timing and magnitude remain uncertain.

*Residual impacts.* BLS considers two aspects of the 2007–2009 recession to be sources of risk to the projections: first, the potential for a prolonged recovery, given the nature of the recession; and second, the possibility of a considerable structural change in the labor market. These events are not necessarily exclusive and they may interact.

The depth and financial nature of the last recession give rise to an uncertain expectation of a recovery period that is longer than history otherwise suggests. In a multicountry study of the decade following financial crises that were preceded by a period of credit expansion and leverage, Carmen Reinhart and Vincent Reinhart found that unemployment rates were significantly higher in the decade that followed.<sup>7</sup> U.S. data so far bear out this point for the 2007–2009 recession. The unemployment rate peaked at 10.0 percent in October 2009, 4 months after the end of the recession, in

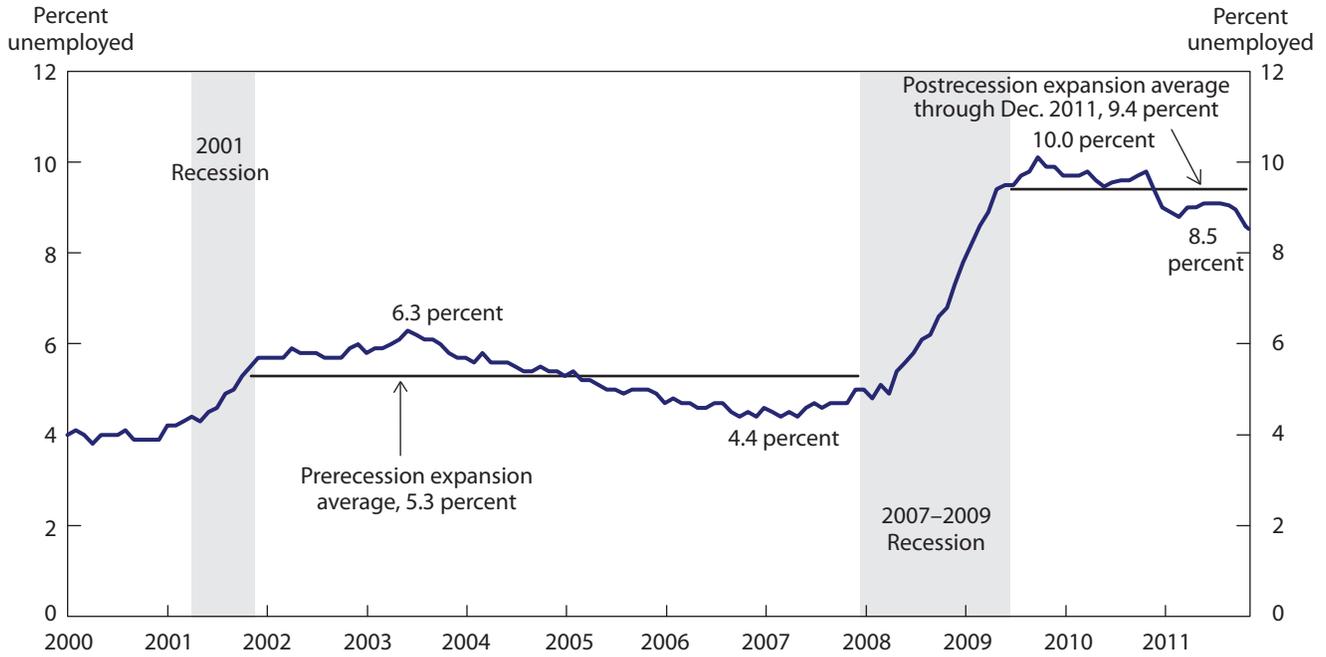
June 2009.<sup>8</sup> As of December 2011, 30 months following the end of the recession, the unemployment rate was 8.5 percent. (See chart 4.) Over the 74 months from the trough of the 2001 recession in November 2001 to the peak of the cycle in December 2007, the beginning of the most recent recession, unemployment averaged 5.3 percent, with a maximum of 6.3 percent and a minimum of 4.4 percent. Over the 30 months since the end of the last recession in June 2009, through December 2011, unemployment has averaged 9.4 percent, peaked at 10.0, and been as low as 8.5 percent. The long-term unemployed, those unemployed 27 or more weeks, increased to above 40 percent as a percentage of the unemployed in December 2009 and has remained there since, reaching as much as 45.4 percent of the unemployed in April 2010. (See chart 5.) Previously, the high had been 26.0 percent, in June 1983.

In terms of employment loss and recovery, the recent recession was both deep and long. With regard to the recessions of 1973, 1981, and 1990, employment recovered to the level it had at the beginning of the recession in 25,<sup>9</sup> 28, and 31 months, respectively, after the recession began. (See chart 6.)<sup>10</sup> As regards the 2001 recession, employment recovered 47 months after the start. In sharp contrast to all these recessions, 4 years since the beginning of the 2007–2009 recession employment is about 5 percent below the level it had at the start of the recession.

There is also some debate over whether the slow employment recovery is the result of structural changes in the economy or is due to a slow recovery in cyclical demand.<sup>11</sup> In this context, cyclical unemployment refers to a worker's being laid off by his or her firm because of weak demand, but who expects to go back to work when demand picks up, typically for the same firm, but generally in the same occupation or industry. Structural unemployment also may be precipitated by weak demand, but is rooted in some other element that hinders a worker's ability to return to work as demand revives. For example, recessions may accelerate the adoption of new technologies or practices by firms in their struggle to survive, and those technologies and practices may require fewer workers. Workers who are unemployed for structural reasons will likely face a longer period of unemployment than those who are unemployed for cyclical reasons. To find new employment, the worker who is unemployed for structural reasons may have to consider a new occupation or industry and may need to seek retraining. Recessions produce unemployment from both causes, and the character of the recession may stimulate either or both causes.

Taken together, the data show that the recession of 2007–2009 was unusual in its employment impacts.

