What Do Expected Changes in U.S. Job Structure Mean for States and Workers in the Tenth District?

By Chad Wilkerson

Public interest in the future structure of the U.S. labor market has been understandably high in recent years, for several reasons. Some types of manufacturing and service jobs are going offshore. The recovery in employment from the 2001 recession has been sluggish. And the quality of job creation has been called into question. Against this backdrop, policymakers, businesses, workers, and students in the Tenth Federal Reserve District are asking difficult questions about the future of jobs in their area. Will local industries increase or decrease employment in the years ahead? What types of workers will be in highest demand? Are future jobs in the area likely to be high paying?

This article looks at the potential impact of expected changes in U.S. job structure on employment in the Tenth District.[1] Specifically, it analyzes the latest national industrial and occupational employment projections made by the U.S. Bureau of Labor Statistics and discusses what the projections mean for states and workers in the region—both in terms of quantity and quality of job growth through 2012.

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The article draws two primary conclusions from the data. First, except in Colorado, the current industrial structures of Tenth District states are less favorable for future job growth than in the nation, although in some cases only slightly so. Second, the prospects for high-quality job growth in several district states may be somewhat lower than in the nation. While high paying jobs are projected to grow faster than low paying jobs across the district, the industrial structures of Kansas, New Mexico, Oklahoma, and Wyoming are not quite as conducive to growth in high paying jobs as in the country as a whole.

The first section of the article explains why and how U.S. industrial structure has changed over time and identifies the industries projected to add and shed jobs the fastest in coming years. The second section discusses the relative importance of industrial structure for state employment growth. It also analyzes the industrial structures of Tenth District states to see if they are favorable for future job growth. The third section describes the projected changes in the mix of occupations nationally and assesses the potential for high-quality job growth in the Tenth District.

I. THE U.S. INDUSTRIAL STRUCTURE OF THE FUTURE

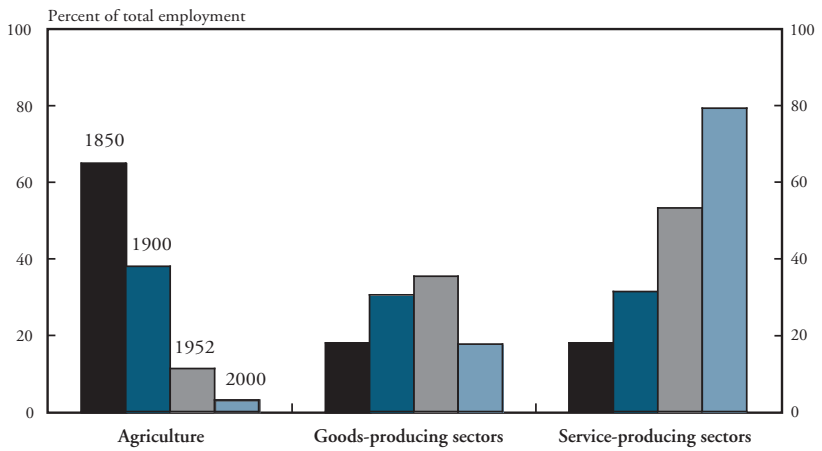
The industrial structure of the United States is likely to change considerably in the years ahead. This section draws from historical data and economic theory to explain why tomorrow's distribution of jobs across industries will look different from that of yesterday and today. The section also analyzes the data available on future industrial structure to determine which industries are expected to add or shed jobs most rapidly.

Why will U.S. industrial structure change?

There are both short and long answers to why U.S. industrial employment structure will change. The short answer is because it has always changed. Over the past 150 years, the industrial composition of U.S. employment has evolved considerably (Chart 1). In 1850, nearly two-thirds of U.S. jobs were in agriculture (Urquhart). By 2000, agriculture's share of total jobs had dropped below 3 percent. The relative importance of the goods-producing sectors of the nonfarm economy

Chart 1

DISTRIBUTION OF U.S. EMPLOYMENT, 1850-2000



Sources: Urquhart, U.S. Bureau of Economic Analysis

(manufacturing, mining, and construction) has also changed, rising steadily from the mid-1800s to the mid-1900s and then dropping off considerably. Meanwhile, service workers in industries such as retail, finance, information, healthcare, and tourism made up less than a fifth of all U.S. workers in 1850—but in 2000 those jobs represented nearly 80 percent of the workforce.

The longer answer to why U.S. industrial employment structure will look different in the future includes several interrelated factors. First, *technological advancements* are likely to produce more rapid productivity gains in some U.S. industries than in others, which could change the relative need for workers across industries. For example, the Bureau of Labor Statistics expects productivity at iron and steel mills to grow more than three times as fast as output, implying a drop in employment. By contrast, productivity in the legal services industry is expected to fall and output is expected to rise, implying an increase in employment.

The anticipated continued *expansion of international trade* will also likely affect the future mix of jobs across U.S. industries. International trade generally allows countries to import goods and services that other

countries produce more efficiently and frees them to specialize in what they do best. For example, the United States has a comparative disadvantage in producing goods like apparel that can easily be made with unskilled labor abroad. At the same time, the U.S. has a comparative advantage in making goods such as such as state-of-the-art medical products that require advanced technology and highly skilled labor. As world trade expands, employment in the U.S. can be expected to shift from industries in which the country has a comparative disadvantage to industries in which it has a comparative advantage.

In addition, *changes in consumer tastes* due to rising incomes or demographic factors will have differing effects on the demand for many goods and services. For example, as real incomes rise over time, people tend to spend relatively more on luxury goods and services—such as travel, elective medical procedures, advanced education, and second homes—and relatively less on necessities like food and clothing. Thus, industries that produce goods and services in higher demand will likely add jobs faster than other industries. In addition, the aging of the population as the baby boomer generation starts to retire will likely increase demand for workers in industries such as healthcare and recreation.

Finally, *changing workforce skills* could alter U.S. industrial job structure. For example, the large number of U.S. workers that will begin retiring in coming years may have different skills than new workers coming into the labor force, meaning the country's comparative advantages could change. Similarly, the educational attainment of the workforce is expected to continue to rise, which could cause employment to expand more in knowledge-based industries than in industries relying on manual labor.

Data on future U.S. industrial structure

No one knows for certain how U.S. job structure will look in the future. However, the industrial and occupational employment projections of the Bureau of Labor Statistics (BLS) have been a respected resource over time. The latest BLS projections, for the years 2002-2012, were released in 2004.

Every two years, BLS economists project job growth by industry and occupation for the entire country. Their projections are based on a careful analysis of a variety of economic and demographic indicators. The projections assume a labor market that clears and an economy that operates at its full potential (Horrigan). The first step in the BLS projection process is to determine the likely labor supply of the nation over the projection period, based on Census Bureau population projections and expected trends in labor force participation. The second step is to forecast gross domestic product (GDP) growth, including its various components, with a macroeconomic model. The third step is to make industrial output and employment projections, based on the demands for specific goods and services implied by the macroeconomic forecasts. Finally, the BLS performs a detailed analysis of individual industries to produce occupational employment projections, based on how goods and services are expected to be produced by workers within industries.