**Chart 4. Unemployment rate, January 2000 to December 2011**



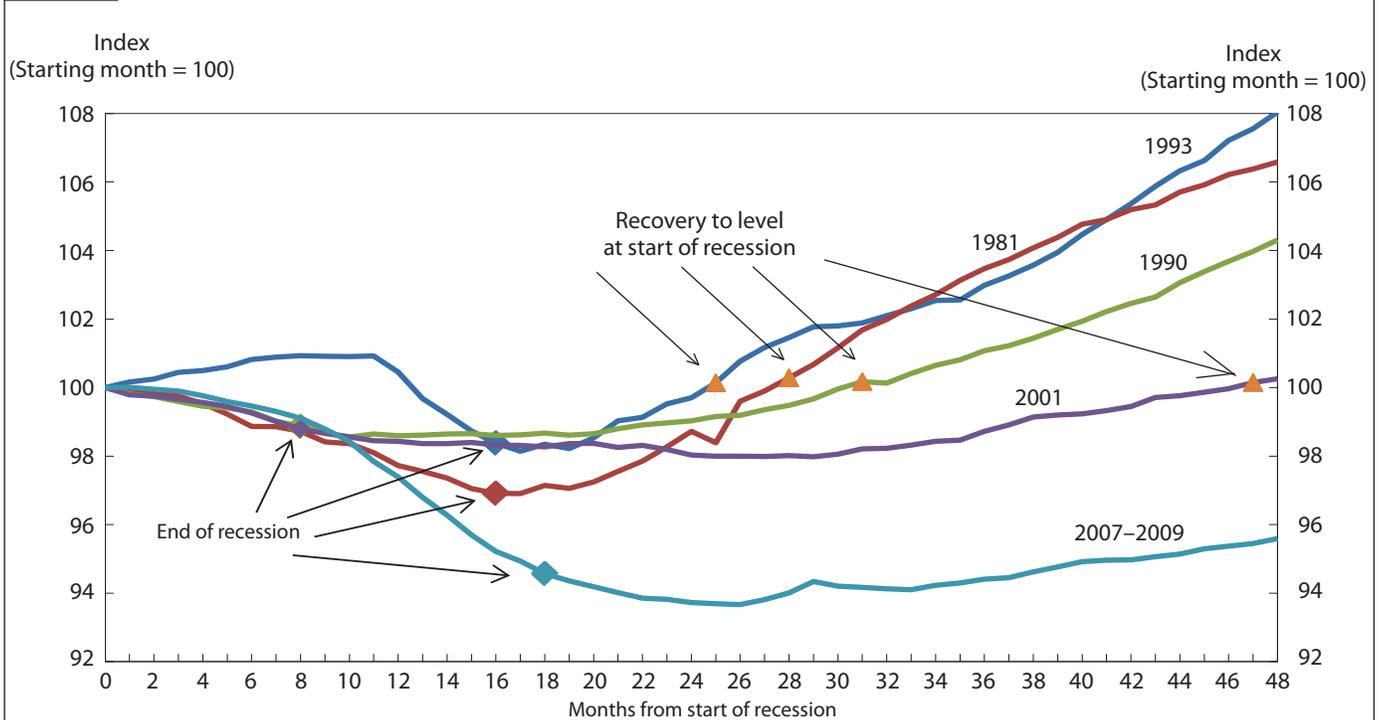
NOTE: Shaded areas denote recessions as determined by the National Bureau of Economic Research.  
 SOURCE: U.S. Bureau of Labor Statistics, Current Population Survey.

**Chart 5. Long-term unemployed as a percentage of total unemployed, January 1960 to December 2011**



NOTE: Shaded areas denote recessions as determined by the National Bureau of Economic Research.  
 SOURCE: U.S. Bureau of Labor Statistics, Current Population Survey.

**Chart 6. Indexes of nonfarm payroll employment during five recessions**



SOURCE: U.S. Bureau of Labor Statistics, Current Employment Statistics.

Much discussion has ensued among economists as to the underlying dynamics of the recession and the implications for recovery, including the likelihood of an extended period being required to reduce debt and rebuild the balance sheets of both consumers and businesses, and the extent to which the employment impacts are structural or cyclical. The main concern is that the long-term natural rate of unemployment has increased above expectations. BLS projections are predicated on a natural rate of unemployment of about 5.2 percent,<sup>12</sup> and although employment is expected to recover, BLS also recognizes that the character of the recent recession creates an underlying risk to the projections.

*European sovereign debt crisis.* The resolution of the European sovereign debt crisis is uncertain. The global aspects of the financial crisis and subsequent recession contributed directly to the current situation in Europe. The resolution of the debt crisis will require addressing both unresolved political integration issues in the management of a common currency<sup>13</sup> and the demographic and political institutional realities that inhibit economic growth.<sup>14</sup> The risk for the U.S. economy is that the situation will deteriorate, creating increased international financial

stress with spillover effects on the U.S. financial markets, reduced European demand for U.S. goods and services, and a general worldwide economic contraction.

### BLS projection methods

To produce its long-term projections, BLS begins with projections of the labor force, which then become an input to the next step, the macroeconomic projections. In turn, macroeconomic projections are the starting point for the industry output and employment projections. In the final component, the industry projections are translated to occupational employment projections and replacement rates are applied to generate estimates of replacement needs.<sup>15</sup>

Projecting the labor force begins with adjusting the resident population projections from the U.S. Census Bureau to the civilian noninstitutional population<sup>16</sup>—the population concept used in labor force measurement—and benchmarking this population to the annual average from the Current Population Survey, in this case for 2010. Time series extrapolation procedures are used to project labor force participation rates. The population and labor force participation rate projections are created for 136 age, gender, and race or ethnicity groups. For

each of these groups, the projected participation rates are applied to the projected population and the results are summed across all groups, resulting in the total labor force projection.

The size of the projected labor force serves as a labor supply constraint on economic growth and is therefore an input to the macroeconomic projections. BLS uses a macroeconomic model provided by Macroeconomic Advisers, LLC, to prepare projections of GDP and its components. The macroeconomic projections also yield projections of total household employment and total nonfarm payroll employment. In addition to producing the labor force projection, BLS develops assumptions and target values for other variables in the model, including the unemployment rate.<sup>17</sup>

In the industry projections process, estimates of GDP obtained from the macroeconomic projections are disaggregated into commodity-level demand and entered into an input-output model to derive output by industry. This output is then translated to industry employment on the basis of labor productivity trends.

The BLS National Employment Matrix is used to translate industry employment to occupational employment. The matrix is a set of tables, one for each detailed industry, depicting the 2010 percent distribution of industry employment by occupation—the staffing pattern—and the 2020 projected staffing patterns developed by BLS staff.<sup>18</sup> Projected staffing patterns reflect past trends, as well as expectations regarding changes in occupational usage resulting from changes in technology, business practices, product mixes, and other factors. The 2020 staffing patterns are applied to the 2020 industry employment projections, and the results are summed across industries to produce projected employment by occupation. Replacement rates are developed from age cohort data for each occupation and are applied to derive projected job openings from replacement needs.

The final employment levels for 2010 and 2020 are measures of total employment as a count of jobs, not a count of individual workers. This concept is different from that used by other measures that are familiar to many readers, including the Current Population Survey's total employment as a count of the number of workers and the BLS Current Employment Statistics' count of nonfarm payroll jobs.

## Overview of the 2010–2020 projections

Each of the four subsequent articles in this issue of the *Review* presents the results for one of the components of

the BLS projections process. These results are summarized here, starting with the labor force and the macroeconomic projections, followed by the industry output and employment projections, and, finally, the occupational employment projections.

### Labor force highlights

Mitra Toossi's article "Labor force projections to 2020: a more slowly growing workforce"<sup>19</sup> presents a picture of the U.S. labor force, one of the driving forces of growth in the economy, continuing to grow over the 2010–2020 decade, although at a slower rate than in past decades. The labor force is projected to grow by 0.7 percent annually, a rate slightly slower than the 0.8-percent growth exhibited in 2000–2010, and to add 10.5 million persons by 2020. (See table 1.) This slower growth results from the combination of two trends: slightly slower growth in the civilian noninstitutional population and a continuing decline in the total labor force participation rate. The labor force is projected to get older, become racially and ethnically more diverse, and show a small increase in women as a share of the total. (See table 2.)

The civilian noninstitutional population grew by 1.1 percent annually between 2000 and 2010, adding 25.3 million people. Over the 2010–2020 period, the civilian noninstitutional population is projected to show an annual growth of 1.0 percent and an increase of 25.2 million, reaching a total of 263.0 million in 2020. Toossi describes how growth rates are expected to vary considerably across age and race or ethnicity groups. In particular, the Hispanic population is projected to rise rapidly, growing 3.2 percent annually and by 12.4 million people, reflecting immigration and relatively high fertility rates among Hispanics.

The declining total labor force participation rate reflects the aging of the baby-boomer generation as these 77 million Americans move entirely from the "prime age" for labor force participation to the 55-years-and-older group, with lower participation rates. This effect is somewhat offset by rising labor force participation among older workers, a trend that Toossi observes began in the late 1990s. The participation rate for those 55 years and older rose from 32.4 percent in 2000 to 40.2 percent in 2010 and is projected to reach 43.0 percent in 2020. Toossi projects continued declining labor force participation rates for the youngest and the prime age groups. Participation rates for those 16–24 years old are projected to decline by 7.0 percentage points, from 55.2 percent to 48.2 percent; for the prime age group, participation is projected to decline

**Table 1. Key labor force, macroeconomic, output, and employment variables, 2006, 2010, and projected 2020**  
[Numbers in thousands]

Projections component	Level			Change		Percent change	
	2006	2010	Projected 2020	2006–2010	Projected 2010–2020	2006–2010	Projected 2010–2020
<b>Labor force</b>							
Civilian noninstitutional population	228,815	237,830	263,009	9,015	25,179	3.9	10.6
Labor force participation rate (percent)	66.2	64.7	62.5	-1.5	-2.2	-2.3	-3.4
Labor force	151,428	153,889	164,360	2,461	10,471	1.6	6.8
Unemployment rate (percent)	4.6	9.6	5.2	5.0	-4.4	108.7	-45.8
<b>Macroeconomic variables</b>							
Real gross domestic product (billions of chained 2005 dollars)	\$12,958	\$13,088	\$17,513	\$130	\$4,425	1.0	33.8
<b>Industry output</b>							
Output (gross duplicated output, billions of chained 2005 dollars)	\$23,625	\$23,171	\$30,876	-\$453	\$7,705	-1.9	33.3
<b>Employment (thousands)</b>							
Household employment	144,427	139,064	155,901	-5,363	16,837	-3.7	12.1
Nonfarm payroll employment	136,086	129,818	149,530	-6,268	19,712	-4.6	15.2

SOURCES: Historical GDP data, Bureau of Economic Analysis; historical labor force and employment data, Bureau of Labor Statistics; historical

industry output estimates, Bureau of Labor Statistics; projected data, Bureau of Labor Statistics.

slowly, from 82.2 percent to 81.3 percent.

Total participation rates for both men and women are projected to decline from 2010 to 2020. For both genders, participation rates are projected to decline among the youngest and the prime age groups and to increase among those 55 years and older. Although participation rates for men will fall somewhat faster than those for women, by 2020 men are expected to have a higher overall participation rate (68.2 percent) than women (57.1 percent) and to continue to be the majority of the labor force. Women's share of the labor force is projected to rise from 46.7 percent in 2010 to 47.0 percent by 2020. Labor force participation rates are expected to decline for all race groups and for Hispanics.<sup>20</sup>

As the baby-boomer generation, born between 1946 and 1964, moves entirely into the 55-years-and-older age group by 2020, the labor force in this age group will grow rapidly, by a projected 3.3 percent annually, representing a gain of 11.4 million people. (See table 2.) Labor force growth in the 25-to-54-year-old prime age group, which has the highest labor force participation rates, will be very slow, 0.2 percent annually. The group is expected to add 1.7 million people, as the baby boomers are replaced by members of the "baby bust" generation, born during a period of lower birthrates. The labor force for the youngest age group, those 16 to 24 years old, is projected to decline, falling 1.3 percent annually and by 2.6 million individuals. (See table 2.)

Toossi also projects rapid growth in the Hispanic labor force, by 3.0 percent annually and 7.7 million people, reflecting the rapid population growth for this group, even though its labor force participation rate is expected to fall slightly. By contrast, the White non-Hispanic labor force is projected to decline slightly, by 0.2 percent annually, or 1.6 million by 2020. Projected annual labor force growth rates for the racial groups are 0.4 percent for Whites, 1.0 percent for Blacks, 2.7 percent for Asians, and 2.5 percent for all other racial groups. (See table 2.)

### Macroeconomic highlights

Kathryn J. Byun and Christopher Frey describe the projected macroeconomy for 2020, building on the labor force projections and assumptions and the target variables consistent with a full-employment economy. They project GDP growth averaging 3.0 percent annually between 2010 and 2020, much faster than the 1.6 percent exhibited over the previous decade, during which the United States experienced two recessions, including the severe 2007–2009 downturn. Household employment is projected to grow by 1.1 percent annually, adding 16.8 million workers, to reach 155.9 million by 2020, consistent with the labor force projection and the target unemployment rate of 5.2 percent. Nonfarm payroll employment is projected to grow somewhat faster, at 1.4 percent annually, reaching 149.5 million, a gain of 19.7 million jobs since 2010.<sup>21</sup>

**Table 2. Summary of labor force projections, 2010 and projected 2020**  
[Numbers in thousands]

Projections component	Level		Projected change, 2010–2020			Percent distribution	
	2010	Projected 2020	Number	Percent change	Annual percent change	2010	Projected 2020
Civilian noninstitutional population	237,830	263,009	25,179	10.6	1.0	...	...
Labor force participation rate (percent)	64.7	62.5	-2.2	-3.4	-.3	...	...
<b>Labor force (thousands)</b>							
Total	153,889	164,360	10,471	6.8	.7	100.0	100.0
Age, years							
16 to 24	20,934	18,330	-2,604	-12.4	-1.3	13.6	11.2
25 to 54	102,940	104,619	1,679	1.6	.2	66.9	63.7
55 and older	30,014	41,411	11,397	38.0	3.3	19.5	25.2
Gender							
Men	81,985	87,128	5,143	6.3	.6	53.3	53.0
Women	71,904	77,232	5,328	7.4	.7	46.7	47.0
Race							
White	125,084	130,516	5,432	4.3	.4	81.3	79.4
Black	17,862	19,676	1,814	10.2	1.0	11.6	12.0
Asian	7,248	9,430	2,182	30.1	2.7	4.7	5.7
All other groups <sup>1</sup>	3,694	4,738	1,044	28.3	2.5	2.4	2.9
Ethnicity							
Hispanic origin	22,748	30,493	7,745	34.0	3.0	14.8	18.6
Other than Hispanic origin	131,141	133,867	2,726	2.1	.2	85.2	81.4
White non-Hispanic	103,947	102,371	-1,576	-1.5	-.2	67.5	62.3

<sup>1</sup> The "all other groups" category includes (1) those classified as being of multiple racial origin and (2) the racial categories of (2a) American Indian and Alaska Native and (2b) Native Hawaiian and Other Pacific Islanders.

NOTE: Details may not sum to totals because of rounding.  
SOURCE: U.S. Bureau of Labor Statistics.

(See table 1.) Labor productivity is projected to grow by 2.0 percent annually, more similar to the long-run historical trend than the faster growth seen in the 2000–2010 decade.

Projected GDP and employment growth figures are consistent with recovery in the housing market, increased consumer confidence, renewed business investment, and expanding exports. At the same time, the economy is facing the challenges of an aging population, rising demand and costs for medical care, and uncertainties surrounding housing and consumer demand.

Byun and Frey caution that the 2010 starting point of the projections is a low point, with GDP, employment, and other factors below historical trends because of the severity of the 2007–2009 recession and the slow recovery through 2010. Thus, although the projected growth rates may appear strong, much of the projected growth is regaining ground lost in the recession.

Viewing GDP growth from the demand side, Byun and Frey examine each GDP component. (See table 3.) Personal consumption expenditures (PCE) are by far the

largest demand component, accounting for 70.5 percent of nominal GDP in 2010. Real PCE is projected to grow by 2.7 percent annually over the 2010–2020 decade, compared with 1.9 percent for 2000–2010. Expenditures on durable goods are projected to be the fastest growing component of PCE, rising at a 4.4-percent annual rate, followed by 2.7 percent on services and 2.0 percent on nondurable goods.