Most studies have found the BLS employment projections to be fairly accurate over time, especially the industrial employment projections (Alpert and Auyer; Andreassen). For example, Andreassen compared forecasts of 1984-95 employment growth by industry with actual growth and found that the majority of industries were projected in the correct direction (up or down).[2]

The 2002-2012 industrial employment projections are expected to be better than usual, for two reasons. First, they incorporate 2000 Census data, whereas recent projections were based on increasingly out-of-date 1990 Census data. Second, the latest projections are the first to be based on the new North American Industrial Classification System (NAICS), which updates industry definitions considerably from the old Standard Industrial Classification (SIC) system in use since 1935 (which was updated periodically through 1987). This more modern and detailed classification of industries should make the projections more meaningful for users of the data.

Industries projected to add and shed jobs the fastest

The BLS made detailed employment projections for about 175 industries for the 2002-2012 period.[3] In broad terms, these projections largely maintain the industrial employment trends of past decades—that is, a continuing shift out of agriculture and goods-producing industries and into service-producing industries.

Among U.S. industries with over 100,000 workers in 2002, the 15 industries expected to experience the fastest job growth heading forward are all service-producing industries (Table 1). Several high-tech services, including software, computer design, and Internet and data processing services, are expected to grow quickly, as businesses increasingly demand these services to further improve productivity and as consumers demand more computer-related items, including video games (Berman). Business services, such as management consulting, employment services, and equipment rental, are also projected to add jobs rapidly, largely because firms in other industries increasingly prefer to outsource many types of work domestically rather than do them in-house. In addition, a number of health and social services industries are expected to expand employment markedly, due in part to the aging of the population but also to a continued expected expansion of services for families and individuals in crisis.

Among the large U.S. industries the BLS projects to lose employment the fastest through 2012, most are manufacturing or natural resource extraction industries. These include apparel and textile manufacturing, in which employment is expected to decline sharply due to expanded trade with low labor-cost countries and to continued productivity gains. In addition, several chemical manufacturing industries are projected to reduce employment, due primarily to sluggish or declining demand for their products. A number of durable manufacturing industries, including steel mills and computer-related manufacturing, are also expected to shed jobs, due largely to labor-saving technological advances. Likewise, some natural resource industries, such as oil and gas extraction and agriculture, are expected to see job losses, due to productivity enhancements and industry consolidation.[4]

Table 1

U.S. INDUSTRIES PROJECTED TO ADD AND SHED JOBS AT THE FASTEST RATE, 2002-2012*

	Industries with the fastest projected job growth	Industries with the fastest projected job declines
1	Software publishers	Cut and sew apparel mfg.
2	Management, scientific, and technical consulting services	Textile mills
3	Community care facilities for the elderly and residential care facilities	Fabric mills
4	Computer systems design and related services	Federal government enterprises
5	Employment services	Other chemical product and preparation mfg.
6	Individual, family, community, and vocational rehabilitation services	Iron and steel mills and ferroalloy mfg.
7	Ambulatory health care services	Oil and gas extraction
8	Internet services, data processing, and other information services	Computer and peripheral equipment mfg.
9	Child day care services	Pulp, paper, and paperboard mills
10	Commercial and industrial machinery and equipment rental and leasing	Resin, synthetic rubber, and artificial synthetic fibers and filaments mfg.
11	Offices of health practitioners	Natural gas distribution
12	Consumer goods rental and general rental centers	Basic chemical mfg.
13	Cable and other subscription programming and program distribution	Aerospace product and parts mfg.
14	Amusement, gambling, and recreation industries	Agricultural products
15	Transit and ground passenger transportation	Semiconductor and electronic component mfg.

* Among industries with over 100,000 employees in 2002

Source: U.S. Bureau of Labor Statistics

Across all industries, the BLS expects U.S. employment to grow 1.4 percent annually from 2002 to 2012. But employment is not likely to grow at the same rate in all states. A number of factors will influence job growth across the nation in coming years. One probable source of variation will be the differing industrial structures of U.S. states.

II. INDUSTRIAL STRUCTURE AND FUTURE TENTH DISTRICT JOB GROWTH

Some states are more concentrated in industries projected to grow or decline rapidly than other states. What impact could these differing concentrations have on future job growth rates across states? This section discusses the importance of industrial structure relative to other factors in explaining state job growth. It then examines which states, particularly in the Tenth District, have favorable and unfavorable industrial structures for future growth in the number of jobs.

The importance of industrial structure for state job growth

A number of studies have looked at the influence of a state's or area's industrial structure on job growth. The typical method of analysis compares actual job growth in an area over a certain period with projected growth based on the area's initial industrial structure—specifically, the rate at which an area's total employment would have grown if employment in each of its industries grew at the same rate as in the nation over the period.[5]

Most studies have found that industrial structure has a limited but "important" impact on state or local employment growth, explaining a "fair amount" of the variation in actual job growth rates across U.S. states and metropolitan areas (Partridge and Rickman; Bound and Holzer). For example, Bound and Holzer found that projected job growth rates based on industrial structure were positively correlated with actual growth rates, explaining about 21 percent of the variation in actual growth rates across U.S. metro areas during the 1980s. In addition, studies have also generally found that areas with favorable industrial mixes tend to add employment even faster than their projected growth rates, possibly due to spillover job growth from high-growth industries to other local industries (Garcia-Mila and McGuire; Partridge and Rickman; Bound and Holzer).

An analysis of more recent, more detailed employment data produces similar results. In late 2004, the BLS released detailed state-level employment data on an NAICS basis back to 1990. These data can be combined in such a way that virtually all of the industries for which the BLS projects employment for 2002-2012 can be analyzed for the previous ten-year period, 1992-2002.[6] As in past studies, projected growth rates based on states' industrial structure are positively related to states' actual growth rates over the period, explaining about 16 percent of the variation in actual growth rates across states. Likewise, the data show that states with favorable industrial structures grew even faster than their projected growth rates from 1992 to 2002.[7] These findings suggest that industrial structure continues to matter for state job growth. Still, it is only one of several factors influencing growth.

What are the other factors? One factor is differences across states in the cost of doing business—costs such as taxes, local wages, and land or office rents. These costs can affect the location decisions of firms and thus impact employment growth in a state (Partridge and Rickman). Similarly, differences in factors affecting the quality of life—for example, crime rates, traffic congestion, and availability of museums or professional sports teams—can affect whether workers want to move in or out of an area. In addition, trends in international immigration could affect states in different ways, based on where immigrants initially locate. Moreover, differences across states in labor force participation rates and worker productivity could enhance or restrain employment growth, regardless of industry mix or the location decisions of firms or workers.

Despite the influence of these and other such factors, initial industrial structure plays a role in job growth. Thus, it is worthwhile to investigate which states are inherently best positioned for future job growth based on this measure. And since the BLS provides relatively reliable information about future U.S. industrial employment structure, it is possible to perform such an exercise.