Gross private domestic investment is projected to increase by 5.6 percent annually, led by residential investment growth, at 7.0 percent annually. Residential investment growth is based on an expected recovery of the housing market, reversing declines during 2000–2010 that resulted from the bursting of the housing bubble.<sup>22</sup> Housing investment, key to economic recovery and projected growth, is one of the areas of greatest uncertainty in the 2010–2020 projections. Nonresidential investment is projected to grow at a 5.4-percent annual rate, with stronger growth for equipment and software (6.2 percent) than for nonresidential buildings and other structures (3.2 percent).

**Table 3. Real gross domestic product, by major demand category, 2010 and projected 2020**  
[Thousands of dollars]

Projections component	Billions of chained 2005 dollars		Projected change, 2010–2020			Billions of dollars		Percent distribution	
	2010	Projected 2020	Number	Percent change	Annual percent change	2010	Projected 2020	2010	Projected 2020
Gross domestic product, total <sup>1</sup>	\$13,088.0	\$17,512.9	\$4,424.9	33.8	3.0	\$14,526.5	\$23,669.5	100.0	100.0
Personal consumption expenditures	9,220.9	12,063.4	2,842.5	30.8	2.7	10,245.5	16,600.5	70.5	70.1
Gross private domestic investment	1,714.9	2,945.1	1,230.2	71.7	5.6	1,795.1	3,604.3	12.4	15.2
Exports	1,663.3	3,065.1	1,401.8	84.3	6.3	1,839.8	4,257.9	12.7	18.0
Imports <sup>2</sup>	2,085.0	3,258.4	1,173.4	56.3	4.6	2,356.7	5,034.6	16.2	21.3
Federal defense consumption expenditures and gross investment	718.2	692.6	-25.6	-3.6	-4	819.2	980.5	5.6	4.1
Federal nondefense consumption expenditures and gross investment	357.7	314.3	-43.4	-12.1	-1.3	403.6	451.8	2.8	1.9
State and local consumption expenditures and gross investment	1,487.0	1,779.4	292.4	19.7	1.8	1,780.0	2,809.0	12.3	11.9

<sup>1</sup> Real GDP components do not necessarily add to the total as a by-product of chain-weighting.

<sup>2</sup> Imports are subtracted from the other components of GDP be-

cause imports are not produced in the United States.

SOURCES: Historical GDP data, Bureau of Economic Analysis; projected data, Bureau of Labor Statistics.

BLS projects that exports will grow by 6.3 percent annually, more rapidly than the 4.6-percent growth in imports, resulting in a reduction in the trade deficit. Byun and Frey note, however, that because trade is dependent on highly unpredictable events in the world market, the trade component is often considered the most uncertain part of macroeconomic projections. Volatile oil prices and the European sovereign debt crisis are examples of this unpredictability. Although exports of services are expected to increase slightly faster than exports of goods, at 6.7 percent and 6.1 percent annually, respectively, goods will still account for the majority of exports.

Government consumption expenditures and gross investment represent another area of uncertainty in the macroeconomic projections, given current uncertainty at the federal level. Medicare and Social Security expenditures are expected to increase with the aging of the population and increases in the cost of health care, although Medicare reimbursement rates are being reduced over the coming decade. Real defense expenditures are projected to decline somewhat with the U.S. troop departure from Iraq, but the war in Afghanistan continues and worn equipment needs to be replaced. BLS projects the federal budget deficit to decline by 4.0 percent annually, dropping to \$846.1 billion in 2020 compared with \$1,273.7 billion in 2010. The deficit is projected to fall from 8.8

percent of nominal GDP in 2010 to 3.6 percent by 2020.

At the State and local levels, government consumption expenditures and investment are expected to grow by 1.8 percent annually between 2010 and 2020, despite budget constraints that many States are currently facing. Increased Medicaid and similar social benefit expenses are expected to lead to reductions in other state programs in order to operate within these budgetary constraints in the near term.

Byun and Frey also discuss GDP projections from the income side. They project that personal income will resume growing, averaging 5.2 percent annually after slow growth from 2000 to 2010, largely accounted for by a 4.3-percent decline between 2008 and 2009. Real per capita disposable income is projected to grow by 1.5 percent annually, while the personal savings rate is expected to decline.<sup>23</sup>

### Industry output and employment highlights

In his article “Industry employment and output projections to 2020,”<sup>24</sup> Richard Henderson describes the results of translating the GDP projections into industry terms. The patterns of growth—which industries are growing faster or slower or are declining—differ somewhat between output and employment, because productivity trends differ

across industries.

Real total output is projected to grow by 2.9 percent annually, adding \$7.7 trillion (in chained 2005 dollars) to the level seen in 2010. Output growth is expected to be much faster than the 1.4-percent annual increase during the 2000–2010 decade, when the rate was pulled down considerably by the 2007–2009 recession. The fastest rate of annual output growth, 4.7 percent, is projected for the information sector, followed by construction (3.8 percent), retail trade (3.7 percent), and business and professional services (also 3.7 percent). (See table 4.)

Total employment is projected to grow at a 1.4-percent annual rate, resulting in 20.4 million new jobs. (See table 4.) The fastest growth, 3.0 percent per year, is expected in the health care and social assistance sector, resulting

in 5.6 million new wage and salary jobs. Employment in this industry continued to grow during the 2007–2009 recession. The construction sector is projected to have the second-fastest rate of job growth, 2.9 percent per year, adding 1.8 million jobs between 2010 and 2020. This sector suffered severe job losses during the recession, and, despite projected rapid job growth, is anticipated to remain below its prerecession employment level in 2020.

Chart 7 depicts industry sector projected change in real output versus change in employment.<sup>25</sup> Where each sector falls on this chart indicates the impact of labor productivity growth on the employment growth (or decline) associated with a particular projected change in output in that sector. Industries falling into the upper right quadrant are projected to have both employment growth