Which states have favorable industrial structures—and why?

To determine which states have favorable industrial structures, state job growth rates for 2002-12 can be projected by applying the BLS national industrial employment growth projections to 2002 state

employment data by industry.[8] This methodology results in projected annual state job growth rates ranging from 1.05 percent for Wyoming to 1.65 percent for Florida.[9] States with favorable or unfavorable industrial structures tend to group together geographically (Figure 1). The favorable mixes (states with projected job growth rates at least as high as the nation, which also happen to be the top third of states) are largely located in the Northeast and Southwest, while the most unfavorable mixes (the bottom third of states) are heavily concentrated in the Southeast and Great Plains.

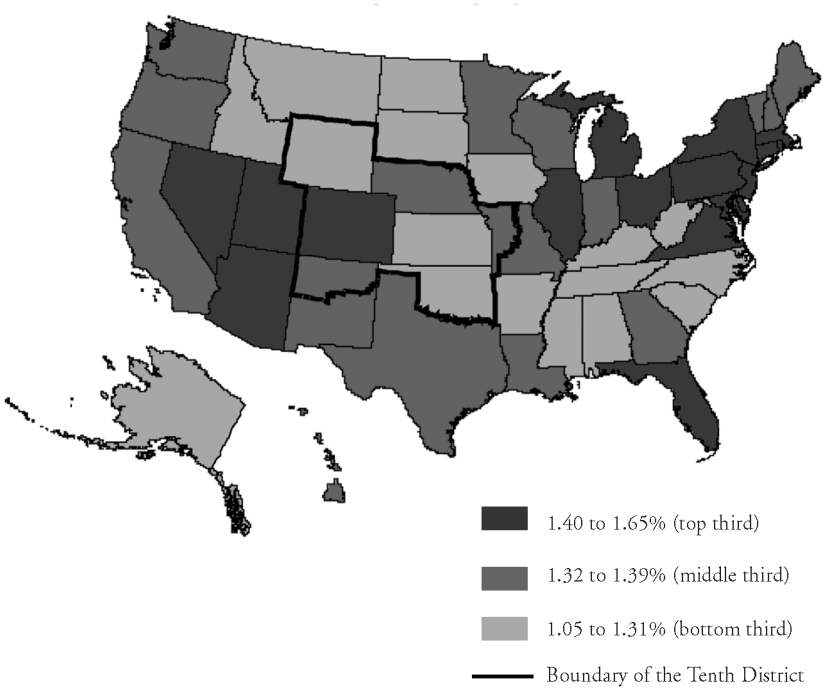
In general, states with a more favorable industrial structure than the nation have high concentrations in industries expected to add jobs rapidly and low concentrations in industries projected to reduce employment or to add jobs slowly. For example, Virginia benefits from the large presence of management and technical consulting services in the state, as well as from the small presence of apparel manufacturing. Conversely, states with less favorable industrial structures than the nation generally have low concentrations in industries projected to add jobs rapidly and high concentrations in industries projected to shed jobs or add jobs only modestly. For example, Arkansas is hurt by both a large presence of agriculture and a small presence of computer systems design.

Within the Tenth District, projected job growth for states varies widely. Colorado (1.45 percent) is the only district state to rank above the national average (1.40 percent).[10] Projected job growth in Nebraska (1.36), Missouri (1.33), and New Mexico (1.33) is slightly below the nation, while Oklahoma (1.30), Kansas (1.26), and Wyoming (1.05) rank among the bottom third of states.

To gain some insight into why district states have favorable or unfavorable industrial structures, it is useful to identify the five industries contributing the most to the gap between a state's and the nation's projected job growth (Table 2). Industries contributing the most to this gap are generally ones in which a state's concentration of jobs differs considerably from that of the nation and in which projected job growth is markedly above or below average at the national level. For example, in Colorado, three of the five industries most responsible for the gap in projected growth rates provide positive contributions, consistent with the state having a more favorable industrial structure than the nation. In

Figure 1

PROJECTED ANNUAL STATE JOB GROWTH, 2002-2012, IF STATES' INDUSTRIES GROW AT PROJECTED NATIONAL RATE



Source: U.S. Bureau of Labor Statistics, author's calculations

Kansas, by contrast, four of the five most important industries to its projected growth rate provide negative contributions, consistent with it having a less favorable industrial structure than the nation.

Although among district states only Colorado has a more favorable overall industrial structure than the nation, all seven district states have high concentrations in some industries projected to add jobs rapidly (Table 3). In addition, all seven states benefit from low concentrations in apparel-related manufacturing, and all states but Colorado benefit

Table 2

INDUSTRIES CONTRIBUTING THE MOST TO DIFFERENCES IN TENTH DISTRICT STATES' PROJECTED 2002-2012 EMPLOYMENT GROWTH RATES FROM THE NATIONAL RATE

	Positive or negative contribution?	Due to large or small presence?
Colorado		
1 Cut and sew apparel mfg.	Positive	Small
2 Computer systems design and related services	Positive	Large
3 Employment services	Negative	Small
4 Computer and peripheral equipment mfg.	Negative	Large
5 Software publishers	Positive	Large
Kansas		
1 Aerospace product and parts mfg.	Negative	Large
2 Agricultural products	Negative	Large
3 Employment services	Negative	Small
4 Telecommunications, except cable	Negative	Large
5 Cut and sew apparel mfg.	Positive	Small
Missouri		
1 Agricultural products	Negative	Large
2 Employment services	Negative	Small
3 Cut and sew apparel mfg.	Positive	Small
4 Motor vehicle mfg.	Negative	Large
5 Fabric mills	Positive	Small
Nebraska		
1 Agricultural products	Negative	Large
2 Employment services	Negative	Small
3 Cut and sew apparel mfg.	Positive	Small
4 Rail transportation	Negative	Large
5 Internet services, data processing, and other info. services	Positive	Large
New Mexico		
1 Federal government enterprises	Negative	Large
2 Nonagriculture self-employed and unpaid family workers	Negative	Large
3 Cut and sew apparel mfg.	Positive	Small
4 Semiconductor and electronic component mfg.	Negative	Large
5 Ambulatory health care services	Positive	Large

Table 2 continued

Oklahoma		
1 Agricultural products	Negative	Large
2 Oil and gas extraction	Negative	Large
3 Computer systems design and related services	Negative	Small
4 Employment services	Positive	Large
5 Nonagriculture self-employed and unpaid family workers	Negative	Large
Wyoming		
1 Coal mining	Negative	Large
2 Agricultural products	Negative	Large
3 Oil and gas extraction	Negative	Large
4 Employment services	Negative	Small
5 Federal government enterprises	Negative	Large

Source: U.S. Bureau of Labor Statistics, author's calculations

from small concentrations in some types of computer or electronics manufacturing, industries in which employment is projected to fall or rise only slightly in the years ahead.

On the negative side, however, all district states have relatively high concentrations in several industries projected to shed jobs or add jobs only modestly heading forward (Table 4). For example, all states except Colorado are hurt by high concentrations in agricultural production. Likewise, all district states are hurt by small concentrations in some industries projected to grow rapidly (Table 5). Indeed, all states but Oklahoma are hurt by low concentrations in employment services, and all states except Missouri are hurt by small concentrations in educational services.

Looking more specifically at individual states, *Colorado* benefits from sizable concentrations in computer systems design, software, and amusement and recreation. On the other hand, the state's projected job growth rate suffers somewhat from high concentrations in several industries in which employment is expected to decline or grow slowly—such as computer-related manufacturing, telecommunications, self-employed, and architectural and engineering services.

Kansas has high concentrations in aircraft manufacturing, telecommunications, agriculture, and state and local government, industries expected to shed jobs or add jobs only sparingly in the years ahead. These concentrations pull its projected job growth rate down below the national average—as does its low concentration in the fast-growing computer systems design industry. On the positive side, Kansas benefits somewhat from the large presence of several health and social service industries in the state.

In *Missouri*, high concentrations in agriculture and motor vehicle manufacturing hold down its projected rate of job growth. The state is also hurt markedly by low concentrations in some business, high-tech, and healthcare industries expected to add jobs rapidly. More positively, Missouri benefits from the large presence of nursing care facilities, truck transportation, and amusement and recreation in the state.

Nebraska benefits from its high concentrations in Internet and data processing services, truck transportation, and community care facilities for the elderly. On the negative side, Nebraska's projected job growth is just under the national average due to the sizable presence of agriculture, rail transportation, and insurance carriers in the state, as well as the small presence of several industries expected to add jobs rapidly.

New Mexico benefits somewhat from high concentrations in ambulatory healthcare services, rehabilitation services, and scientific research and development services. But the state's projected employment growth rate remains below the national average due to the large presence of a number of government and natural resource industries in the state, as well as to the small presence of several high-tech and business services.

In *Oklahoma*, high concentrations in employment services and a couple of healthcare fields provide positive contributions. These positives are outweighed, however, by the negative effects of large concentrations in agriculture, mining, and government enterprises, as well as small concentrations in several industries expected to increase employment rapidly, such as computer systems design and management consulting.

Finally, *Wyoming* has the lowest overall projected rate of annual job growth of any state in the country. The state does have high concentrations in a few industries projected to add jobs rapidly, including equipment rental and traveler accommodation. But the state also has

Table 3

HIGH CONCENTRATIONS IN INDUSTRIES EXPECTED TO ADD JOBS RAPIDLY, TENTH DISTRICT STATES*

Colorado
Computer systems design and related services
Software publishers
Amusements, gambling, and recreation
Cable and other subscription programming and program distribution
Business support and investigation and security services and support
Kansas
Community care facilities for the elderly and residential care facilities
Individual, family, community, and vocational rehabilitation services
Nursing care and residential mental health facilities
Truck transportation and couriers and messengers
Office administration and facilities support services
State and local government education
Missouri
Nursing care and residential mental health facilities
Truck transportation and couriers and messengers
Amusements, gambling, and recreation
Nebraska
Internet services, data processing, and other information services
Truck transportation and couriers and messengers
Community care facilities for the elderly and residential care facilities
Business support and investigation and security services and support
Nursing care and residential mental health facilities
New Mexico
Ambulatory health care services
Individual, family, community, and vocational rehabilitation services
Scientific research and development and other professional services
Office administration and facilities support services
State and local government education
Oklahoma
Employment services
Ambulatory health care services
State and local government education
Nursing care and residential mental health facilities
Cable and other subscription programming and program distribution
Wyoming
State and local government education
Commercial and industrial machinery and equipment rental and leasing
Traveler accommodation

*Defined as high-concentration industries that raise a state's projected job growth rate by at least 0.0025 percentage points.

Sources: U.S. Bureau of Labor Statistics, author's calculations

Table 4

HIGH CONCENTRATIONS IN INDUSTRIES EXPECTED TO REDUCE JOBS OR ADD JOBS SLOWLY, TENTH DISTRICT STATES*

Colorado
Computer and peripheral equipment mfg.
Nonagriculture self-employed and unpaid family workers
Telecommunications, except cable
Architectural and engineering services

Kansas
Aerospace product and parts mfg.
Agricultural products
Telecommunications, except cable
State and local government hospitals
Rail transportation

Missouri
Agricultural products
Motor vehicle mfg.

Nebraska
Agricultural products
Rail transportation
Insurance carriers

New Mexico
Federal government enterprises
Nonagriculture self-employed and unpaid family workers
Semiconductor and electronic component mfg.
State and local government enterprises
Agricultural products
Oil and gas extraction
Federal general government
Support activities for mining
Coal mining
Metal ore mining

Continued on next page

Table 4 continued

Oklahoma
Agricultural products
Oil and gas extraction
Nonagriculture self-employed and unpaid family workers
Federal general government
Support activities for mining
Natural gas distribution
Federal government enterprises

Wyoming
Coal mining
Agricultural products
Oil and gas extraction
Federal government enterprises
Support activities for mining
Rail transportation
Nonagriculture self-employed and unpaid family workers
State and local government hospitals
State and local general government
Nonmetallic mineral mining and quarrying
Power generation and supply
Basic chemical mfg.
Petroleum and coal products mfg.
Federal general government
Sawmills and wood preservation

*Defined as high-concentration industries that lower a state's projected job growth rate by at least 0.005 percentage points

Sources: U.S. Bureau of Labor Statistics, author's calculations

Table 5

LOW CONCENTRATIONS IN INDUSTRIES EXPECTED TO ADD JOBS RAPIDLY, TENTH DISTRICT STATES*

Colorado
Employment services
Educational services
Kansas
Employment services
Educational services
Computer systems design and related services
Missouri
Employment services
Management and technical consulting services
Computer systems design and related services
Offices of health practitioners
Nebraska
Employment services
Ambulatory health care services except offices of health practitioners
Management and technical consulting services
Individual, family, community, and vocational rehabilitation services
Educational services
Offices of health practitioners
Software publishers
New Mexico
Computer systems design and related services
Educational services
Management and technical consulting services
Employment services
Offices of health practitioners
Software publishers
Oklahoma
Computer systems design and related services
Educational services
Management and technical consulting services
Software publishers
Offices of health practitioners
Wyoming
Employment services
Computer systems design and related services
Individual, family, community, and vocational rehabilitation services
Educational services
Ambulatory health care services except offices of health practitioners
Management and technical consulting services
Software publishers

*Defined as low-concentration industries that lower a state's projected job growth rate by at least 0.005 percentage points

Sources: U.S. Bureau of Labor Statistics, author's calculations

high concentrations in many industries projected to shed jobs or add jobs only modestly in coming years, including agriculture, a number of mining industries, and government enterprises.