**Table 4. Summary of industry output and employment projections, 2010–2020**  
[Numbers in thousands]

Industry sector	Employment						
	Jobs		Projected change, 2010–2020			Percent distribution	
	2010	Projected 2020	Number	Percent change	Annual percent change	2010	Projected 2020
Total <sup>1,2</sup>	143,068.2	163,537.1	20,468.9	14.3	1.4	100.0	100.0
Nonagriculture wage and salary <sup>3</sup>	130,435.6	150,176.8	19,741.2	15.1	1.4	92.2	92.8
Goods-producing, excluding agriculture	17,705.5	19,496.8	1,791.3	10.1	1.0	12.5	12.0
Mining	655.9	680.7	24.8	3.8	.4	.5	.4
Construction	5,525.6	7,365.1	1,839.5	33.3	2.9	3.9	4.5
Manufacturing	11,524.0	11,450.9	-73.1	-.6	-.1	8.1	7.1
Service-providing	112,730.1	130,680.1	17,950.0	15.9	1.5	79.7	80.7
Utilities	551.8	516.1	-35.7	-6.5	-.7	.4	.3
Wholesale trade.	5,456.1	6,200.2	744.1	13.6	1.3	3.9	3.8
Retail trade	14,413.7	16,182.2	1,768.5	12.3	1.2	10.2	10.0
Transportation and warehousing	4,183.3	5,036.2	852.9	20.4	1.9	3.0	3.1
Information	2,710.9	2,851.2	140.3	5.2	.5	1.9	1.8
Financial activities	7,630.2	8,410.6	780.4	10.2	1.0	5.4	5.2
Professional and business services	16,688.0	20,497.0	3,809.0	22.8	2.1	11.8	12.7
Educational services	3,149.6	3,968.8	819.2	26.0	2.3	2.2	2.5
Health care and social assistance	16,414.5	22,053.9	5,639.4	34.4	3.0	11.6	13.6
Leisure and hospitality	13,019.6	14,362.3	1,342.7	10.3	1.0	9.2	8.9
Other services	6,031.3	6,850.7	819.4	13.6	1.3	4.3	4.2
Federal government	2,968.0	2,596.0	-372.0	-12.5	-1.3	2.1	1.6
State and local government	19,513.1	21,154.8	1,641.7	8.4	.8	13.8	13.1
Special industries <sup>4</sup>	-	-	-	-	-	-	-
Agriculture, forestry, fishing, and hunting <sup>5,6</sup>	2,135.5	2,005.3	-130.2	-6.1	-.6	1.5	1.2
Agriculture wage and salary	1,282.1	1,236.1	-46.0	-3.6	-.4	.9	.8
Agriculture self-employed and unpaid family workers	853.4	769.3	-84.1	-9.9	-1.0	.6	.5
Nonagriculture self-employed and unpaid family worker <sup>7</sup>	8,943.8	9,720.6	776.8	8.7	.8	6.3	6.0
Secondary wage and salary jobs in agriculture and private household industries <sup>8,9</sup>	111.6	112.2	.6	.5	.1	.1	.1
Secondary jobs as a self-employed or unpaid family worker <sup>10</sup>	1,441.7	1,522.2	80.5	5.6	.5	1.0	.9

See notes at end of table.

**Table 4. Continued—Summary of industry output and employment projections, 2010 and projected 2020**  
[Numbers in thousands]

Industry sector	Output							
	Billions of chained 2005 dollars		Projected change, 2010–2020		Billions of dollars		Percent distribution	
	2010	Projected 2020	Number	Annual percent change	2010	Projected 2020	2010	Projected 2020
Total <sup>1,2</sup>	23,171.3	30,876.3	7,705.0	2.9	26,273.7	43,000.3	100.0	100.0
Nonagriculture wage and salary <sup>3</sup>	22,869.9	30,507.3	7,637.4	2.9	24,632.9	40,332.4	93.8	93.8
Goods-producing, excluding agriculture	5,565.8	7,385.6	1,819.8	2.9	6,390.9	9,769.0	24.3	22.7
Mining	388.1	441.0	52.9	1.3	417.9	641.1	1.6	1.5
Construction	814.7	1,183.3	368.6	3.8	932.5	1,540.2	3.5	3.6
Manufacturing	4,363.0	5,723.3	1,360.3	2.8	5,040.6	7,587.6	19.2	17.6
Service-providing	16,165.8	21,600.5	5,434.7	2.9	18,242.0	30,563.4	69.4	71.1
Utilities	354.2	431.7	77.5	2.0	429.0	644.0	1.6	1.5
Wholesale trade	1,176.4	1,648.9	472.5	3.4	1,213.5	1,836.6	4.6	4.3
Retail trade	1,165.0	1,671.0	506.0	3.7	1,208.1	2,029.3	4.6	4.7
Transportation and warehousing	709.4	977.6	268.2	3.3	820.4	1,365.6	3.1	3.2
Information	1,196.4	1,893.0	696.6	4.7	1,281.2	2,407.4	4.9	5.6
Financial activities	3,329.5	4,568.5	1,239.0	3.2	3,761.4	6,489.4	14.3	15.1
Professional and business services	2,355.0	3,372.1	1,017.1	3.7	2,667.4	5,056.6	10.2	11.8
Educational services	198.5	235.5	37.0	1.7	260.7	387.8	1.0	.9
Health care and social assistance	1,525.9	2,025.9	500.0	2.9	1,763.2	3,145.1	6.7	7.3
Leisure and hospitality	870.2	1,123.9	253.7	2.6	996.4	1,664.6	3.8	3.9
Other services	514.5	652.3	137.8	2.4	591.7	947.5	2.3	2.2
Federal government	1,012.1	938.9	-73.2	-7	1,158.6	1,345.8	4.4	3.1
State and local government	1,758.6	2,120.4	361.8	1.9	2,090.3	3,243.7	8.0	7.5
Special industries <sup>4</sup>	1,138.3	1,521.1	382.8	2.9	1,272.6	2,182.2	4.8	5.1
Agriculture, forestry, fishing, and hunting <sup>5,6</sup>	301.4	365.1	63.7	1.9	368.2	485.7	1.4	1.1
Agriculture wage and salary	-	-	-	-	-	-	-	-
Agriculture self-employed and unpaid family workers	-	-	-	-	-	-	-	-
Nonagriculture self-employed and unpaid family workers <sup>7</sup>	-	-	-	-	-	-	-	-
Secondary wage and salary jobs in agriculture and private household industries <sup>8,9</sup>	-	-	-	-	-	-	-	-
Secondary jobs as a self-employed or unpaid family worker <sup>10</sup>	-	-	-	-	-	-	-	-

<sup>1</sup> Output subcategories do not necessarily add to higher categories as a by-product of chain-weighting.

<sup>2</sup> Employment data for wage and salary workers are from the BLS Current Employment Statistics survey, which counts jobs, whereas self-employed, unpaid family workers, and agriculture, forestry, fishing, and hunting are from the Current Population Survey (household survey), which counts workers.

<sup>3</sup> Includes wage and salary data from the Current Employment Statistics survey, except private households, which is from the Current Populations Survey. Logging workers are excluded.

<sup>4</sup> Consists of accounting categories to reconcile the input-output system with NIPA accounts.

<sup>5</sup> Includes agriculture, forestry, fishing, and hunting data from the Current Population Survey, except logging, which is from Current Employment Statistics survey. Government wage and salary workers are excluded.

<sup>6</sup> Estimate of output not available separately by employment class.

<sup>7</sup> Comparable estimate of output growth is not available.

<sup>8</sup> Due to methodological changes, these data are not comparable to previously published numbers for these categories of secondary workers.

<sup>9</sup> Workers who hold a secondary wage and salary job in agricultural production, forestry, fishing, and private household industries.

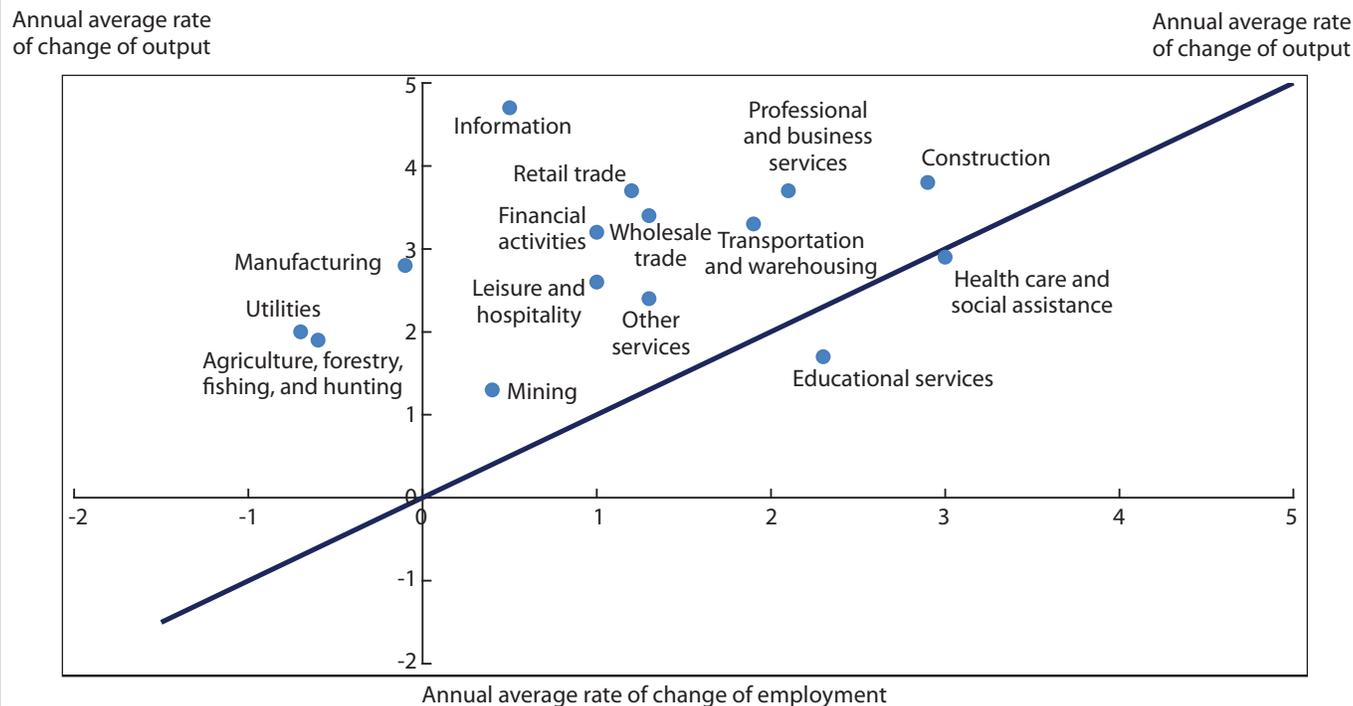
<sup>10</sup> Wage and salary workers who hold a secondary job as a self-employed or unpaid family worker.

NOTE: Dash indicates data not available.

and output growth. The chart shows a 45-degree line on which projected output and employment growth rates are identical, meaning zero productivity growth.<sup>26</sup> Any sector in the upper right quadrant that falls above the line is expected to have positive productivity growth, support-

ing more rapid growth in output than in employment. The farther each sector appears above the 45-degree line, the faster is its projected rate of productivity growth. Any sector in the upper right quadrant that falls below the 45-degree line is projected to have declining productivity,

**Chart 7. Projected annual percent change: employment versus output by industry sector, 2010–2020**



SOURCE: U.S. Bureau of Labor Statistics.

resulting in more rapid growth in employment than in output. Any sector falling into the upper left quadrant of the chart is projected to have output growth, but because of productivity growth, employment in that sector is projected to decline.

Ten of the fifteen industry sectors shown in chart 7 fall above the 45-degree line in the upper right quadrant, indicating that their productivity growth is allowing projected output to grow faster than employment but job gains are still expected. Because it has the fastest projected productivity growth, the information sector appears farthest above the line. Real output in this sector is projected to grow at 4.7 percent annually, but projected employment growth is a very slow 0.5 percent per year. Other industry sectors with above-average productivity growth and both output and job gains are retail trade, financial activities, and wholesale trade.

Chart 7 shows two industry sectors falling below the 45-degree line in the upper right quadrant: education services and health care and social assistance. Both industries have projected output growth, but productivity is expected to decline somewhat, resulting in slower growth for output than for employment.

Three industry sectors fall into the upper left quadrant

of chart 7: manufacturing, utilities, and the agriculture sector. These sectors are projected to grow in output, but lose jobs, between 2010 and 2020 because productivity growth is outstripping output growth. Manufacturing real output is projected to grow by 2.8 percent annually, close to the 2.9-percent rate for the overall economy. However, manufacturing employment is projected to continue its long-term decline, although at a very slow rate of 0.1 percent per year, but still resulting in 73,100 fewer jobs than in 2010. The utilities and agriculture sectors present a similar picture: utilities are projected to see real output grow by 2.0 percent per year, but a slow 0.7-percent annual rate of job decline, while the agriculture, forestry, fishing, and hunting industry is projected to have 1.9 percent annual growth in output and a 0.6-percent rate of job loss.

### Occupational projections

In their article “Occupational employment projections to 2020,”<sup>27</sup> C. Brett Lockard and Michael Wolf examine how the overall projected 14.3-percent growth in employment to a full-employment economy will affect occupations. The fastest growth is expected in health care, per-

sonal care, and community and social service occupations. Lockard and Wolf review each of the 22 major occupation groups and present data on projected job openings resulting from both employment growth and the need to replace workers who are expected to leave the occupation over the coming decade. Finally, they introduce some results from a new BLS education and training system that depicts (1) the education and work experience in a related occupation typically needed for entry into a given occupation and (2) the postemployment or on-the-job training typically needed to attain competency in a given occupation.

Lockard and Wolf also discuss the impact of the recession on the 22 major occupation groups and show that, for some groups, projected growth from 2010 to 2020 will consist largely of the recovery of jobs lost between 2006 and 2010. (Their analysis is discussed, in part, in the previous section on the impact of the recession on the projections.) Further, employment in three occupation groups—construction and extraction, production, and transportation and material moving occupations—fell by 10 percent or more from 2006 to 2010. Although all three groups are expected to grow between 2010 and 2020, none is expected to regain its 2006 employment level. In contrast, six major groups grew by at least 2.0 percent between 2006 and 2010; all are projected to continue to grow to 2020, and all but one at rates above the 14.3-percent average for all occupations. (See table 5.)

*Major occupation groups.* Major occupation groups provide a summary view of the impact on occupational demand from industry employment growth and expected changes in the occupational composition of industry staffing patterns.

Employment is projected to grow rapidly, 20.0 percent or more, in 6 major occupation groups, with the fastest growth found in healthcare support occupations (34.5 percent), personal care and service occupations (26.8 percent), and healthcare practitioners and technical occupations (25.9 percent). Below-average growth is expected in 10 major groups, with the slowest growth projected for food preparation and serving related occupations (9.8 percent), management occupations (7.0 percent), and production occupations (4.2 percent). One major group—farming, forestry, and fishing occupations—is projected to continue its long-term decline, with a projected 2.0-percent employment decrease.

Projected growth rates tell only part of the story, however, because rapid growth may not result in large numbers of new jobs if the occupation (or occupation group) is not large to start with. Thus, the office and administrative support occupations group is projected to add the most

new jobs, 2.3 million, but is expected to grow at a below-average rate of 10.3 percent. Other major groups adding the largest numbers of new jobs are healthcare practitioners and technical occupations (2.0 million) and sales and related occupations (1.9 million).

*Detailed occupations.* Lockard and Wolf find that employment in 657 of the 749 detailed occupations is projected to grow, while 92 occupations are expected to decline. They summarize the projections for detailed occupations through lists showing the most rapidly growing occupations, those adding the most new jobs, those declining most rapidly, and those losing the most jobs. As with the major occupation groups, these lists reflect the changing demand for workers in each occupation, as driven by industry change and the changing occupational composition of industries. Thus, the 30 fastest growing detailed occupations include 10 from either the healthcare practitioner and technical occupations group or the healthcare support occupations group, reflecting the rapid growth in demand for health care for the aging population.

The list of the fastest growing occupations also includes eight construction occupations, a result of rapid job gains as the construction industry partially recovers from the 2007–2009 recession. As noted earlier, the construction and extraction occupations group, to which these eight occupations belong, is not projected to regain enough jobs to return to its prerecession employment level.