Implications of state industrial structures

Six of the seven states in the Tenth District have less favorable industrial structures than the nation for future growth of jobs. Are these states destined to have slower employment growth than the nation in coming years? Not necessarily. As noted earlier, other factors besides industrial structure—such as the tightness of local labor markets, immigration flows, quality-of-life factors, and costs of living and doing business—can play a sizable role in state job growth. As an example, given their industrial structures in 1992, four district states—Kansas, Missouri, Oklahoma, and Wyoming—would have been expected to add jobs at a slower rate than the national rate (1.8 percent) through 2002. But Kansas and Oklahoma actually added jobs at a *faster* pace than the nation during this period. Both states' projected annual job growth rates were 1.7 percent, while their actual growth rates were 1.9 and 2.0 percent, respectively.

Although initial industrial structure is only one of several factors influencing state job growth, the results of this section can still be of value to policymakers. For example, the results illustrate the challenges some states could face in keeping up with or surpassing national job growth in the years ahead. States with low projected job growth rates may need to enhance efforts to improve their infrastructure and quality of life to become more attractive to both firms and workers. Some states may also want to focus more attention on improving education and training programs to enhance the skills of their workers so they are better able to adapt to the projected changes in industry job structure. Finally, states may want to identify key industries most likely to encounter difficulties in coming years, as workers in these industries may need special attention in making the transition to new jobs in the economy.

III. WORK AND PAY IN THE TENTH DISTRICT ECONOMY OF THE FUTURE

In addition to potential differing impacts on the *quantity* of jobs created across states, a changing U.S. industrial structure could also have an impact on the *quality* of jobs created in different areas, primarily in terms of pay. This section discusses the types of jobs the BLS expects to grow the fastest in the years ahead. Next, it analyzes the education and training requirements of the jobs of the future. Finally, it looks at whether the jobs likely to grow fastest in Tenth District states will pay high or low salaries.

The occupations of the future

The discussion of projected job growth by industry in the previous section provided a preliminary look at the nature of future job growth in the nation. However, one important aspect was missing—the wide variety of projected growth rates of specific occupations both within and across industries. The BLS occupational employment projections for 2002-12 shed light on this feature of the future U.S. labor market.

Like the industrial employment projections, the BLS occupational employment projections have generally proved to be good predictors of actual changes in jobs (Veneri; Rosenthal). For example, Rosenthal found that, since the BLS began publishing detailed occupational projections in 1966, it has correctly predicted the direction of change in employment for the vast majority of occupations. Projections for specific occupations, however, have sometimes been very inaccurate, as BLS economists have occasionally not anticipated important technological changes within and across industries (Alpert and Auyer). Perhaps most famously, the BLS projected strong growth in demand for gas station attendants and travel agents from 1988 to 2000, while actual demand for these jobs fell considerably over this period, due, respectively, to the rise of self-service gas stations and Internet-based personal travel planning (*The Economist*).

Which jobs are expected to grow the fastest in the United States in the years ahead, and why? Among occupations with more than 50,000 employees, the 15 occupations expected to grow the fastest are computer analysts, software engineers, and a number of assistant-type jobs

in the health and social services industries (Table 6). Most of these occupations are expected to grow in part because demand for the services produced in the primary industry in which they are employed—such as healthcare and software—is expected to grow rapidly (Horrigan). However, some occupations within these and other industries are expected to grow much faster than others. In a recent study, Levy and Murnane attributed these differences in projected occupational job growth to the changing nature of work. The jobs likely to grow fastest in the future, they argued, are those that involve performing nonroutine tasks that cannot easily be done by computers or by a lower-paid worker in another country. Specifically, workers in highest demand will be those adept at "expert thinking," or those who have the ability to recognize and analyze complex patterns of information—such as software engineers and computer analysts. Also in high demand will be workers with "complex communication" skills, or those who can clearly communicate complex and changing information, both verbally and nonverbally, in ways computers cannot—such as employees in many of the assistant-type jobs projected to grow rapidly.

Among the 15 large occupations the BLS projects to lose jobs the fastest are several farm-related occupations, as well as a number of occupations that include the words "operator," "assembler," or "clerk" in the title. Many of these jobs are projected to decline in part because of expected difficulties in the primary industry in which they are found, such as agriculture and manufacturing. However, most of these jobs—regardless of their primary industry—are also those that involve relatively routine tasks that can easily be replicated by computers, machinery, or a lower-paid foreign worker.

As part of the occupational employment projections, the BLS lists the primary level of education or training a worker needs to be qualified for a particular occupation.[11] One fairly common distinguishing feature of occupations projected to grow rapidly through 2012, especially in comparison with those projected to decline, is the requirement of some type of post-high-school degree. For example, nine of the 15 occupations projected to grow fastest require a vocational award or higher, while only two of the 15 fastest-declining occupations have such a requirement.

Table 6

U.S. OCCUPATIONS PROJECTED TO ADD AND SHED JOBS AT THE FASTEST RATE, 2002-2012*

	Occupations with the fastest projected job growth	Educational requirement to be fully qualified for job in 2002
1	Network systems and data communications analysts	Bachelor's degree
2	Medical assistants	On-the-job training (> 1 month)
3	Computer software engineers, systems software	Bachelor's degree
4	Home health aides	On-the-job training (< 1 month)
5	Physician assistants	Bachelor's degree
6	Social and human service assistants	On-the-job training (> 1 month)
7	Personal and home care aides	On-the-job training (< 1 month)
8	Fitness trainers and aerobics instructors	Vocational award
9	Computer software engineers, applications	Bachelor's degree
10	Medical records and health information technicians	Associate degree
11	Database administrators	Bachelor's degree
12	Dental hygienists	Associate degree
13	Dental assistants	On-the-job training (> 1 month)
14	Computer systems analysts	Bachelor's degree
15	Self-enrichment education teachers	Work experience in related occupation

Table 6 continued

	Occupations with the fastest projected job declines	Educational requirement to be fully qualified for job in 2002
1	Word processors and typists	On-the-job training (> 1 month)
2	Electrical and electronic equipment assemblers	On-the-job training (< 1 month)
3	Farmers and ranchers	On-the-job training (> 1 year)
4	Computer operators	On-the-job training (> 1 month)
5	Sewing machine operators	On-the-job training (> 1 month)
6	Loan interviewers and clerks	On-the-job training (< 1 month)
7	Brokerage clerks	On-the-job training (> 1 month)
8	Travel agents	Vocational award
9	Textile knitting and weaving machine setters, operators, and tenders	On-the-job training (> 1 year)
10	Meter readers, utilities	On-the-job training (< 1 month)
11	Chemical plant and system operators	On-the-job training (> 1 year)
12	Aerospace engineers	Bachelor's degree
13	All other farming, fishing, and forestry workers	On-the-job training (> 1 month)
14	Farmworkers and laborers, crop, nursery, and greenhouse	On-the-job training (< 1 month)
15	Prepress technicians and workers	On-the-job training (> 1 year)

* Among occupations with over 50,000 employees in 2002

Source: U.S. Bureau of Labor Statistics

An analysis of projected job growth by employers' preferred level of education and training shows that the fastest job growth through 2012 is projected for those jobs requiring a graduate or professional degree, though this is a relatively small group of jobs (Chart 2). In addition, jobs requiring a bachelor's degree and jobs requiring an associate degree or post-high-school vocational award—which together made up nearly a quarter of all jobs in 2002—are projected to grow much faster than jobs not requiring a post-high-school degree.[12]

Interestingly, the slowest job growth is projected for jobs that primarily require extensive on-the-job training or work experience in a related field.[13] These jobs, in general, are projected to grow even more slowly than jobs for which a person can be fully qualified with less than a month of training.[14] Some occupations in this group that are projected to decline particularly rapidly include farmers and ranchers, aircraft and other types of skilled manufacturing assemblers, butchers, and several types of mining and railroad workers.

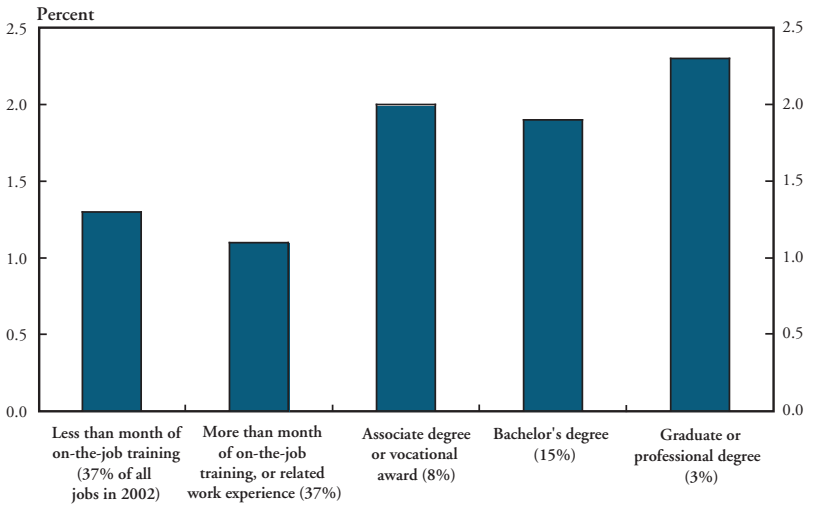
Pay of the jobs of the future

The jobs of the future are increasingly expected to be in service-producing industries, require the ability to perform nonroutine tasks, and require some type of post-high-school degree. Will the jobs of the future also pay well? One way to assess the likely future pay of jobs is to look at whether jobs that currently pay high salaries are projected to grow faster than those that currently pay low salaries. This method does not take into account whether the nation's future labor force will have the appropriate skills for the jobs of the future—and thus leaves out half of the labor supply and demand equation that ultimately determines wages. Still, an analysis of expected demand for jobs by current pay levels should provide useful insights into the quality of future job growth.

To see whether high paying jobs are projected to grow faster than low paying jobs, occupations were divided into quintiles based on their 2002 pay. For the nation as a whole, the quintile of occupations projected to grow the fastest through 2012 is—by far—the highest paying quintile, or those jobs that paid over $47,610 in 2002 (Chart 3). Projected growth for these jobs is nearly 2 percent per year, or almost one and a half times the projected growth rate across all jobs (1.4 percent).

Chart 2

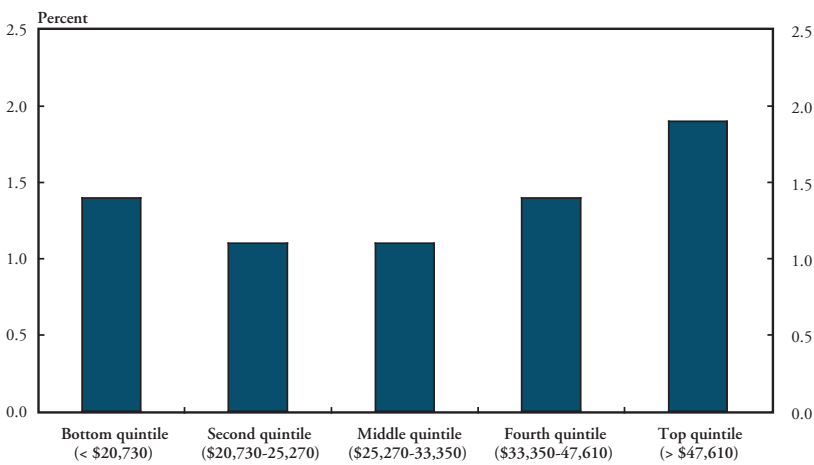
PROJECTED ANNUAL U.S. JOB GROWTH, 2002-2012, BY PRIMARY EDUCATION OR TRAINING REQUIREMENTS OF JOBS IN 2002



Source: U.S. Bureau of Labor Statistics

Chart 3

PROJECTED ANNUAL U.S. JOB GROWTH, 2002-2012, BY AVERAGE PAY OF JOBS IN 2002



Source: U.S. Bureau of Labor Statistics
Note: In some cases, median salary data were used due to missing average salary data.

By contrast, projected employment growth for the lowest paying quintile of jobs—those that paid less than $20,730 in 2002—is roughly the same as the average across all jobs.[15]

Interestingly, the slowest projected job growth is for occupations currently in the middle and second-lowest paying quintiles. These are jobs that paid between $20,730 and $33,350 in 2002. The slow projected growth for these jobs is consistent with the recent study by Levy and Murnane, which argued that the increased use of computers and outsourcing will have the biggest adverse effects on jobs in the "lower middle" of the pay scale. The middle and second-lowest paying quintiles of jobs include several occupations that are expected to shrink rapidly through 2012, including factory workers of many types, farmers and ranchers, loan interviewers, travel agents, stock clerks, parts salesmen, and switchboard operators. Many of these occupations are also those that require some type of extensive on-the-job training, the group of jobs found to have the lowest projected growth based on education and training level.

A number of economists and economic policymakers have recently noted some of the potential problems that could arise from strong national demand for workers at the top of the pay scale, moderate demand at the bottom, and sluggish demand in the middle. In particular, if the supply of workers with the skills to compete for high-quality jobs cannot keep up with the rising demand for such workers, wages for these top jobs will be pushed up further. At the same time, if the supply of workers with skills commensurate with jobs at the middle and lower levels of the pay scale exceeds the demand for these jobs, their wages could be held back (Greenspan; Levy and Murnane; Reich).

Most economists and policymakers agree that more emphasis on education and worker training—or retraining—is the answer to ensuring that the future supply of labor matches the skills demanded by employers, thus allowing for wage growth throughout the pay scale. However, since effective changes in education and training programs can sometimes take considerable time, several experts also advocate some type of job transition assistance—especially healthcare benefits—for workers displaced by structural changes in the economy (Bernanke; Cohen and DeLong; Levy and Murnane).