Among the 30 occupations expected to generate the largest numbers of new jobs, healthcare occupations are prominent. Six of these occupations are in either the healthcare practitioner and technical occupations group or the healthcare support occupations group, including registered nurses, the occupation projected to add the most new jobs. Medical secretaries, an occupation concentrated in health care industries, appears on this list, as does personal care aides, an occupation that is in demand because of the aging population. The list also includes several large office and administrative support occupations that are employed across many industries and will gain jobs as the economy recovers.

The lists of declining occupations—the 10 fastest declining and the 10 losing the most jobs—include 4 unique occupations, that appear on both lists. Five of the occupations listed are for textile, apparel, or furnishings workers, concentrated in apparel- and textile-manufacturing industries that are declining rapidly due to increased imports, and four are Postal Service occupations. Farmers, ranchers, and other agricultural managers are expected to lose 96,100 jobs, more than any other occupation, as pro-

**Table 5. Employment by major occupational groups, 2006, 2010, and projected 2020**

[Numbers in thousands]

Matrix code	2010 National Employment Matrix title	Employment			Change, 2006–2010		Projected change, 2010–2020		Median annual wage, May 2010
		2006	2010	Projected 2020	Number	Percent	Number	Percent	
00–0000	Total, all occupations	150,620.0	143,068.2	163,537.1	-7,551.8	-5.0	20,468.9	14.3	\$33,840
11–0000	Management occupations	8,771.9	8,776.1	9,391.9	4.2	.0	615.8	7.0	91,440
13–0000	Business and financial operations occupations	6,831.9	6,789.2	7,961.7	-42.7	-6	1,172.5	17.3	60,670
15–0000	Computer and mathematical occupations.	3,313.2	3,542.8	4,321.1	229.6	6.9	778.3	22.0	73,720
17–0000	Architecture and engineering occupations	2,583.2	2,433.4	2,686.2	-149.8	-5.8	252.8	10.4	70,610
19–0000	Life, physical, and social science occupations	1,172.6	1,228.8	1,419.6	56.2	4.8	190.8	15.5	58,530
21–0000	Community and social service occupations	2,385.5	2,402.7	2,985.0	17.2	.7	582.3	24.2	39,280
23–0000	Legal occupations	1,222.2	1,211.9	1,342.9	-10.3	-8	131.0	10.8	74,580
25–0000	Education, training, and library occupations	9,033.7	9,193.6	10,597.3	159.9	1.8	1,403.7	15.3	45,690
27–0000	Arts, design, entertainment, sports, and media occupations	2,677.0	2,708.5	3,051.0	31.5	1.2	342.5	12.6	42,870
29–0000	Healthcare practitioners and technical occupations	7,197.6	7,799.3	9,819.0	601.7	8.4	2,019.7	25.9	58,490
31–0000	Healthcare support occupations	3,723.5	4,190.0	5,633.7	466.5	12.5	1,443.7	34.5	24,760
33–0000	Protective service occupations	3,162.9	3,302.5	3,667.0	139.6	4.4	364.5	11.0	36,660
35–0000	Food preparation and serving related occupations	11,352.4	11,150.3	12,242.8	-202.1	-1.8	1,092.5	9.8	18,770
37–0000	Building and grounds cleaning and maintenance occupations	5,744.6	5,498.5	6,162.5	-246.1	-4.3	664.0	12.1	22,490
39–0000	Personal care and service occupations.	4,877.6	4,994.7	6,331.4	117.1	2.4	1,336.6	26.8	20,640
41–0000	Sales and related occupations	15,985.4	14,915.6	16,784.7	-1,069.8	-6.7	1,869.1	12.5	24,370
43–0000	Office and administrative support occupations	24,344.0	22,602.5	24,938.2	-1,741.5	-7.2	2,335.7	10.3	30,710
45–0000	Farming, fishing, and forestry occupations	1,037.8	972.1	952.6	-65.7	-6.3	-19.4	-2.0	19,630
47–0000	Construction and extraction occupations	8,294.5	6,328.0	7,735.2	-1,966.5	-23.7	1,407.2	22.2	39,080
49–0000	Installation, maintenance, and repair occupations	5,883.3	5,428.6	6,228.7	-454.7	-7.7	800.2	14.7	40,120
51–0000	Production occupations	10,674.6	8,594.4	8,951.2	-2,080.2	-19.5	356.8	4.2	30,330
53–0000	Transportation and material moving occupations	10,350.8	9,004.8	10,333.4	-1,346.0	-13.0	1,328.7	14.8	28,400

SOURCE: C. Brett Lockard and Michael Wolf, "Occupational employment projections to 2020," this issue, pp. 84–108, table 1.

ductivity gains continue to reduce the number of workers needed despite projected output growth in the agriculture sector.

*Job openings from replacement needs.* In addition to job openings from employment growth, openings will occur because some workers leave the occupation over the decade, either to retire, to leave the labor force for other

reasons, or to move to other occupations. Openings from replacements generally are much larger in number than openings from the creation of new jobs; Lockard and Wolf find that, of the 54.8 million total job openings expected from 2010 to 2020, 61.5 percent are from replacement needs and 38.5 percent are from growth. Because of replacement needs, even occupations with projected declining employment are expected to have some openings.

**Table 6. Employment and total job openings, by education category, 2010 and projected 2020 and median annual wage, May 2010**

[Numbers in thousands]

Typical education needed for entry	Employment				Projected change, 2010–2020		Job openings due to growth and replacement needs, 2010–2020		Median Annual wage, May 2010
	Number		Percent distribution		Number	Percent	Number	Percent distribution	
	2010	Projected 2020	2010	Projected 2020					
Total, all occupations	143,068.2	163,537.1	100.0	100.0	20,468.9	14.3	54,787.4	100.0	\$33,840
Doctoral or professional degree	4,409.7	5,286.3	3.1	3.2	876.6	19.9	1,701.8	3.1	87,500
Master's degree	1,986.0	2,417.2	1.4	1.5	431.2	21.7	903.9	1.6	60,240
Bachelor's degree	22,171.1	25,827.2	15.5	15.8	3,656.1	16.5	8,562.4	15.6	63,430
Associate's degree	7,994.6	9,434.6	5.6	5.8	1,440.0	18.0	2,941.0	5.4	61,590
Postsecondary nondegree award	6,524.0	7,624.9	4.6	4.7	1,100.9	16.9	2,389.6	4.4	34,220
Some college, no degree	811.6	953.8	.6	.6	142.2	17.5	362.0	.7	44,350
High school diploma or equivalent	62,089.6	69,665.7	43.4	42.6	7,576.1	12.2	21,745.9	39.7	34,180
Less than high school	37,081.7	42,327.4	25.9	25.9	5,245.7	14.1	16,180.8	29.5	20,070

SOURCE: C. Brett Lockard and Michael Wolf, "Occupational employment projections to 2020," this issue, pp. 84–108, table 6.

Lockard and Wolf cite the example of farmers, ranchers, and other agricultural managers, an occupation that is projected to decline in employment yet have 234,500 job openings that are due to replacement needs.

*New education, work experience, and on-the-job training information.* With the 2010–2020 projections, BLS is introducing a new way of depicting the entry-level education, experience, and training needed for the various occupations. Each occupation is assigned a level for each of three dimensions: typical education needed for entry into the occupation, work experience in a related occupation, and typical on-the-job training. Compared with the old BLS education and training categories, this new system presents a more complete picture of the education, related work experience, and training needed for entry into a given occupation and to become competent in the occupation.<sup>28</sup>

Lockard and Wolf present the first analysis of employment and projections data for these new categories, beginning with employment and projected job openings in each of the eight categories indicating the typical education needed for entry. Note that these data are the sum of employment and job openings for the occupations assigned to

each education category; the data are *not* counts of workers who have the particular level of education attainment.