The quality of future job growth in Tenth District states

Will changes in the quality of jobs be the same for Tenth District states as for the nation? A district state could diverge from the trends described in the previous section due in part to its industrial structure. For example, a state could enjoy faster growth in high paying jobs because it has sizable concentrations in industries that already have a high percentage of high paying jobs that are expected to grow rapidly. Or a state could enjoy faster growth in high paying jobs because it has sizable concentrations in industries expected to shift from low paying jobs to high paying jobs.

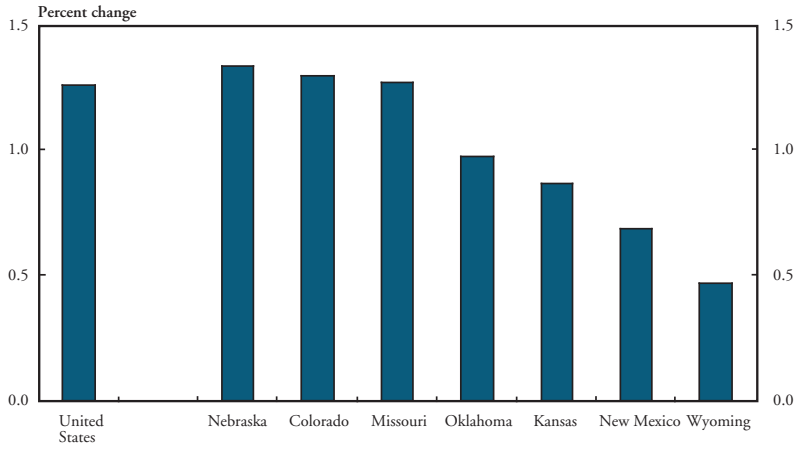
The same type of approach used earlier in this article can determine the influence of a state's industrial structure on the quality of its future job growth. For each industry in the nation, the BLS reports the current and projected distribution of employment across occupations. These estimates can be applied to states' actual and projected employment by industry—the data presented in Section II—to obtain estimates of current and future employment by occupation.[16]

The employment projections suggest that several district states have industrial structures that are less favorable than the nation for high-quality future job growth. This can be seen by looking at how projected changes in the mix of employment would affect a state's average salary if the wage of each occupation were the same as in the nation and remained unchanged from 2002 to 2012 (Chart 4). While the net effect of projected changes in employment mix is to increase the average salary in all seven district states, the effect ranges across states. The rise in average salary in Colorado, Missouri, and Nebraska is similar to the nation, but Kansas, New Mexico, Oklahoma, and Wyoming each have a smaller rise than the nation.

Dividing occupations into quintiles based on 2002 national pay levels shows that, for the most part, projected job growth by pay in district states resembles that in the nation (Table 7). The highest paying quintile of jobs generally has the fastest growth, while the middle or second-lowest paying quintile has the slowest growth. However, there are some differences across states in the relative growth of different pay groups, and these differences provide additional insight into the potential quality of future job growth in each district state.

Chart 4

NET EFFECT ON STATES' AVERAGE SALARY OF PROJECTED CHANGES IN THE MIX OF JOBS, 2002-2012



Note: In some cases, median salary data were used due to missing average salary data.

Source: U.S. Bureau of Labor Statistics

For example, projected job growth in *Colorado* is similar to the nation in the middle of the pay scale but exceeds the nation at the two ends of the pay scale. Colorado has a high concentration in the software and computer design industries, which generally have high paying jobs and are expected to add workers at a rapid pace. At the same time, the state has a large concentration in the tourism industry, which is also expected to increase employment rapidly but has many relatively low paying jobs. The strong projected job growth at the two ends of the pay scale has the potential to increase income inequality slightly more in Colorado than in the nation.

In *Kansas*, projected job growth lags the nation in all but the lowest paying quintile of jobs. However, the largest shortfall in growth is for the highest paying jobs. This shortfall is related to the slow job growth expected in several important industries in the state that employ highly paid workers, such as aircraft manufacturing and telecommunications.

Table 7

PROJECTED ANNUAL STATE JOB GROWTH, 2002-2012, BY AVERAGE PAY OF JOBS IN 2002

	Bottom quintile	Second quintile	Middle quintile	Fourth quintile	Top quintile
United States	1.4%	1.1%	1.1%	1.4%	1.9%
Colorado	1.5	1.2	1.1	1.4	2.0
Kansas	1.4	1.0	1.0	1.3	1.6
Missouri	1.3	1.0	1.1	1.4	1.8
Nebraska	1.3	1.0	1.1	1.5	1.8
New Mexico	1.4	1.1	1.1	1.4	1.6
Oklahoma	1.3	1.1	1.1	1.4	1.7
Wyoming	1.3	0.9	0.8	0.9	1.3

Note: In some cases, median salary data were used due to missing average salary data.

Sources: U.S.Bureau of Labor Statistics, author's calculations

Thus, while job growth is likely to be more equal across pay groups in Kansas than in the nation, the state could suffer from slower job growth at the top of the pay scale.

In *Missouri*, the average salary of its projected 2012 mix of employment rises from that of its 2002 employment mix by roughly the same amount as in the nation. Thus, the state has a fairly favorable industrial structure for high-quality job growth. However, it has slightly lower projected job growth rates than the nation at the top and bottom of the pay scale. This means that job growth could be more equal across pay groups in Missouri than in the country as a whole.

Nebraska's projected job growth by pay is similar to Missouri's, lagging the nation slightly in the lowest, second-lowest, and highest paying quintiles. However, Nebraska is the only district state that exceeds the national rate for the second-highest paying quintile of jobs, or those paying between $33,350 and $47,610 at the national level in 2002. This is due in part to the sizable presence in the state of the trucking industry, a large industry with above-average paying jobs that is expected to increase employment faster than the national average in coming years. Another contributing factor is the state's high concentra-

tion in the Internet services and data processing industry, which is expected to undergo a sizable shift from lower paying to higher paying jobs in coming years.

In *New Mexico*, the only pay quintile with a different projected job growth rate than the nation is the highest paying quintile, where the state lags the nation considerably. Slower projected growth at the top of the pay scale results in part from New Mexico's lack of concentration in the management and technical consulting services industry, an industry expected to experience a sizable shift from lower paying to higher paying jobs. In addition, the state has high concentrations in some industries that employ highly paid workers but are expected to shed jobs due to rapid improvements in productivity—such as mining and oil and gas extraction. While the slower projected growth of jobs at the high end of the pay scale would be unwelcome, New Mexico would, as a result, have one of the most equal distributions of job growth by pay in the district.

Oklahoma's primary divergence from the nation in job growth is also at the top of the pay scale, where it lags somewhat. Similar to New Mexico, the state has a high concentration in the energy industry, which employs many highly paid workers but is expected to add relatively few jobs. The state also has a small concentration in some high paying industries such as software and computer systems design that are expected to add jobs rapidly. In addition, it has a low concentration in management and technical consulting services, an industry expected to experience a sizable shift from lower paying to higher paying jobs in the years ahead.