Occupations assigned to the education category of master's degree are projected, as a group, to grow by 21.7 percent between 2010 and 2020, faster than any other education category. These occupations, however, make up a small share, 1.5 percent, of projected total employment. (See table 6.)

The slowest growth, 12.2 percent, is projected for occupations in which a high school diploma or the equivalent is typically needed for entry. The occupations assigned to this education category account for 42.6 percent of total projected employment.

The new BLS education and training system allows for a fuller understanding of the preparation needed for entry into, and competency in, a given occupation by examining the work experience in related occupations and the on-the-job training, along with education needed. For example, among occupations assigned to the high school education category, those in which apprenticeship is the typical on-the-job training are projected to grow by 22.5 percent over the decade and have higher wages than the high school group as a whole.<sup>29</sup> Further analysis will be presented in a forthcoming article in the *Review*. □

## Notes

<sup>1</sup> See "Employment Projections: Education and Training Assignments" (U.S. Bureau of Labor Statistics, Dec. 6, 2011), [http://www.bls.gov/emp/ep\\_education\\_training\\_system.htm](http://www.bls.gov/emp/ep_education_training_system.htm).

<sup>2</sup> The 2010–2011 *Occupational Outlook Handbook* appears online at <http://www.bls.gov/oco>. The forthcoming 2012–2013 edition will

use a new format and provide new search tools.

<sup>3</sup> This figure is equivalent to the nonfarm payroll employment measure published by the BLS Current Employment Statistics program. It includes the wage and salary employment in all industries, less private households and the agricultural sector, but also includes logging.

<sup>4</sup> See Kathryn J. Byun and Christopher Frey, “The U.S. economy in 2020: recovery in uncertain times,” this issue, pp. 21–42.

<sup>5</sup> C. Brett Lockard and Michael Wolf, “Occupational employment projections to 2020,” this issue, pp. 84–108.

<sup>6</sup> See “Household data annual averages, table 25, Unemployed persons by occupation and sex” (Bureau of Labor Statistics, Current Population Survey), <ftp://ftp.bls.gov/pub/special.requests/lf/aat25.txt>.

<sup>7</sup> Carmen Reinhart and Vincent Reinhart, “After the Fall,” NBER working paper 16334 (Cambridge, MA, National Bureau of Economic Research, September 2010).

<sup>8</sup> The National Bureau of Economic Research is the official U.S. arbiter of the beginning and ending dates of recessions. (See “U.S. Business Cycle Expansions and Contractions” (Cambridge, MA, National Bureau of Economic Research, Jan. 6, 2012), <http://www.nber.org/cycles/cyclesmain.html>.)

<sup>9</sup> After the start of the 1973 recession, employment continued to increase for 11 months before beginning to decline. Employment regained its postrecession starting high point 27 months after the recession began, or, alternatively, 16 months from the peak of employment after the recession began.

<sup>10</sup> The recession of 1980 is not shown in the chart for reasons of visual clarity. Employment recovered to the level it had at the beginning of the 1980 recession 11 months later.

<sup>11</sup> See, for example, Christina D. Romer, “Jobless Rate Is Not the New Normal,” *The New York Times*, Apr. 9, 2011, <http://www.nytimes.com/2011/04/10/business/10view.html>.

<sup>12</sup> See Byun and Frey, “The U.S. economy in 2020: recovery in uncertain times,” for further discussion.

<sup>13</sup> See, for example, Austan Goolsbee, “Europe’s Currency Road to Nowhere,” *The Wall Street Journal*, Nov. 29, 2011, <http://online.wsj.com/article/SB10001424052970203611404577046532948487236.html>, and Sebastian Mallaby, “Germany Is the Real Winner in a Transfer Union,” Council on Foreign Relations, Nov. 25, 2011, <http://www.cfr.org/financial-crises/germany-real-winner-transfer-union/p26585>.

<sup>14</sup> See, for example, Fareed Zakaria, “Europe’s real problem: a lack of growth,” *The Washington Post*, Oct. 12, 2011, [http://www.washingtonpost.com/opinions/europes-real-problem-a-lack-of-growth/2011/10/12/gIQAUKkDgL\\_story.html](http://www.washingtonpost.com/opinions/europes-real-problem-a-lack-of-growth/2011/10/12/gIQAUKkDgL_story.html).

<sup>15</sup> Detailed descriptions of the projection methodology for each of these stages are found at the BLS website, [http://www.bls.gov/emp/ep\\_tech\\_documentation.htm](http://www.bls.gov/emp/ep_tech_documentation.htm).

<sup>16</sup> The civilian noninstitutional population comprises all persons 16 years and older who are not in the Armed Forces and who are

neither inmates of penal or mental institutions nor residents of sanitariums or homes for the aged.

<sup>17</sup> Values for assumed variables are presented in Byun and Frey, “The U.S. economy in 2020: recovery in uncertain times,” table 1, p. 23. The authors also discuss assumptions and target variables.

<sup>18</sup> For most industries, the National Employment Matrix uses data from the Occupational Employment Statistics (OES) survey as the source of the staffing patterns for wage and salary workers. Current Population Survey (CPS) data are used when OES data are not available—for example, for the agriculture production and private household industries. BLS treats self-employed workers and unpaid family workers as industries, using data from the CPS.

<sup>19</sup> This issue, pp. 43–64; see especially table 3, pp. 50–51.

<sup>20</sup> *Ibid.*

<sup>21</sup> In the macroeconomic model, nonfarm payroll employment is as defined in the BLS Current Employment Statistics program. In the industry projections component of the BLS Employment Projections program, this definition is adjusted to remove the logging industry and add the private households industry to derive the alternative measure nonagriculture wage and salary employment. Thus, the nonfarm payroll employment projection of 149.5 million in the macroeconomic model is different from the projection of 150.2 million presented in the industry output and employment projection results.

<sup>22</sup> See Kathryn J. Byun, “The U.S. housing bubble and bust: impacts on employment,” *Monthly Labor Review*, December 2010, pp. 3–17, <http://www.bls.gov/opub/mlr/2010/12/art1full.pdf>.

<sup>23</sup> Byun and Frey, “The U.S. economy in 2020: recovery in uncertain times.”

<sup>24</sup> This issue, pp. 65–83.

<sup>25</sup> The government sectors are excluded, because output is measured in terms of compensation and, under this measure, productivity change is difficult to interpret.

<sup>26</sup> The line roughly indicates zero labor productivity in terms of output per job. The BLS projections model, however, uses a more precise measure of labor productivity, namely, output per hour worked.

<sup>27</sup> This issue, pp. 84–108.

<sup>28</sup> See “Employment Projections: Education and Training Assignments” (U.S. Bureau of Labor Statistics, Dec. 6, 2011), [http://www.bls.gov/emp/ep\\_education\\_training\\_system.htm](http://www.bls.gov/emp/ep_education_training_system.htm).

<sup>29</sup> Lockard and Wolf present additional examples as well. For tables of education and training assignments and attainment, as well as more detailed summary data, see “Employment Projections: Education and Training Assignments (U.S. Bureau of Labor Statistics, Dec. 6, 2011), [http://www.bls.gov/emp/ep\\_education\\_training\\_system.htm](http://www.bls.gov/emp/ep_education_training_system.htm).