Finally, projected job growth in *Wyoming* lags the nation in all five pay quintiles, and by increasingly wider margins with each higher paying quintile. This projection suggests Wyoming could have difficulties producing high-quality jobs in the years ahead, as many of its currently high paying jobs are in industries projected to decline or grow slowly in the nation. Some of these industries, however, are energy-related industries that have witnessed a resurgence during the past year, which may improve the state's outlook somewhat.

IV. CONCLUSIONS

As it has in the past, U.S. job structure is expected to change in the years ahead. Some U.S. states are inherently better positioned to benefit from projected changes than others, based simply on their current industrial structure. States could be well positioned for overall growth in jobs by having high concentrations in industries expected to add jobs rapidly or low concentrations in industries expected to shed jobs. Similarly, states could also be well-positioned for high-quality job growth by having high concentrations in industries that already have many high paying jobs and are expected to grow rapidly in coming years, or by having high concentrations in industries that are expected to experience a large shift from low paying jobs to high paying jobs.

This article found that most states in the Tenth Federal Reserve District have a somewhat less favorable industrial structure than the nation for overall job growth through 2012, with Colorado being the only exception. Several district states are hurt by high concentrations in agriculture, federal government, telecommunications, and rail transportation industries projected to shed jobs or to add jobs only modestly in the years ahead. Most states are also hurt by low concentrations in educational services, software publishing, and management consulting services—industries projected to add jobs rapidly.

The article also found that several district states—Kansas, New Mexico, Oklahoma, and Wyoming—have a somewhat less favorable industrial structure than the nation for high-quality job growth in the years ahead. The pattern of future job growth in these four states is not projected to produce as big an improvement in average pay as in the nation. This is due in part to the large presence in these states of high paying industries expected to shed jobs, such as mining or aircraft manufacturing, as well as a small presence in some fast-growing technology industries that either already have many high paying jobs or are expected to add high paying jobs in coming years.

More positively, the article found that all seven district states have high concentrations in at least some industries projected to grow rapidly. In addition, the net effect of expected changes in the mix of jobs in each state is to raise the state's overall average salary. States also have many options to improve their prospects for both quantity and

quality of future job growth, primarily by acting to increase the quantity and quality of their labor force. For example, states can make themselves more attractive to high-skill workers by enhancing their quality of life and by providing the infrastructure necessary for the jobs of the future. States can also increase the prospects of their current and future workers by focusing on improving educational institutions and worker training programs.

ENDNOTES

[1]The Tenth Federal Reserve District includes the entire states of Colorado, Kansas, Nebraska, Oklahoma, and Wyoming, plus the northern half of New Mexico and the western third of Missouri.

[2]Specifically, Andreassen found that employment changes in 62 percent of industries were projected in the correct direction. However, this figure likely understates the accuracy of the projections. Manufacturing made up 64 percent of the number of industries projected for 1984-95 while only accounting for 15 percent of total employment. Most of the industries projected in the wrong direction were manufacturing industries that did not rebound from the recessions of the early 1980s as expected. Employment in services industries, by contrast, was generally projected in the correct direction, though projections of growth were too conservative in many cases.

[3]Employment projections were also available in some BLS releases for even more detailed industries, but the BLS did not produce the occupational estimates necessary for the analysis in Section III of this article for these industries.

[4]It should be noted that the intermediate-term outlook for employment in the oil and gas sector may have improved somewhat since the BLS employment projections were released in early 2004, due to the recent sustained increases in oil and gas spot and futures prices.

[5]For convenience, the term "projected growth" will be used through the remainder of the article to refer to projected growth based on the area's industrial structure.

[6]The exceptions are agriculture, the self-employed, and railroads—sectors generally not covered by unemployment insurance and thus more difficult to track.

[7]The coefficient on projected job growth in a simple regression of actual employment growth on projected growth was 1.74, similar in magnitude to findings in the previous studies listed.

[8]The state employment data used in this analysis came primarily from the Covered Employment and Wages (CEW) program at the BLS. Exceptions include farm employment, railroad employment, and self-employed workers—groups generally not covered by unemployment insurance and thus not included in the CEW data set. In each of these cases, the BLS estimate of 2002 national employment was apportioned to states based on state-level data from other sources—for farm employment, the BEA's REIS system; for railroad employment, the Railroad Retirement Board; and for the self-employed, the BLS's Current Population Survey.

[9]This range is considerably smaller than the range of actual growth rates across states in recent decades. However, this smaller range may not be surprising given the finding noted in the previous section of the article that states with favorable industrial structures generally grow even faster than their projected growth rate, perhaps due to spillover job growth from high-growth industries to other local industries.

[10]The national average used as a benchmark in this article is actually the growth rate of the sum of states (1.40 percent). This figure is slightly less than the national average reported by BLS (1.42 percent), due to some small differ-

ences between the sum of state employment data as reported in CEW and other sources and the national employment data used for the projections. The sum of states is used instead of the actual national average for purposes of meaningfully comparing state growth rates with a national rate.

[11]The BLS introduced a new and additional method of apportioning jobs by education and training for the 2002-12 projections, based on the actual educational attainment of workers in each occupation. However, the old method—distributing occupations by employers' preferred level of training—was used in this article due to the article's primary interest in labor demand as opposed to labor supply.

[12]Some researchers have analyzed the education and training information in the occupational employment projections in a different way. For example, Bernstein notes that a college degree is required in only 30 percent of occupations adding the most jobs in coming years (as opposed to those occupations adding jobs at the fastest rate).

[13]This group of occupations includes those whose primary job requirements are "moderate-term on-the-job training" (defined as jobs requiring between one month and one year of on-the-job training), "long-term on-the-job training" (defined as jobs requiring more than one year of on-the-job training) or "work experience in a related field." Projected annual job growth rates for each of these groups of jobs were between 1.0 percent and 1.2 percent.

[14]This group of occupations is made up of those jobs requiring "short-term on-the-job-training," defined by the BLS as those jobs requiring less than a month of on-the-job training.

[15]Due to the need later in this article to make comparisons with individual states, the salary data used in this national analysis are for the sum of states. As a result, the data may not match up exactly with actual U.S. totals.

[16]State labor departments also produce state-level projections of occupational employment every two years, based upon both the national projections and information about the labor force in their state. However, these projections are generally released with considerable and varying lags, and in some cases use differing methodologies. While each individual state's projections likely provide valuable information for workers in that particular state, the state labor department data presents some problems for the researcher attempting to analyze how national projections might inherently favor some states more than others. It should also be noted that occupational employment data are available for each district state in 2002. These data were not used for two reasons. First, a sizable amount of occupational employment data was missing for most states. Second, a similar method of determining occupational employment was needed for both 2002 and 2012, so that employment in the two years would be comparable. Since the 2002 occupational data for states used in this section are "constructed," findings should be interpreted with caution.

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